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PSSRU
Personal Social Services Research Unit

Estimating relative needs formulae for new forms of social care support: using an extrapolation method

Interim working paper

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Contents

Executive Summary

Introduction

1. Local authorities in England have responsibility for securing adult social care for their local populations. Historically, social care support has included: services such as home care and residential care; personal budgets and direct payments; equipment; and also some professional support like social work. The majority of public social care funding, however, comes from central Government, and is distributed to local authorities in the form of both open-ended grants (the majority) and some ring-fenced grants.

2. Following the Layfield enquiry in 1976 (Cmnd 6453 1976) central Government grants have been allocated to local authorities using a formula to help account for differences in local funding requirements (Bebbington and Davies 1980). The latest incarnation – in operation since 2006/7 – is the relative need formula (RNF) (Darton, Forder et al. 2010).

3. The fundamental principle underpinning the use of allocation formulas is to ensure equal opportunity of access to 'support' for equal need. The conventional way to interpret this principle is that each council should have, after their allocation, sufficient net funding so that they can provide an equivalent level of support (services or otherwise) to all people in their local population who would satisfy national standard eligibility conditions (Gravelle, Sutton et al. 2003; Smith 2007).

4. The number of people satisfying eligibility tests for public support for social are, and the amount of that support, will vary between local authorities according to a range of 'need-related' and wealth/income factors. These factors can be largely regarded as being 'exogenous', beyond the (reasonable) control of the local council, and therefore funding allocations should be adjusted to compensate local authorities accordingly.

5. Following implementation of the Care Act 2014 local authorities will be required to meet the costs of care for people whose cumulative cost of care has exceeded a certain threshold amount – the 'cap' limit. In order to determine people's progression towards the cap, authorities will be required to regularly assess the needs of all people with possible care needs. The Care Act 2014 will also introduce a new deferred payment scheme. This policy allows people to defer paying assessed charges for their care from local authorities until a later date, up to their time of death

6. We consider the new forms of support to be provided by local authorities as arising from the Care Act 2014: the additional responsibility for the assessment of need and the provision of deferred payment agreements (DPAs). The main aim is to develop two relative needs formulae that will determine funding allocations to local authorities for these new responsibilities.

Key concepts

7. The principle of formula allocations is that local authorities are compensated for externally driven cost variation. In applying this principle we need to determine what factors are considered external, and so beyond the control of the local authority, and which are not. The main drivers of cost for social care are the needs-characteristics of the local population. Needs factors are the core variables in relative needs formulae and can be regarded as external.

8. Some other factors, such as council preferences about setting local eligibility thresholds, are clearly within council control and should not be 'controlled for' in the formula. But other factors are between these two cases. At least three merit further discussion in the context of this analysis.

a. First, the supply of care services. Most LAs commission services from independent sector providers, and so do not have direct control over that form of supply. Nonetheless, LAs do have powers to directly provide services and are able to manage local markets to some extent. For this reason, supply conditions were not treated as exogenous in developing relative needs formulae.

b. The second factor concerns the demand for services. Differences in demand can lead to variation in the use of services beyond that expected on the basis of (eligible) need alone. In this study we did not include these factors in the formula because they are at least in part affected by LA policies. In particular, LAs operate with need-assessment criteria with regard to publicly-funded care, including for the new responsibilities. Also, more pragmatically, behavioural effects are very hard to anticipate and model. For example, there are no sound data or theoretical models on which to predict demand for assessments or DPA.

c. The third is population sparsity. The main argument is that the costs of providing services could be higher in rural areas than in urban areas. Formula funding directly accounts for differences in unit cost by applying the area cost adjustment. There may also be supply effects, but these are treated as above i.e. excluded from the formula. There could be an argument that rurality implies some direct need effect. Nonetheless, in theory, the other direct need proxies used in the analysis should account for this effect.

9. The general approach was not to include factors in the formulae unless they were clearly considered to be external. The concern otherwise is that by including factors which could be affected by LA policies, the amount of 'compensatory' funding an LA receives would become partly under its control.

Methods

10. Relative needs formulae in social care are generally determined by using data about the support/services that local authorities currently provide. In this case we are concerned with new forms of support and so lack relevant utilisation data. Nonetheless, we can assume that the need-driven uptake of these new forms of support will be directly proportionate to the number of people that would satisfy the *need test* that underpins current social care support. Neither assessments nor DPAs will be subject to the current *financial means-test* for social care, although DPAs will be subject to new financial eligibility conditions.

11. We therefore required a measure of the number of people who would satisfy the need test for this analysis. Available datasets provide a range of relevant indicators related to need e.g. rates of attendance allowance uptake, rates of long-standing illness in the population, age, sex and so on. However, for the purposes of funding allocations, particularly into the future, we required a single *index of need* for each LA that combines the contribution of all these factors. One way of doing this was to statistically model the social care needs test using data on the current use of public social care. Then we could estimate – using regression analysis – how far these indicators 'explain' current social care utilisation (service user numbers). A formula for a relative need index can be calculated on this basis.

12. The problem with using social care utilisation data is that current utilisation rates will be determined by the financial means-test, LA preferences/efficiencies and current supply patterns, as well as by the need test. These non-need influences had to be removed or 'cleaned'.

13. Supply factors were cleaned by including a supply variable directly in the regression analysis. The relative effect of supply was then removed by setting this variable to a constant for all LAs. Similarly, LA effects were estimated and removed by using LA dummy variables.

14. The financial means-test is more difficult to clean because it is determined by variables that also explain need: e.g. living alone and income/income benefits. If we set all relevant financial indicator variables to a constant for each LA, we risk under-measuring some important aspects of need differences. We tackled this problem by estimating the effect of relevant financial indicator variables on a *simulated* version of the current financial eligibility test.

15. Once these non-need influences were removed, the result was an equation predicting differences in relative need between LAs, and this was used to calculate a relative need equation for additional assessments.

16. The simulation approach could also be used to model the new DPA financial eligibility test. In the same way as above, the results could be used in combination with the needs test to determine likely up-take patterns for DPAs in each LA. By estimating the relationship between these expected up-take patterns and relevant exogenous factors, we had a basis for estimating a relative needs formula in the DPA case.

17. One of the important benefits of using data on existing local authority-funded services is that this approach avoids problems of out-of-area placement. We use data on what LAs spend, not on what services are used within the local authorities.

Empirical analysis

18. Two datasets were used. First, we constructed a (small) area dataset comprising data on the numbers of LA-supported clients and routinely-available need and wealth variables such as rates of benefit uptake and Census variables. These data were collected for each *lower super-output area* (LSOA) – a standard geographical unit – in a final sample of 53 LAs, giving a total of around 14,000 LSOAs. Data for LA-supported clients were provided directly from LAs at LSOA level.

19. The second dataset was the English Longitudinal Survey of Ageing (ELSA). This dataset has a wide range of data about individuals in the survey, including information about their needs-related characteristics and their wealth and income, including benefit uptake.

20. Five waves of ELSA were combined (with financial variables inflated to be in line with the last wave). The sample of people aged 65 and over (or 65+ in shorthand) was selected. This provided 25,420 observations for people aged 65+. These data were then reweighted so that rates of home ownership, living alone and pension credit uptake were in line with rates in the LSOA data.

21. The small area data were used to model the combined effect of local authority need and financial eligibility. The ELSA data were used to directly simulate (a) the financial means-test for current social care support and (b) the new test for DPA eligibility. The results could be used to remove the effect of the current financial means-test, as outlined above.

Assessment and DPA estimations

22. A relative need formula for assessments was estimated for both people with a residential care need and with a non-residential care need. The following steps were repeated for each case:

    a. We used a regression model to estimate the probability that a person satisfies the current financial means-test (E) using ELSA data with wealth and need variables (ones that are also available at small area level).

b. We used another regression model to estimate the numbers of people in an LSOA that have LA-supported services – i.e. that satisfy both need and financial means-test $(R + E)$ – with need, wealth and supply variables.
c. The predicted values from these two estimations (steps a. and b.) were used to calculate the number of people in an LSOA that would pass the needs test (only) (R).
    i. We removed LA-level effects and supply effects using their national average values from the estimation at step b.
d. A regression model was used to estimate an equation for the number of people in an LSOA that would pass the needs test only (R) (as determined at step c.) in terms of need, wealth, supply and (population) scaling variables.
    i. We calibrated between the two estimations (steps a. and b.) by scaling all the coefficients in this equation using a common factor so that the net effect of home ownership on the numbers of people satisfying the need test was zero.
e. Statistical error for the process in steps b. to d. was estimated (using bootstrapping).
f. A linear approximation was calculated for the coefficients from the equation in step d. This involved calculating the change in the predicted numbers with need for small changes in each need-related and wealth variable from their sample mean values.

23. An additional assessments formula was found by subtracting the LA-supported clients (linear) equation $(R + E)$ from the linear equation for numbers of people passing the need test (R).

24. The DPA formula was produced in a similar way with the predicted value of DPA eligibility (D) also applied at step c. to produce a value for the expected count of DPA-eligible people in each LSOA, and in total for the LA.

Results

25. The estimations used the following variables:

Need:	**Supply:**
Attendance Allowance claimants 65+ per capita 65+	Total care home beds per MSOA per MSOA pop 65+
Limiting (significantly) condition 85+ per capita 65+	**Population/ scale:**
Living arrangements: couples per households 65+	Population 65+ (log)
Wealth/ income:	**Sparsity:**
Home owner household 65+ per households 65+	Population density (total pop per hectare)
Pension Credit Claimants 80+ per capita 65+	

26. Both age and gender variables were initially included but proved not to be significant. Sparsity was not significant in the residential care estimation but was for non-residential care. Relative need formulae (RNFs) were derived holding supply, scale and sparsity constant.

27. Table 14 give RNFs for residential care. For non-residential care, we used two different specifications: the first with the number of clients using either LA-funded home care or direct payments (Table 15); and the second with the number of clients using any LA-funded non-residential care service (Table 16). The former variable had fewer missing values.

28. The condition whereby a person satisfies the need test but is not financially eligible (*Need and not eligible*) is calculated by subtracting the first column from the second column. It gives an RNF for *additional assessments*. The DPA formula only applies in the residential care case.

Table 1. Relative need formulae, residential care

	Need + Elig (LA-supp clients)	Need (All clients)	Additional assessments (Need and *not* eligible)	DPA
Attendance Allowance claimants 65+ per person 65+	0.01213	0.02072	0.00858	0.00436
Limiting (significantly) condition 85+ per person 65+	0.00736	0.01022	0.00286	0.00098
Home owner households 65+ per households 65+	-0.00244	0.00000	0.00244	0.00317
Pension Credit Claimants 80+ per person 65+	0.01166	0.01552	0.00387	0.00331
Living arrangements: couple households per HHs 65+	-0.00377	-0.00735	-0.00358	-0.00598
Constant	0.00743	0.01012	0.00269	0.00169

Table 2. Relative need formulae, non-residential care (Home care + DP)

	Need + Elig (LA-supported clients)	Need (All clients)	Additional assessments (Need and *not* eligible)
Attendance Allowance claimants 65+ per person 65+	0.07983	0.09998	0.02014
Limiting (significantly) condition 85+ per person 65+	0.20773	0.33162	0.12389
Home owner households 65+ per households 65+	-0.02195	0.00000	0.02194
Pension Credit Claimants 80+ per person 65+	0.10760	0.07773	-0.02986
Living arrangements: couple households per HHs 65+	-0.03785	-0.04246	-0.00461
Constant	0.05288	0.05523	0.00235

Table 3. Relative need formulae, non-residential care (All NR services)

	Need + Elig (LA-supported clients)	Need (All clients)	Additional assessments (Need and *not* eligible)
Attendance Allowance claimants 65+ per person 65+	0.08339	0.11082	0.02744
Limiting (significantly) condition 85+ per person 65+	0.13912	0.22154	0.08242
Home owner households 65+ per households 65+	-0.01681	0.00000	0.01681
Pension Credit Claimants 80+ per person 65+	0.10011	0.08257	-0.01754
Living arrangements: couple households per HHs 65+	-0.03101	-0.03596	-0.00495
Constant	0.05025	0.05650	0.00625

29. To provide combined formulae (residential plus non-residential clients), we weighted the individual formulae together by the respective number of total supported clients in England for residential and non-residential services – see Table 17 and Table 18.

Table 4. Relative need formulae, combined res and NR (HC + DP) 65+

	Need + Elig (LA-supported clients)	Need (All clients)	Additional assessments (Need and *not* eligible)	DPA
Attendance Allowance claimants 65+ per person 65+	0.06051	0.07736	0.01684	0.00436
Limiting (significantly) condition 85+ per person 65+	0.15055	0.23991	0.08935	0.00098
Home owner households 65+ per households 65+	-0.01638	0.00000	0.01638	0.00317
Pension Credit Claimants 80+ per person 65+	0.08022	0.05998	-0.02023	0.00331
Living arrangements: couple households per HHs 65+	-0.02812	-0.03244	-0.00432	-0.00598
Constant	0.03991	0.04236	0.00245	0.00169

Table 5. Relative need formulae, combined res and NR (all non-res) 65+

	Need + Elig (LA-supported clients)	Need (All clients)	Additional assessments (Need and *not* eligible)	DPA
Attendance Allowance claimants 65+ per person 65+	0.06306	0.08511	0.02206	0.00436
Limiting (significantly) condition 85+ per person 65+	0.10152	0.16124	0.05972	0.00098
Home owner households 65+ per households 65+	-0.01271	0.00000	0.01271	0.00317
Pension Credit Claimants 80+ per person 65+	0.07487	0.06344	-0.01143	0.00331
Living arrangements: couple households per HHs 65+	-0.02324	-0.02780	-0.00456	-0.00598
Constant	0.03803	0.04327	0.00523	0.00169

Discussion

30. Formula-based allocations differ substantially from allocations that are worked out solely on LA population 65+ shares. Assuming the same total budget was allocated in each case, the most-affected LAs would receive nearly 40% less or over 12% more money respectively than a population shares allocation as regards additional assessments. The corresponding comparison for DPAs is that some LAs would receive over 40% less funding whilst others would receive over 30% more money than a population shares allocation.

31. A range of robustness checks were carried out. We also compared the results regarding additional assessments as derived using the methods in this study (the extrapolation method) with those using an entirely different method – one based on re-weighting person-level data in ESLA to reflect LA-level characteristics (the person-level survey re-weighting method). Full details of this method are outlined in Fernandez and Snell (2014). Overall, we found a correlation of 0.80 which gives us confidence that each method is properly reflecting differences in need, even though the methods differed slightly in their assumptions.

32. There are different methods available to determine relative needs formulae, each with their strengths and weaknesses. The main strength of this approach is that is estimates 'need' according to current local authority need-eligibility criteria. These need-criteria should be a good indicator of the need for the new forms of support, although this argument depends on how far new eligibility criteria change. It also removes the effects of supply to give a better indicator of actual need. The main weakness is that its analytical methods embody certain statistical assumptions which, although reasonable, must be taken as read. Also, as noted, if the new eligibility criteria are quite different then it might be better to use an alternative approach.

Introduction

Local authorities in England have responsibility for securing adult social care for their local populations. Historically, social care support has included: services such as home care and residential care; personal budgets and direct payments; equipment; and also some professional support like social work. The majority of public social care funding, however, comes from central Government, and is distributed to local authorities in the form of both open-ended grants (the majority) and some ring-fenced grants.

Following the Layfield enquiry in 1976 (Cmnd 6453 1976) central Government grants have been allocated to local authorities using a formula to help account for differences in local funding requirements (Bebbington and Davies 1980). The latest incarnation – in operation since 2006/7 – is the relative need formula (RNF) (Darton, Forder et al. 2010).

The fundamental principle underpinning the use of allocation formulas is to ensure equal opportunity of access to 'support' for equal need. The conventional way to interpret this principle is that each council should have, after their allocation, sufficient net funding so that they can provide an equivalent level of support (services or otherwise) to all people in their local population who would satisfy national standard eligibility conditions (Gravelle, Sutton et al. 2003; Smith 2007).

In other words, the objective of the system of Relative Needs Formulae is to provide a way of assessing the relative need for a particular set of services or support by different local authorities. The formulae need to be based on factors that are measured and updated routinely, which have a demonstrable and quantifiable link with needs and costs, and are outside the influence of local authorities (particularly through past decisions about services). The formulae have to be designed to measure variations in needs between local authorities and costs, other than area costs. They are not concerned with the absolute level of expenditure needed, or with the short-run implications of actual funding arrangements. The current formula contains four components: a need component, a low income adjustment, a sparsity adjustment, and an area cost adjustment.

Two sets of eligibility conditions/tests are relevant for public social care support in general (Wanless, Forder et al. 2006; Forder and Fernández 2009; Fernandez and Forder 2010; Fernandez, Forder et al. 2011). First, the *access and support test* that determines whether a person should receive support and if so how much, given their condition and circumstances. Second, any *financial means test* which determines whether a person is eligible for any public support on the basis of relevant non-need criteria, particularly the person's financial circumstances.

Together these tests determine how much need-related funding is required to meet the national standard. The number of people satisfying these tests and the public cost of their support as dictated by the tests will vary between local authorities according to the size and nature of both 'need' and wealth within the local population. These factors can be largely regarded as being 'exogenous' beyond the (reasonable) control of the local council, and therefore the funding allocations going to local authorities should be adjusted to reflect differences in these exogenous factors. Relevant factors will include indicators of need, such as rates of disability in the local population. These will largely affect expenditure requirements through the first test. Furthermore, factors will include markers of asset holding and income, which mainly work through the second test – see Box 1. Conventionally, a formula is deployed to account for these exogenous factors and adjust each local authority's funding allocation accordingly.

This analysis concerns the development of allocation formulae for the new forms of support that councils will need to provide as a result of the Care Act 2014. In particular, it is concerned with those measures that are due to come into effect from April 2015, namely: the additional responsibility on local authorities for the *assessment* of need, including for people that are currently not eligible for support on the basis of their financial means (i.e. self-payers); and the provision of deferred payment agreements (DPAs).

Following implementation of the Care Act 2014 local authorities will be required to meet the costs of care for people whose cumulative cost of care has exceeded a certain threshold amount – the 'cap' limit. In order to determine people's progression towards the cap, authorities will be required to regularly assess the needs of all people with possible care needs. As a result, LAs can expect to have to undertake significantly more assessments, particularly from people that currently fund their own care. The 2013 DH consultation document suggests that, as a result of the reforms, up to 500,000 more people with eligible care needs could make contact with their local authority in 2016 (Department of Health 2013). This activity will create a new cost burden for councils which will require funding that is allocated by a relative need formula.

The Care Act 2014 will also introduce a new deferred payment scheme. This policy allows people to defer paying assessed charges for their care from local authorities until a later date, up to their time of death. A deferred payment agreement will involve the local authority meeting an agreed proportion of the cost of a care home until the agreed time, with the debt secured against the equity in the person's housing assets. Since the local authority will have to fund the loan, particularly during the initial period of this policy, additional public funding is likely to be required for LAs to meet this obligation. Again, the relevant funding will be allocated from the centre using a relative needs formula.

The study described in this report was commissioned to examine the needs component for associated RNFs. The main aim of this work is to develop two relative needs formulae that will determine funding allocations to local authorities for these new responsibilities.

Relative needs formulae in social care are generally determined by using data on the support that local authorities currently provide, and establishing (using statistical models) the relationship between exogenous need variables and the amount of that support. In particular, this has involved using data on the current level of publicly-funded social care service utilisation by local populations (Darton, Forder et al. 2010). The methods for determining these relationships allow for the influence of non-exogenous factors when using data on current support.

Box 1 Exogenous factors

Relative needs formulae should therefore include exogenous need factors. They also need to allow for the effects of preferences and supply when establishing the relationship between expenditure requirements and need factors.

The ***needs factors*** are likely to include:

- Age and sex
- Marital status
- Impairment, disability, chronic conditions
- Environment e.g. housing
- Informal care
- Health care provision (endogenous)
- Affluence
- Education/socio-economic status
- Ethnicity

In this case we are concerned with new forms of support, and therefore lack data on actual level of support. Nonetheless, we can assume that the relative need for these new forms of support is directly proportionate to the number of people that would satisfy the need test. This 'information' is embodied in current patterns of service utilisation.

The specific aim is to determine the relative proportion of the national cost of assessments and DPAs that each LA will need to fund. Eligibility for both these forms of support will determined by a needs test. Neither will be subject to the current financial means-test for social care, although DPAs will be subject to new financial eligibility conditions.

As regards needs-based eligibility, current datasets provide a range of indicators of need (and different aspects of need) such as rates of AA uptake, rates of LLSI in population, age, sex and so on. These need factors will determine whether a person satisfies the need test. The problem is that the need test embodies a combination of needs-related conditions. We might in principle use just a single need factor e.g. the size of the local older population, but this approach would almost certainly not capture all relevant factors. What we require is a way of combining these indicators into a single *index of need* for each LA. One way of doing this is to model the current social care needs test. We can see how far these factors explain current social care utilisation (service user numbers) by LAs, using regression analysis. A formula for a relative need index can be estimated on this basis. If we assume that the need for assessments and DPAs is proportionate to this index, then the index can directly serve as a basis for determining funding shares that should go to each LA.

The limitation with using social care provision is that utilisation of support reflects both the current financial means-test and current supply patterns, as well as needs factors.

These influences need to be 'cleaned' from the social care utilisation data because they have no basis to inform a *relative need* formula about assessments and/or DPAs. Leaving these factors in such a formula (e.g. using the current relative needs formula) will bias the results.

Supply factors can be 'cleaned' by including a supply variable directly in the regression analysis. The relative effect of supply is then removed by setting this variable to a constant for all LAs.

The financial means-test is more difficult to clean because it is determined by variables that also explain need i.e. living alone and income/income benefits. If we set all relevant financial indicator variables to a constant for each LA, we risk under-measuring some important aspects of need differences. One way to tackle this problem is to estimate the effect of relevant financial indicator variables on a *simulated* version of the current financial eligibility test. In theory, the relative contributions of financial indicator variables can then be removed from the estimated need test. One of the steps needed in this process is to calibrate this adjustment. For this purpose we select one of the financial indicator variables that is least likely to also reflect need and then set this value to zero in the need formula. In this analysis we selected home ownership rates as the calibration variable.

The simulation approach can also be used to model the new DPA financial eligibility test. In the same way as above, the results can be used in combination with the needs test to determined likely up-take patterns for DPAs in each LA. By estimating the relationship between these expected up-take patterns and relevant exogenous factors, we have a basis for estimating a relative needs formula in the DPA case.

One of the important benefits of using existing local authority-funded services for estimating relative need is that this avoids problems of out-of-area placement. Many LAs, but particularly those in London, have some residents placed in care homes outside the LA boundaries. These public costs of care for these people generally remains the responsibility of the referring LA. We use data on what LAs spend, not on what services are used within the local authorities, so precluding this issue.

In what follows we outline the analytical framework, discuss data and methods and then provide results. Finally, relative need formulae are presented.

Key concepts

The principle of formula allocations is that local authorities are compensated for externally driven cost variation. In applying this principle we need to be able to determine what factors are considered external, and so beyond the control of the local authority, and which are not. The *needs-related characteristics* of the local population can generally be regarded as external. These characteristics would include indicators of population disability, health, age and age and gender mix, income and wealth characteristics and so on. Needs factors are the core variables in relative needs formulae and would be expected to account for most of the difference in care utilisation patterns between councils.

Some other factors, such as council preferences about setting local eligibility thresholds, are clearly within council control and should not be 'controlled for' in the formula. But other factors are between these two cases. At least three merit further discussion in the context of this analysis.

The first is the supply of care services. Most LAs commission services from independent sector providers, and so do not have direct control over that form of supply. Nonetheless, LAs do have powers to directly provide services and are able to manage local markets to some extent. For this reason, we did not treat supply conditions as exogenous in developing relative needs formulae. Relevant factors were included in the underlying analysis to account for supply effects, and so identify need, but these were factors were set to their national average and treated as a constant in the RNFs.

The second consideration relates to factors that drive demand or individual preferences for services, where differences in demand can lead to variation in use of service beyond that expected on the basis of (eligible) need alone. In other words, whilst a certain number of people in an area might be eligible for support, the actual number of people taking up support could differ. Local characteristics such as information, wealth etc. can explain differences in demand. Again in this paper we did not include these factors in the formula because they are at least in part affected by LA policies. In particular, LAs operate with need-assessment criteria with regard to publicly-funded care, including the new responsibilities. As a consequence, for example, any people/families with preferences such that they enter residential care earlier than indicated by LA assessment criteria (by self-funding), would not be eligible for DPAs.

Preferences for care might lead to under-utilisation of care relative to eligible levels in some cases. But again, LAs should be able to influence these factors. Moreover, it would not seem appropriate to have a formula that rewards under-utilisation of care relative to eligible levels. Also, more pragmatically, behavioural effects are very hard to anticipate and model. For example, there are no sound data or theoretical models on which to predict demand for assessments or DPA, as opposed to the numbers who might meet eligibility criteria for these forms of support.

A third factor relates to rurality or population sparsity. The main argument is that the costs of providing could be higher in rural areas than in urban areas. Formula funding directly accounts for differences in wage-driven unit cost by applying the area cost adjustment on top of the relative needs formula. However, differences in the costs of delivering services can also affect the amount of supply, not just the unit cost. For example, in areas with low labour costs and/or low transport costs, the supply of non-residential care would be higher than in high-cost areas, other things equal. As outlined above, we need to isolate supply from need differences and therefore should include supply indicators. For residential care, we did have a direct measure in the form of the total number of available places in care homes in the area. We did not have a similar variable for non-residential care. Rather, we included population density (population per hectare). In treating this variable as a supply indicator it was used in the underlying analysis, but was not incorporated into the relative needs formulae. There could be an argument that rurality implies some direct need effect. Nonetheless, in theory, the other direct need proxies used in the analysis should account for this effect.

The general approach was not to include factors in the formulae unless they were clearly considered to be external. The concern otherwise is that by including factors that could be affected by LA policies, the amount of 'compensatory' funding an LA receives would become partly under its control. As such, formula approaches have tended to take the most parsimonious route and only include factors if they are unambiguously exogenous. But ultimately this is a design philosophy.

Analytical framework

The two tests that determine access to LA-supported social care for each person are: the needs test and the (financial) eligibility test. For shorthand, we can abbreviate the former as R and the latter as E. Our aim was to determine the nature of the LA needs test R, and in particular to estimate the probability that a person satisfies this test. Again as a shorthand, we can denote this probability as $p(R)$. With a suitable measure of this probability, we could use a statistical model to determine how it is affected by relevant exogenous factors that are available in routine data sets. In other words, this would give an equation for need comprising variables as given in Box 1, as we require.

We did not, however, have a *direct* measure of this probability. The number of people that are LA-supported is directly available data and this number will depend on this probability, but it also depends on the probability that those people also meet the means-test (E). Also, we could not simulate the needs test even if we had a suitable dataset, because the needs test guidance

(Department of Health 2010; Department of Health 2013) is insufficiently precise and subject to local interpretation (Fernandez and Snell 2012). We could, however, estimate this probability indirectly.

Any person that actually receives LA-funded support will have satisfied both tests. For an individual, the probability of doing this is $p(R + E)$. With data on the proportion of people that are LA-supported we had an estimate of this joint probability and we know that this joint probability encompasses the two probabilities of satisfying each individual test. The problem was that the probability of meeting these tests is not independent across a population. A person who has high needs is also more likely to have lower financial means, for example. As such, the joint probability of a person passing both tests is their probability of being in need times their 'conditional' probability of satisfying the financial means test *given that they have eligible needs*. This equation can be rearranged as:

$$p(R) = \frac{p(R + E)}{p(E|R)} \tag{1}$$

i.e. the probability of people with care needs is equal to the probability of people both in need and eligible divided by the probability of those people in need being eligible.

With suitable measures for $p(R + E)$ and $p(E|R)$ the above ratio could be used to calculate a measure of $p(R)$. In turn, a need equation could be estimated using routinely available needs data (as in Box 1).

As noted, the joint probability of satisfying need and eligibility tests could be measured using data on the numbers of people using LA-supported care. We also needed an estimate of the (conditional) probability of passing the eligibility test, given the person having assessable need $p(E|R)$, when using this method. As with the need test, we could not directly observe the numbers of people that satisfied this test from utilisation data because that is the result of both tests. But instead the eligibility test could be simulated by approximating the eligibility rules in a sample dataset. Because the eligibility rules are formulaic and explicit (especially for residential care), the eligibility of a person with given characteristics can be calculated, as least to a reasonable degree of approximation.

For this purpose, we needed a dataset with relevant variables enabling us to most closely simulate the eligibility test. Furthermore, the dataset should have need variables. The English Longitudinal Survey of Ageing (ELSA) data were considered to be most suitable.

A range of variables captured in ELSA – such as people's housing and non-housing wealth, whether they owned a home, whether they lived alone, their income and level of disability – were used. The relevant variables are not available in routine datasets at the local authority level and so eligibility cannot be directly established with routine data. Rather, we used variables that are available in both ELSA and routinely as predictors of financial eligibility so as to have predicted numbers of people that are eligible at the area level.

The result of these calculations was a (linear) equation predicting need:

$$\hat{p}(R) \cong \alpha_0 + \alpha_1 x + \alpha_2 y + \alpha_3 s \tag{2}$$

where the terms in the equation are: need proxies, x, wealth proxies, y, and supply, s, and the coefficients are the α's. It remained to set the supply variable to its national average value to give a relative needs equation that can be applied at local authority level. Traditionally RNFs are provided as linear formulae that apply at the LA level. Adding up the individual probabilities for all people in an LA, this formula becomes:

$$C_l^R = \alpha_0^R + \alpha_{11}^R X_{1l} + \alpha_{12}^R X_{2l} + \cdots + \alpha_{21}^R Y_{1l} + \alpha_{22}^R Y_{2l} \ldots \qquad (3)$$

where C_l^R is the predicted number of people in each local authority (as denoted by the subscript l) with an assessable level of need i.e. $C_l^R = \sum_i \hat{p}_i(R)$ when expressed mathematically. This equation has various need and wealth proxies: the X's and Y's being the numbers with need or with given wealth at the local authority level, added up from their individual person values, x and y. The derivation of these equations is given in Annex 1.

Assessment formula

A relative needs formula (RNF) for total assessments would be based on (3) where R is the (LA-assessed) need for social care. It would be used to determine the proportion of the total England number of assessments arising in each LA. We can assume that the number of assessments is a fixed multiple of the number of people with any need (e.g. σC_l^R). For a relative needs formula which determines the shares of total assessments arise in each LA, the multiplier drops out.

A similar approach can be used for additional assessments i.e. above those already carried out by LAs. The number of LA-supported clients is subtracted from the total number with need C_l^R, and the difference is used to calculate relative need shares.

Deferred payment agreements

A person's overall eligibility for a DPA is determined by the LA need test (for residential care) and also a new financial test. An important condition is that a person must have non-housing assets (savings) below a certain level. We have assumed this threshold to be £23250 in line with the main support eligibility test. Anyone with more than £23250 in assessable non-housing capital is not eligible. Also, the amount of a DPA will depend on the person's income.

Another important criterion is that the person has assessable property i.e. is a home owner in circumstances where the value of the home can be taken into account. In the main, the latter requires that no (eligible) dependants live at the home.

As with the means-test E above, our approach was to simulate this DPA financial test. In lieu of actual regulations we approximated the eligibility conditions, applying these criteria according to the characteristics of people in the ELSA dataset. The main variables for this purpose were measures of people's non-housing wealth, whether they owned a home and whether they lived alone. Income will also have a bearing. For example, people with high levels of income and modest non-housing wealth may not be eligible for a DPA. Nonetheless, relevant groups of people so affected will be small and ignorable for the purposes of establishing relative needs.[1]

The relevant variables determining DPA eligibility are not available in routine area-level data and so this eligibility cannot be directly established at area level. Rather, routine need and wealth variables were used in ELSA to predict the numbers of people calculated to be eligible and those not eligible at area level.

As above, we can define the eligibility condition D for a DPA. This includes a requirement that the potential recipient also owns a home. The probability of a person being financially eligible for a DPA (conditional on need) is $p(D|R)$. The probability of a person satisfying both the need test and being financially eligible was calculated as:

[1] The proportion of these people is strongly correlated with housing wealth, and the relative differences in this proportion between LAs, after accounting for the effect of different levels of housing wealth in the population, will be very modest.

$$p(R + D) = p(R)p(D|R) \quad (4)$$

This calculation used the estimate of $p(R)$ as outlined above.

With analogy to the assessment formula, we used statistical models to estimate a formula predicting the number of people in each LA, using routine need and wealth variables:

$$C_l^{R+D} = \alpha_0^{R+D} + \alpha_{11}^{R+D} X_{1l} + \alpha_{12}^{R+D} X_{2l} + \cdots + \alpha_{21}^{R+D} Y_{1l} + \alpha_{22}^{R+D} Y_{2l} \,.. \quad (5)$$

Empirical analysis

Two datasets were used. First, we constructed a (small) area dataset comprising data on the numbers of LA-supported clients, as well as routinely-available need and wealth variables such as rates of benefit uptake and Census variables. These data were collected initially at the lower super-output area (LSOA) corresponding to a final sample of 53 LAs, with around 14000 LSOAs – see Annex 2 for details. As LSOAs are coterminous with local authority boundaries, these data could also be aggregated to form a LA-level dataset with the same variables.

The second dataset was the English Longitudinal Survey of Ageing (ELSA). This dataset has a wide range of data about individuals in the survey, including information about their needs-related characteristics and their wealth and income, including benefit uptake.

Estimating financial eligibility

Financial eligibility for LA support was modelled using the ELSA data. Specifically we set condition E as follows:

$$\begin{cases} E = 1 \; if \; NHW + HW \times alone < £23250 \\ E = 0 \; if \; NHW + HW \times alone \geq £23250 \end{cases} \quad (6)$$

where *NHW* is non-housing wealth and *HW* is housing wealth, where the latter only applies if people live alone (*alone*).

Five waves of ELSA were combined (with financial variables inflated to be in line with the last wave). The sample of people aged 65 and over (or 65+ in shorthand) was selected. This provided 25,420 observations for people aged 65+. These data were then reweighted so that rates of home ownership, living alone and pension credit uptake were in line with those rates in the LSOA data.

We estimated a linear regression model[2] over a sub-sample of people with at least one ADL and aged 75 or over. Both need and wealth factors were used in the estimation:

$$p(E|R) = \beta_0^E + \beta_1^E x^E + \beta_2^E y^E + \epsilon^E \quad (7)$$

The following variables were included:

Need x^E:
Attendance Allowance claimant
Age 75 to 84 (as opposed to Age 85+)
Living arrangements: lives alone
Female
Wealth/ income y^E:
Home owner
Pension Credit claimant

[2] Specifically, a linear probability model using OLS.

The resulting estimation could be applied to (small area) populations by treating individual level variables as rates per capita 65+.

Financial eligibility for a DPA was also simulated in ELSA using the rules outlined above:

$$\begin{cases} D = 1 \; if \; HW \times alone \geq 0 \; and \; NHW < 23250 \\ D = 0 \; if \; HW \times alone = 0 \; or \; NHW \geq 23250 \end{cases} \quad (8)$$

Since being a home owner and living alone are dominant factors in this DPA means test, we estimated this condition in two parts in the ELSA data:

$$p(D|R) = p(own, alone, need) \times p(NHW < 23250) \quad (9)$$

Administrative data (Census) give both home ownership rates per 65+ and living alone rates 65+ in any population, but do not give the combined chance of being a home owner, living alone and with some care need. Instead we first used a model in ELSA to predict how the joint probability of being alone and a home owner varied with a number of need and wealth proxies. The estimation results were then used to adjust the area-level home ownership and living alone rates in the population according, using need and wealth proxies. This approach is based on the expectation that the number of people in an area who are jointly a home owner, live alone and have care needs is correlated with the independent rates of these variables in the population.

The second step was to estimate the probability of having sufficiently low non-housing wealth (NHW) to qualify, conditional on being a home owner, living alone, and having a care need i.e. $p(own, alone, need) = 1$. In this case the living alone (*alone*) and home owner (*own*) variables were directly available. Having a care need was indicated if the person reported at least one problem with activities of daily living in ELSA.

Two regression (OLS linear probability) models were used for these two steps, with analogy to (7), and used similar need and wealth variables.

Estimating need eligibility

Small area data were used to approximate the experience of individuals whilst offering a means to link datasets, specifically local authority records, Census data, DWP Benefits data, CQC data and a number of ONS variables.

The individual person-level probabilities discussed above in the analytical framework can be approximated by the proportion of people in the LSOA population 65 and over that meet the relevant test(s) – e.g. the proportion of people 65+ in receipt of LA-supported social care for $p(R + E)$. Or for relevant exogenous factors e.g. the proportion 65+ who live alone, are in receipt of pension credit and so forth. Equivalently, the count of people satisfying the condition could be used in the analysis after we multiplied by the LSOA population 65+. Annex 1 provides further details.

In generalising in this way, we needed to assume that the respective probabilities of individual people meeting eligibility tests was about the same as others in same population within the small area. This assumption seems reasonable if the relevant characteristics of people in that population are also similar. For this reason, we used as small a population level as possible for the analysis: namely LSOA populations. We also selected only the LSOA population aged 65 and over.

The general method used involves calculating the expected counts of people in each LSOA who satisfy the relevant 'test' condition – i.e. either need and financial means tests $R + E$, need-only, R, and need plus DPA eligibility, $R + D$ – and then using a regression model to determine the relationship between these counts and LSOA population rates of relevant (routinely-available) need, wealth and supply factors.

A standard set of variables was included in each estimation. They can be grouped by primary variable type: need, wealth and supply. We also scaled the estimation by population 65+ and accounted for LA-level effects.

Need x:
Attendance Allowance claimants 65+ per capita 65+
Limiting (significantly) condition 85+ per capita 65+
Living arrangements: couples per households 65+
Population (all) density (lsoa) [Sparsity]
Wealth/income y:
Home owner 65+ per Households 65+
Pension Credit Claimants 80+ per capita 65+
Supply, s:
Total care home beds per MSOA per MSOA pop 65+
Population/scale:
Population 65+ (log)

Annex 2 describes the data sources and basic data manipulation used for the small area analysis.

A range of age group and gender variables was tested but did not prove to be statistically significant in any specification and so were not used.

Population density (total population per hectare) was used to measure any effects of sparsity (low population density). Total care home beds per capita was used as a supply measure. It was used for both residential and non-residential estimations, where we expect a positive effect on the former and a negative effect on the latter. Because supply could also be affected by need levels, it was important to isolate supply effects. For this reason, rather than use number of beds at the LSOA level, we used for each LSOA observation the total number of beds in the corresponding middle-layer super-output area (MSOA); there are 6,791 MSOAs in England compared with 32,844 LSOAs.[3] There is still a possibility that this supply variable could affect estimated coefficients for relative need, but the standard diagnostic test for this problem was negative at the 5% significant level.

LA-level effects were modelled to account for (a) differences in policy and efficiency between LAs and (b) differences in data collection methods and quality. As to the latter, in the residential care data there were a number of LAs that had some problems in identifying pre-care addresses (LSOAs). We dropped LAs where this problem was significant. 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 in the models should 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.

Regarding the non-residential care data specifically, these inconsistencies appeared to multiply where LAs had summed over all NR service types. For this reason we also estimated models where we simply added home care and direct payment service users together, and dropped other NR

[3] MSOAs and LSOAs are coterminous.

service use. As shown in the results below, there was relatively little difference in terms of the formulas produced.

The particular econometric models used in the analysis are described below. In general, we opted to use (exponential) count (of service users) models, given the nature of the data. We can hypothesise about the underlying interplay of demand and supply which leads to an (integer) number of clients in any given area. We observe the latter number in the data rather than the underlying (continuous) probabilities, making non-linear count models the more appropriate statistical estimation method.

Although a third of LSOAs had zero residential care (supported) service users, this is likely to be a characteristic of the small size of some LSOAs (with service user counts censored to zero) rather than there being a different underlying process for whether an LSOA has any service users and the subsequent number of service users in that LSOA. As such, a count model (as opposed to a two-part model) is likely to be most appropriate. For non-residential care, only 3.7 per cent of sample LSOAs had zero clients.

Assessment and DPA estimations

A relative need function for assessments was estimated for both people with a residential care need and with a non-residential care need. The following steps were repeated for each case:

1. We estimated the probability that a person satisfies the financial means-test (E) using ELSA with variables that are available at (small) area level.
2. We estimated the number of people in an LSOA that have LA-supported services – i.e. that satisfy both need and financial means-test $(R + E)$ – with need, wealth and supply variables. Data for the dependent variable were provided directly from LAs at LSOA level.
3. The predicted values from these two estimations (steps 1 and 2) were used to calculate the number of people in an LSOA that would pass the needs test (only) (R).
    a. We removed LA-level effects and supply effects using their national average values from the estimation at step 2.
    b. The predicted probability for each person with care needs in the LSOA of satisfying the financial means-test was calculated using the equation estimated at step 1. As outlined in the introduction, we needed to calibrate between the two sets of estimation results. We did this by scaling all the coefficients in this equation using a common factor so that the net effect of home ownership on the numbers of people satisfying the need test was zero (to 2 decimal places).
4. A regression model was used to estimate an equation for the number of people in an LSOA that would pass the needs test (only) (R) (as determined at step 3) in terms of need, wealth, supply and (population) scaling variables.
5. Statistical error for the process in steps 2 to 4 was estimated (using bootstrapping methods).
6. A linear approximation was calculated for the coefficients from the equation in step 4. This involved calculating the change in the dependent variable (numbers with need R) for small changes in each need and wealth variable from their sample mean values.

An additional assessment formula can be created by subtracting the (linearised) equation for LA-supported clients $(R + E)$ (step 2) from linear equation for numbers of people passing the need test (R).

The DPA formula was produced in a similar way using steps 1 to 6. In this case, the predicted value of DPA eligibility (D) was also applied at step 3 produce a value for the expected count of DPA-eligible people in each LSOA.

Estimation results

Descriptive statistics

Descriptive data and sample sizes for the models is given in Table 6 (residential care) and Table 7 (non-residential care). The respective variable mean values are compared to the National values. In the main, both estimation samples appeared to be very similar to the England values, suggesting high representativeness.

Table 6. Representativeness of sample viz. National England averages: LSOA level means for various samples

	National		Res care sample		
	Obs	Mean	Obs	Mean	% national
Attendance Allowance claimants 65+ per capita 65+	32697	0.16	13805	0.15	97%
Limiting (significantly) condition 85+ per capita 65+	32843	0.06	13805	0.06	98%
Home owner households 65+ per households 65+	32843	0.64	13805	0.66	102%
Pension Credit Claimants 80+ per capita 65+	32697	0.09	13805	0.08	93%
Living arrangements: couple households per HH 65+	32843	0.44	13805	0.45	102%
Population (all) density (lsoa)	32844	43.09	13805	40.56	94%
Population 65+ (log)	32843	5.51	13805	5.54	100%
Total MSOA care home beds per MSOA pop 65+	32844	0.04	13805	0.04	99%
Population 65+	32844	275.74	13805	282.73	103%
Females 65+	32844	152.34	13805	155.69	102%
Population (all)	32844	1628.72	13805	1626.05	100%
Households 65+	32844	174.21	13805	177.32	102%

Table 7. Representativeness of sample viz. National England averages: LSOA level means for various samples

	HC+DP sample			All non-res care sample		
	Obs	Mean	% national	Obs	Mean	% national
Attendance Allowance claimants 65+ per capita 65+	13373	0.16	99%	13251	0.16	99%
Limiting (significantly) condition 85+ per capita 65+	13373	0.06	99%	13251	0.06	99%
Home owner households 65+ per households 65+	13373	0.66	102%	13251	0.65	101%
Pension Credit Claimants 80+ per capita 65+	13373	0.08	96%	13251	0.09	97%
Living arrangements: couple households per HH 65+	13373	0.44	101%	13251	0.44	101%
Population (all) density (lsoa)	13373	40.65	94%	13251	41.50	96%
Population 65+ (log)	13373	5.53	100%	13251	5.53	100%
Total MSOA care home beds per MSOA pop 65+	13373	0.04	100%	13251	0.04	99%
Population 65+	13373	280.94	102%	13251	280.93	102%
Females 65+	13373	155.11	102%	13251	155.05	102%
Population (all)	13373	1629.17	100%	13251	1630.95	100%
Households 65+	13373	176.30	101%	13251	176.39	101%

Count models

The following three tables give the results of the main models for the estimated numbers of clients in each LSOA, satisfying the listed condition, respectively for residential care, home care plus direct payment clients, and all non-residential care. These are the models corresponding to Step 2 above. In each case, the table lists the relevant condition:

- Those people satisfying the LA need and eligibility tests i.e. those clients who are LA-supported
- Those people satisfying the LA need test, regardless of eligibility (the basis for calculating total assessments)
- Those people satisfying the LA need test and qualifying for a DPA.

All variables had the expected signs and scales of effect. Note that these are the coefficients for non-linear models. They do not tell use the direct effect on client numbers of the listed factor. We provide the linear coefficients for RNFs below.

The asterisks denote significance levels: * 10%; ** 5%, *** 1%.

In general, the model coefficient on (log) population was close to 1 in value. This suggests that scale effects were relatively small (justifying our assumption of treating population size as a constant).

Table 8. Residential care client numbers (per LSOA), various conditions, bootstrapped

	Need + Elig (LA-supported clients)		Need (All clients)		DPA	
	Coeff	Z-stat	Coeff	Z-stat	Coeff	Z-stat
Attendance Allowance claimants 65+ per capita 65+	2.106***	5.70	2.256***	5.71	2.463***	6.17
Limiting (significantly) condition 85+ per capita 65+	1.278**	2.27	1.113*	1.87	0.553	0.89
Home owner households 65+ per households 65+	-0.424***	-2.98	0.000	0.00	1.795***	13.25
Pension Credit Claimants 80+ per capita 65+	2.023***	4.87	1.691***	4.09	1.871***	4.26
Living arrangements: couple households per HH 65+	-0.654***	-4.57	-0.801***	-5.68	-3.381***	-24.57
Population 65+ (log)	0.845***	30.72	0.850***	29.57	0.811***	26.19
Total MSOA care home beds per MSOA pop 65+	0.856***	3.92				
Constant	-4.612***	-20.61	-4.337***	-19.27	-6.027***	-21.64
Log-likelihood	212833.75		20877.63		22309.27	
Number of observations (LSOAs)	13806.00		13805.00		13805.00	

Table 9. Non-residential care, home care + direct payments: service user numbers, various conditions, bootstrapped

	Need + Elig (LA-supported clients)		Need (All clients)	
	Coeff	Z-stat	Coeff	Z-stat
Attendance Allowance claimants 65+ per capita 65+	1.610***	9.04	1.392***	8.31
Limiting (significantly) condition 85+ per capita 65+	4.189***	11.74	4.618***	12.77
Home owner households 65+ per households 65+	-0.443***	-6.85	0.000	0.00
Pension Credit Claimants 80+ per capita 65+	2.170***	7.61	1.082***	3.64
Living arrangements: couple households per households 65+	-0.763***	-6.17	-0.591***	-4.75
Population (all) density (lsoa)	0.001***	5.87	0.001***	6.47
Population 65+ (log)	0.933***	29.23	0.931***	26.70
Total MSOA care home beds per MSOA pop 65+	-1.243***	-7.52		
Constant	-3.337***	-20.57	-3.276***	-17.47
Log-likelihood	182033.59		-9115.24	
Number of observations (LSOAs)	13374		13373	

Table 10. Non-residential care, all services: service user numbers, various conditions, bootstrapped

	Need + Elig (LA-supported clients)		Need (All clients)	
	Coeff	Z-stat	Coeff	Z-stat
Attendance Allowance claimants 65+ per capita 65+	1.761***	11.05	1.629***	10.07
Limiting (significantly) condition 85+ per capita 65+	2.939***	12.71	3.257***	14.93
Home owner households 65+ per households 65+	-0.355***	-9.55	0.000	0.00
Pension Credit Claimants 80+ per capita 65+	2.114***	12.36	1.214***	6.04
Living arrangements: couple households per households 65+	-0.655***	-8.01	-0.529***	-6.16
Population (all) density (lsoa)	0.001***	7.22	0.001***	5.86
Population 65+ (log)	0.889***	34.29	0.890***	29.61
Total MSOA care home beds per MSOA pop 65+	-0.803***	-6.16		
Constant	-2.434***	-14.55	-2.320***	-10.03
Log-likelihood	171093.51		-14015.02	
Number of observations (LSOAs)	13252		13251	

Model performance: Prediction correlations

The regression models used in the above estimations are non-linear to account for the nature of the data and do not produce the 'r-squared' goodness-of-fit statistics of standard (OLS) estimation. Nonetheless, we can assess the correlation between the data on LA-supported clients and the number of such clients predicted by the statistical model. Table 11 has these results. In general, the two non-residential care models were more closely able to predict the actual number of LA-supported clients.

Table 11. Correlations between actual and predicted LA-supported clients

	Model		Correlation, r	r-squared	n
Residential	Table 8, need + elig	With area dummies	0.55	0.30	13806
		Without area dummies	0.45	0.20	
HC+ DP	Table 9, need + elig	With area dummies	0.69	0.48	13374
		Without area dummies	0.62	0.39	
All NR	Table 10, need + elig	With area dummies	0.81	0.66	13252
		Without area dummies	0.62	0.38	

Eligibility models

Table 12 reports the estimation models for whether a person satisfies (simulated) financial eligibility, using the ELSA data. With a linear probability, the coefficients can be interpreted as the change in the probability of being eligible of having the listed condition. As expected given the nature of the means-test, being a home owner was found to mean a person being significantly less likely to be eligible, especially for residential care. Being in receipt of pension credit was associated with a significantly increased chanced of being eligible in both cases. Living alone reduced the probability of being financially eligible for residential care because in that case the home can normally be counted as an assessable asset.

In these estimations we included both 9-category region dummies and ELSA wave dummies.[4]

Variants with additional interaction terms – e.g. Lives alone and home owner – produced very similar results.

The results of these models were applied at small area to predict the probability of a person being financially eligible.

[4] Approximately 0.12% of the sample had missing region codes. The missing values were included in the dummy variable reference category. Excluding these cases made no material difference to the results (e.g. only small changes at the 3rd decimal place).

Table 12. Financial eligibility estimation, OLS models

	Non-residential care		Residential care	
	Coefficient	Z-stat	Coefficient	Z-stat
Female	0.064	3.37	0.002	0.13
Aged 75 to 84	0.002	0.12	0.020	1.46
Home owner	-0.268	-10.87	-0.602	-28.98
In receipt of pension credit	0.274	11.44	0.421	11.33
Lives alone	-0.022	-0.94	-0.206	-10.84
Home owner x pension credit	0.275	10.98	-0.163	-5.9
Lives alone x pension credit	0.013	0.57	-0.178	-5.07
Constant	0.691	16.96	0.909	24.74
Wave dummies	Yes		Yes	
Area dummies	Yes		Yes	
Weighted	Yes		Yes	
n	3693		3684	
F	104.62		407.99	
R^2	0.293		0.527	
Condition				
Age	>=75		>=75	
ADLs	>0		>0	
Live alone	Any		Any	
Home owner	Any		Any	

Table 13 gives the eligibility results as regards DPAs. As outlined above we used a model in ELSA to predict how the joint probability of being alone and a home owner varied with a number of need and wealth proxies (column 3). Conditional on being a home owner, living alone and in need, the risk factors for a person being financially eligible for a DPA were also modelled (column 2). As anticipated, people in this sub-group who were also pension credit recipients (compared to those not in receipt) were significantly more likely to qualify for a DPA in principle.

As above, these results were applied in the small areas models.

Table 13. Eligibility conditions for DPAs, OLS models

	Home owner, lives alone		DPA financially eligible	
	Coefficient	Z-stat	Coefficient	Z-stat
female	0.015	0.48	0.157	6.63
Aged 75 to 84	-0.046	-1.47	-0.083	-3.6
Aged 85+	-0.032	-0.91		
In receipt of pension credit	0.254	8.92	-0.082	-3.93
In receipt of AA	0.061	1.91	-0.039	-1.76
Constant	0.479	8.84	0.353	7.89
Wave dummies	Yes		Yes	
Area dummies	Yes		Yes	
Weighted	Yes		Yes	
n	1560		3850	
F	5.64		6.32	
R^2	0.058		0.048	
Condition				
Age	>=65		>=75	
ADLs	>0		>0	
Live alone	Yes		Any	
Home owner	Yes		Any	

Relative need formulae

As described above, we derived RNFs by holding supply, scale and sparsity constant. As such, each relative need formula has the following variables:

- Attendance Allowance claimants 65+ per person 65+
- Limiting (significantly) condition 85+ per person 65+
- Home owner households 65+ per households 65+
- Pension Credit Claimants 80+ per person 65+
- Living arrangements: couple households per HHs 65+
- Constant

Both age and gender variables were initially included but proved not to be significant. Sparsity was not significant in the residential care estimation (but was for non-residential care).

Table 14 give RNFs for residential care. For non-residential care, RNFs are given in Table 15 and Table 16. The former is based on the analysis using home care plus direct payments-supported clients as the indicator variable, and the latter used supported clients for all non-residential services as the indicator variable.

The condition whereby a person satisfies the need test but is not financially eligible (*Need and not eligible*) is calculated by subtracting the first column from the second column. It gives an RNF for *additional assessments*.

The DPA formula only applies in the residential care case.

Table 14. Relative need formulae, residential care

	Need + Elig (LA-supported clients)	Need (All clients)	Need and *not* eligible	DPA
Attendance Allowance claimants 65+ per person 65+	0.01213	0.02072	0.00858	0.00436
Limiting (significantly) condition 85+ per person 65+	0.00736	0.01022	0.00286	0.00098
Home owner households 65+ per households 65+	-0.00244	0.00000	0.00244	0.00317
Pension Credit Claimants 80+ per person 65+	0.01166	0.01552	0.00387	0.00331
Living arrangements: couple households per HHs 65+	-0.00377	-0.00735	-0.00358	-0.00598
Constant	0.00743	0.01012	0.00269	0.00169

Table 15. Relative need formulae, non-residential care (Home care + DP)

	Need + Elig (LA-supported clients)	Need (All clients)	Need and *not* eligible
Attendance Allowance claimants 65+ per person 65+	0.07983	0.09998	0.02014
Limiting (significantly) condition 85+ per person 65+	0.20773	0.33162	0.12389
Home owner households 65+ per households 65+	-0.02195	0.00000	0.02194
Pension Credit Claimants 80+ per person 65+	0.10760	0.07773	-0.02986
Living arrangements: couple households per HHs 65+	-0.03785	-0.04246	-0.00461
Constant	0.05288	0.05523	0.00235

Table 16. Relative need formulae, non-residential care (All NR services)

	Need + Elig (LA-supported clients)	Need (All clients)	Need and *not* eligible
Attendance Allowance claimants 65+ per person 65+	0.08339	0.11082	0.02744
Limiting (significantly) condition 85+ per person 65+	0.13912	0.22154	0.08242
Home owner households 65+ per households 65+	-0.01681	0.00000	0.01681
Pension Credit Claimants 80+ per person 65+	0.10011	0.08257	-0.01754
Living arrangements: couple households per HHs 65+	-0.03101	-0.03596	-0.00495
Constant	0.05025	0.05650	0.00625

To provide combined formulae (residential plus non-residential clients), we weighted the individual formulae together by the respective number of total supported clients in England for residential and non-residential services – see Table 17 based on the home care plus DP results, and Table 18 based on the results using all non-residential services. Note these are not cost-weighted and so favour the NR contribution, which has 418,000 clients versus 167,000 supported in residential care (2012/3).

Table 17. Relative need formulae, combined res and NR (HC+ DP) 65+

	Need + Elig (LA-supported clients)	Need (All clients)	New Assessments (i.e. Need and *not* eligible)	DPA
Attendance Allowance claimants 65+ per person 65+	0.06051	0.07736	0.01684	0.00436
Limiting (significantly) condition 85+ per person 65+	0.15055	0.23991	0.08935	0.00098
Home owner households 65+ per households 65+	-0.01638	0.00000	0.01638	0.00317
Pension Credit Claimants 80+ per person 65+	0.08022	0.05998	-0.02023	0.00331
Living arrangements: couple households per HHs 65+	-0.02812	-0.03244	-0.00432	-0.00598
Constant	0.03991	0.04236	0.00245	0.00169

Table 18. Relative need formulae, combined res and NR (all non-res) 65+

	Need + Elig (LA-supported clients)	Need (All clients)	New Assessments (i.e. Need and *not* eligible)	DPA
Attendance Allowance claimants 65+ per person 65+	0.06306	0.08511	0.02206	0.00436
Limiting (significantly) condition 85+ per person 65+	0.10152	0.16124	0.05972	0.00098
Home owner households 65+ per households 65+	-0.01271	0.00000	0.01271	0.00317
Pension Credit Claimants 80+ per person 65+	0.07487	0.06344	-0.01143	0.00331
Living arrangements: couple households per HHs 65+	-0.02324	-0.02780	-0.00456	-0.00598
Constant	0.03803	0.04327	0.00523	0.00169

Exemplifications

The calculation to determine final (ACA-adjusted) relative need in an area is as follows:

Step 1. Calculate RN per capita. For example, for DPAs:

RN per capita =

Attendance Allowance claimants 65+ per person 65+	×	0.00436
Limiting (significantly) condition 85+ per person 65+	×	0.00098
Home owner households 65+ per households 65+	×	0.00317
Pension Credit Claimants 80+ per person 65+	×	0.00331
Living arrangements: couple households per HHs 65+	×	-0.00598
	+	0.00169

Step 2. Calculate RN:

RN = RN per capita × population 65 and over

Step 3. Apply ACA:

Final RN = RN × ACA

The combined assessment, need, and LA-supported RNFs and the DPA RNF are exemplified in Annex 3. In this case, we provide both RN and RN per capita (before application of the ACA). Relative shares are provided for all LAs (summing to an England total of 1), both when expressed in terms of per capita 65+ rates and also after multiplying by population 65+ to get shares regarding total clients.

Discussion

Figure 1 shows the how a formula-based allocation of resources for additional assessments would differ from an allocation that worked solely on LA population 65+ shares. Assuming the same total budget was allocated in each case, the most affected LAs at either end of the distribution would receive nearly 40% less or over 12% more money respectively than a population shares allocation. Figure 2 shows the corresponding comparison in allocation for the funding of DPAs. In this case, some LAs would receive over 40% less whilst others would receive over 30% more money than a population shares allocation.

These figures show that using relative need formulae can make a substantial difference to an LA's actual monetary allocation, reflecting the differences in need beyond that implied by differences in older population alone between LAs.

Figure 1. Percentage difference in total monetary allocation compared to a pop 65+ allocation – additional assessments

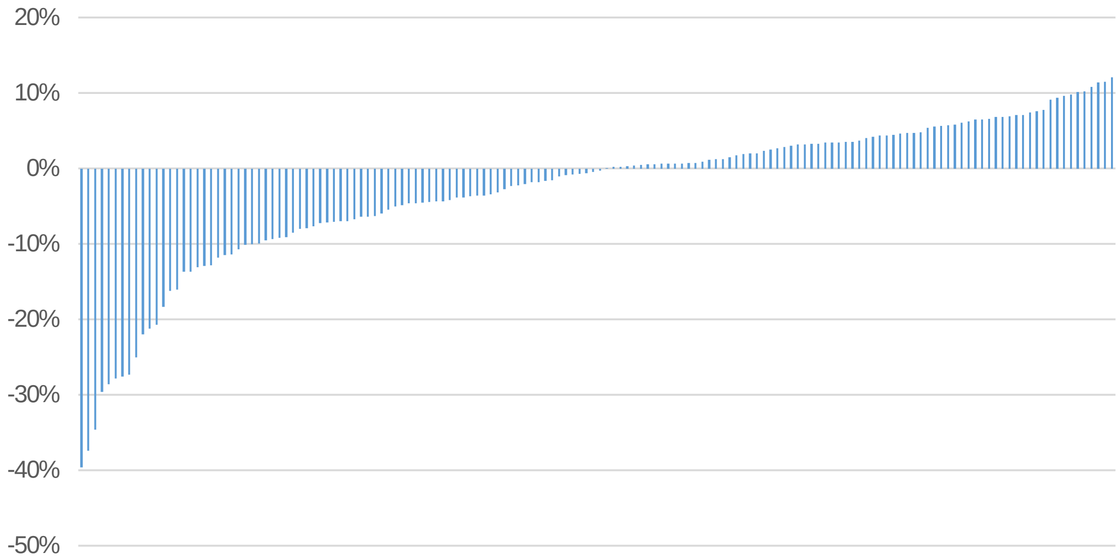
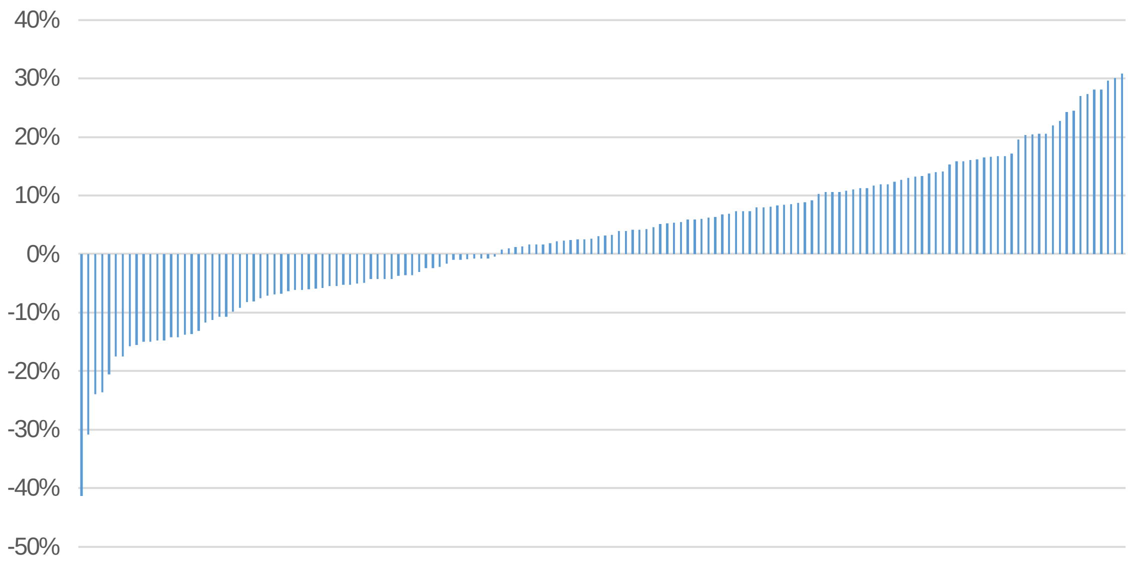


Figure 2. Percentage difference in total monetary allocation compared to a pop 65+ allocation – deferred payment agreements



Sensitivity and robustness

Given the nature of the problem, a number of assumptions have been made in the analysis. Throughout the analysis, these assumptions have been flexed and the implications considered. Two particular robustness checks were undertaken.

First, as outlined above, as well as data on total clients using any non-residential care services, formulae were estimated using just the utilisation of home care and direct payments. Figure 3 (below) shows the correlation between an additional assessment allocation per capita 65+ based on the home care plus direct payments model and the all non-residential services model. The correlation in this case is 97.27%. If we compare total allocations (after multiplying the rates variables by population 65+), the correlation increases to 99.97%.

The second major robustness check involved comparing the results regarding additional assessments as derived using the methods in this paper (the extrapolation method) with those using an entirely different method – one based on re-weighting person-level data in ESLA to reflect LA-level characteristics (the person-level survey re-weighting method). Full details of this method are outlined in Fernandez and Snell (2014). Figure 4 gives a comparison of the relative need shares per capita 65+ for each LA as derived using the two methods – as based on table 5 in Fernandez and Snell (2014). Overall, we found a correlation of 0.80 which gives us confidence that each method is properly reflecting differences in need, even though the methods differed slightly in their assumptions.

Figure 3. Correlation between an additional assessments RNF per capita 65+ based on the home care plus direct payments model and the all-non-residential services model.

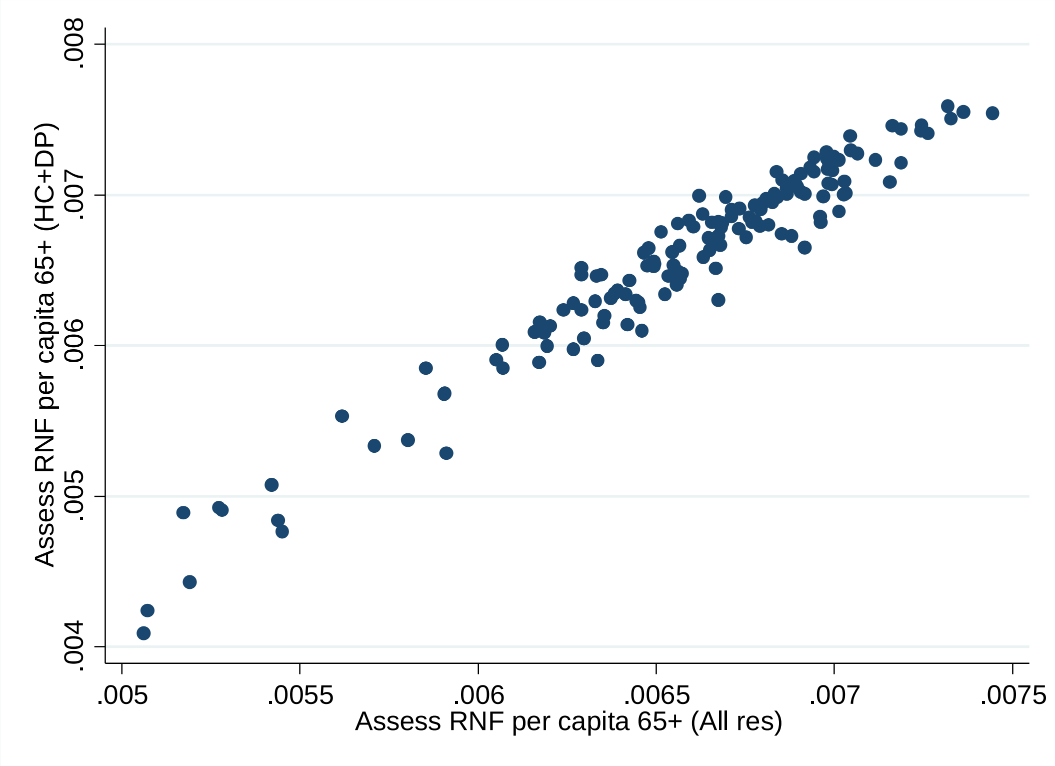
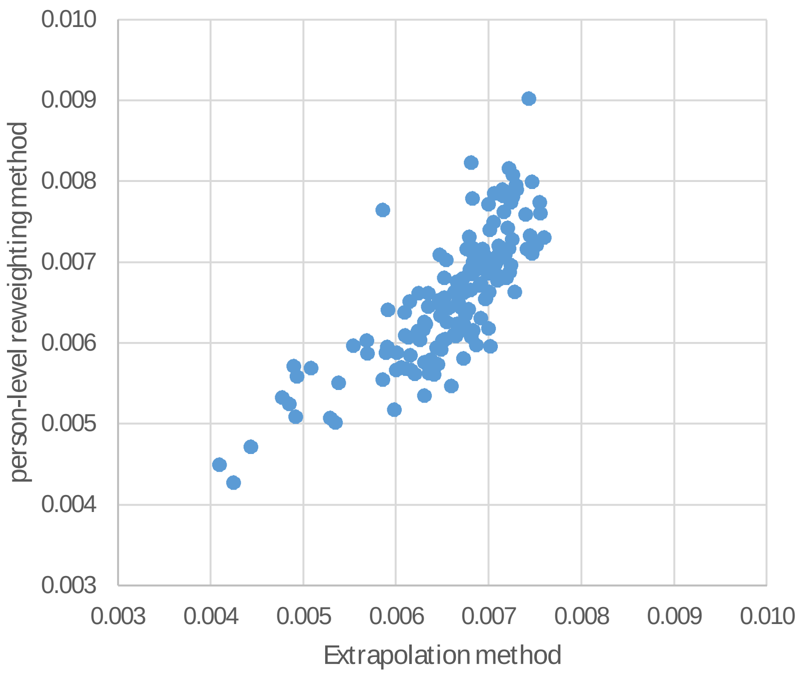


Figure 4. Comparing the additional assessments per capital relative needs: extrapolation and imputation methods



Policy implications

There are a number of alternative methodologies for estimating relative need formulae, with strengths and weakness. Their suitability often depends on which assumptions and principles are chosen to be embodied in relative need formulae. The extrapolation method produces a relative need formula where need is principally defined by local authority eligibility assessment. This concept of 'need' differs from the actual utilisation of services, where the latter is also determined by demand and supply factors. The choice as to whether demand and supply factors should be in the final needs formula depends on assumptions as to whether they are within or beyond the control of local authorities.

The extrapolation approach is most suited to the case whether these factors are assumed to be within the control of local authorities. The two relevant arguments are as follows. First, with respect to demand/preferences, local authority needs-based eligibility criteria will apply for the new responsibilities. For example, a person will only qualify for a DPA if they also meet the LA test for needing residential care (which is not necessarily the same as already being resident in a care home as a self-payer). Similarly, for a full assessment and measuring of progress towards the cap, a person should have LA-level care needs. Clearly, the number of initial approaches to LAs in any area will depend on the person/families own judgement of need, but this can at least in part be managed by information campaigns, assessment screening, etc. So the implications of LA eligibility criteria for each locality is an important determinant of future funding requirements in those areas.

The extrapolation approach determines need by extrapolating the numbers of people that would meet local authority eligibility criteria. Local authority level effects are also used in the analysis to account for differences in policy between LAs.

The second argument relates to supply. Although actual patterns of LA-supported care will demand on local supply conditions, the relative need formula ought to provide sufficient funding to LAs to meet the support needs of the expected number of people with such need in their locality. LAs can make choices about how to best meet that need locally and have the power to provide services directly if independent sector supply is insufficient. Also local unit cost differences are accounted for by the ACA. So again, this argument suggests that current supply indicators should not be used in the formula. The current approach uses data on supply to remove short-term supply effects from the formula.

The weaknesses with this approach are twofold. First, is that modelling assumptions need to be made in extrapolating from current LA practice. Regression analysis imposes certain statistical assumptions for example. The second point is that LA eligibility criteria will change to some extent, so that needs-based eligibility for the new forms of support could differ from current practice. The suitability of this approach therefore depends on any judgement as to whether current practice is still the best indicator for future eligibility. An alternative approach might be one which does not embody any consideration of eligibility, such as an epidemiological approach.

The results in this paper do support the principles of need adjustment (however that is made). Need levels differ between areas and do impact on the amount for care support each local authority will need to provide to meet its obligations.

Annex 1. Analytical framework

Predicting need

The probability that a person in the population satisfies these two tests is $p(R + E)$ where R is the needs test and E is the eligibility test.

Our aim is to determine the nature of the LA 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.

Given the interdependence of conditions R and E, we can write:

$$p(R) = \frac{p(R + E)}{p(E|R)} \quad (10)$$

i.e. the probability of people with care needs is the probability of people both in need and eligible divided by the probability of those people in need who are eligible.

We therefore need an estimate of $p(R + E)$ and $p(E|R)$, as a function of relevant risk factors: need proxies, x, wealth proxies, y, and supply, s.

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:

$$p(R + E) = f^{R+E}(x, y, s) \quad (11)$$

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 e data 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. 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:

$$p(E) = f^E(y; R) \quad (12)$$

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

$$p(E|R = 1) = f^{E|R}(y) \quad (13)$$

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

$$p(E|R = 1) = f^{E|R}(y) \cong f^E(y; x > \underline{x}) \quad (14)$$

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.

Having made these two estimations, the two functions (11) and (14) can then be combined using (1):

$$p(R) = \frac{f^{R+E}(x, y, s)}{f^E(y; x > \underline{x})} \quad (15)$$

We used predicted values $f^{R+E}(x,y,s)$ in (15) to better accommodate censored distributions of LA-supported utilisation data.

Finally, the predicted value of $\hat{p}(R)_i$ from (15) can be estimated in terms of the need, wealth and supply factors:

$$\hat{p}_i(R) = f^R(x,y,s) \tag{16}$$

New forms of support

Assessment formula

A relative needs formula (RNF) for total assessments would be based on (16) where R is the (LA-assessed) need for social care. It would be used to determine the proportion of the total England number of assessments arising in each LA. We need to assume that the proportion of full assessments, σ, is a fixed multiple of the number of people with any need:

$$\sigma\hat{p}_i(R) = \sigma f^R(x,y,s) \tag{17}$$

The proportion of total assessment in England that go to each LA is:

$$\frac{\sigma\hat{p}_i(R)}{\sum_i \sigma\hat{p}_i(R)} = \frac{\sigma\hat{p}_i(R)}{\sigma\sum_i \hat{p}_i(R)} = \frac{\hat{p}_i(R)}{\sum_i \hat{p}_i(R)} \tag{18}$$

As σ drops out, this means we do not need to actually put a value on this factor to estimate each LA's share. A similar approach can be used for additional assessments i.e. above those already carried out by LAs.

Deferred payment agreement

In this case, we need to determine those people in the population with (i) an LA-assessed care home level of need and (ii) who might be in a position to need a DPA and be eligible on the basis of the DPA rules. Essentially the latter (ii) will be self-payers. Anyone with a home that is assessable under the current means-test will be a self-payer (unless the home is of very low value). People with high levels of income and non-housing wealth may not be eligible for a DPA but this will be a small group and probably ignorable for the purposes of establishing relative needs.[5]

As above, we can define the eligibility condition D for a DPA. This includes the requirement that the potential recipient also owns a home:

$$p(D|R = 1) = f^{D|R}(y) \cong f^D(y; x > \underline{x}) \tag{19}$$

and so

$$p(R + D) = p(R)\big(p(D|R)\big) = \frac{f^{R+E}(x,y,s)}{f^E(y; x > \underline{x})} f^D(y; x > \underline{x}) = f^{R+D}(x,y,s) \tag{20}$$

Estimating financial eligibility

Financial eligibility for LA support (14) was modelled using the ELSA data. Specifically we set condition E as described in (6). We estimated (14) with ESLA data using a linear probability model

[5] The proportion of these people is strongly correlated with housing wealth and the relative differences in this proportion between LAs, after accounting for the effect of different levels of housing wealth in the population will be very modest.

(OLS) over a sub-sample of people with at least one ADL, a proxy for the $R = 1$ condition in (14). Both need and wealth factors were used in the estimation:

$$E(R = x_A) = \beta_0^E + \beta_1^E x^E + \beta_2^E y^E + \epsilon^E \quad (21)$$

The independent variables are described in the main text.

Financial eligibility for a DPA was also simulated in ELSA using the rules outlined above (8). We estimated this model in two parts.

$$\begin{aligned} p(D|R = 1) &= p(own, alone, need) \times p(NHW < 23250) \\ &= f^{OA}(x^{OA}, y^{OA}) f^{D|OA}(x^{D|OA}, y^{D|OA}) \end{aligned} \quad (22)$$

The two functions f^{OA} and $f^{D|OA}$ were also estimated using linear (OLS) probability models.

Estimating need eligibility

The discussion of the analytical framework above refers to individual person probabilities. But this analysis readily generalises to the population level (e.g. an LSOA). This generalisation is achieved by calculating the expected number of people in a population that would satisfy the relevant conditions.

Suppose there are j people in each LSOA i, then (1) can be written:

$$\sum_j p_{ij}(R + E) = \sum_j [p_{ij}(R) p_{ij}(E|R)] \quad (23)$$

We do not observe $p_{ij}(E|R)$ at LSOA level but rather use an individual level estimate from elsewhere (using ELSA data, see below) and assume that $p_j(E|R) = p_i(E|R)$, the mean value for the LOSA. As such, (23) becomes:

$$c_i^{R+E} = p_i(E|R) \sum_j [p_{ij}(R)] = p_i(E|R) c_i^R \quad (24)$$

where c_i^{R+E} is the count of people satisfying the needs and eligibility tests. Also, c_i^R is the count of people satisfying just the need test. A similar function can be written for the DPA test:

$$c_i^{R+D} = p_i(D|R) c_i^R \quad (25)$$

In generalising in this way, we need to assume that individual level probabilities in a given small area population are about the same. This assumption seems reasonable if the relevant characteristics of people in that population are also similar. For this reason, we use as small a population level as possible for the analysis; namely LSOA populations.

We estimated a number of RNFs, for different conditions. As a shorthand, we use the variable g to summarise the relevant condition: $g = \{R + E, R, R + D\}$.

The general method used involves calculating the expected counts of people in each LSOA who satisfy condition g and then using a regression model to estimate a prediction formula for these numbers based on LSOA population rates of relevant need, wealth and supply factors.

We fit count models to the small area data:

$$c_i^g = \exp\left(\beta_0 + \sum_k \beta^k \frac{z_i^k}{m_i} + \beta^m \ln(m_i)\right) \quad (26)$$

at the LSOA i level. Here c_i is the count of recipients per LSOA satisfying condition $g = \{R + E, R, R + D\}$. Also, z_i are both the need and wealth variables and m_i is the over 65s' population of the LSOA.

The inclusion of a population size variable in an LSOA-level analysis is mainly to account for scale effects. Other things equal, the numbers of clients in any area should be proportional to the population in that area.

We could estimate a model in rates of service users per capita (65+) but count models should be better able to deal with integer effects in small areas by having population on the right-hand side. We only observe integer counts of service users by LSOA in the data, noting that the average number of clients in any LSOAs is *unlikely* to be an integer. Consequently in small LSOAs we might observe zero clients even if the average is greater than zero (but less than one). Similarly, in larger LSOAs we are more likely to see positive integer numbers of clients, whereas the average is less than this amount. Consequently, the size of the LSOA can artificially affect the actual observed numbers of clients, and we need to control for this artefact in the analysis.

A standard set of variables, z^k, were included in each estimation (of the different g's), grouped by primary variable type: need, wealth and supply. These are described in the main text.

Linear formulae

A linear approximation can be obtained using a first-order Taylor Series expansion of (26):

$$c_i^g \cong \pi_0^g + \sum_k \pi_i^{gk}(m_i) \frac{z_i^k}{m_i} + \pi_i^{gm}(m_i) m_i \tag{27}$$

where $\pi_i^k = \frac{\partial c_i^g}{\partial \left(\frac{z_i^k}{m_i}\right)}$ and $\pi_i^m = \frac{\partial c_i^g}{\partial m_i}$ are coefficients of a linear formula.

This formula can be summed to the LA level.

$$\sum_i^L c_i^g \cong N_l \pi_0^g + \sum_i^L \pi_i^{g1} \frac{z_i^1}{m_i} + \cdots + \sum_i^L \pi_i^{gK} \frac{z_i^K}{m_i} + \sum_i^L \pi_i^{gm} m_i \tag{28}$$

This can be further simplified is we assume that the linear coefficients are not functions of population and therefore constant for each LSOA i. We explore this assumption below. This means:

$$C_l^g \cong N_l \pi_0^g + \pi^{g1} \sum_i^L \frac{z_i^1}{m_i} + \cdots + \pi^{gK} \sum_i^L \frac{z_i^K}{m_i} + \pi^{gm} \sum_i^L m_i \tag{29}$$

The z terms are needs factors and these may be assumed to apply at the person level and not functions of the size of local populations, i.e.

$$z_i^k = \phi^k m_i \tag{30}$$

Consequently, $\sum_i^L \frac{z_i^k}{m_i} = \sum_i^L \phi^k = N_l \phi^k = N_l \frac{Z_l^k}{M_l}$, where $Z_l^k = \sum_i z_i^k$ is the LA sum of the need factor e.g. number of people claiming AA, and $M_l = \sum_i m_i$ the LA-level population 65+.

Using this result in (29) gives:

$$C_l^g \cong N_l \pi_0^g + \pi^{g1} N_l \frac{Z_l^1}{M_l} + \cdots + \pi^{gK} N_l \frac{Z_l^K}{M_l} + \pi^{gm} M_l \tag{31}$$

Or

$$\frac{C_l^g}{M_l} \cong \frac{N_l}{M_l}\pi_0^g + \pi^{g1}\frac{N_l}{M_l}\frac{Z_l^1}{M_l} + \cdots + \pi^{gK}\frac{N_l}{M_l}\frac{Z_l^K}{M_l} + \pi^{gm} \tag{32}$$

Finally, average LOSA population 65+ in LA l is $\overline{m_l} = M_l / N_l$ and therefore:

$$\frac{C_l^g}{M_l} \cong \frac{\pi_0^g}{\overline{m_l}} + \pi^{gm} + \frac{\pi^{g1}}{\overline{m_l}}\frac{Z_l^1}{M_l} + \cdots + \frac{\pi^{gK}}{\overline{m_l}}\frac{Z_l^K}{M_l} \tag{33}$$

This method can be applied to any condition g and therefore we can write the general case as:

$$\frac{C_l^g}{M_l} \cong \alpha_0^g + \alpha_1^g\frac{Z_l^1}{M_l} + \cdots + \alpha_K^g\frac{Z_l^K}{M_l} \tag{34}$$

where $\alpha_k^g = \frac{\pi^{gk}}{\overline{m_l}}$ and $\alpha_0^g = \frac{\pi_0^g}{\overline{m_l}} + \pi^{gm}$.

In theory, the α' are functions of population size, m_i, and therefore subject to scaling issues. Local authorities with different populations would have different coefficients. In practice, we might expect client counts to be directly proportional to LSOA population size, after accounting for any integer effects. In this case, we would expect that the coefficient β^m to have a value close to one. We have:

$$\alpha^k = \frac{\pi^k}{\overline{m_l}} = \frac{1}{\overline{m_l}}\frac{\partial c_i^g}{\partial\left(\frac{z_i^k}{m_i}\right)} = \frac{\beta^k}{\overline{m_l}}\exp\left(\beta_0 + \sum_k \beta^k \frac{z_i^k}{m_i}\right)\exp\left(\beta^m ln(m_i)\right) \tag{35}$$

$$= \beta^k \exp\left(\beta_0 + \sum_k \beta^k \phi^k\right) m_i^{\beta^m - 1}$$

Consequently if $\beta^m = 1$, then $\alpha^k = \beta^k \exp\left(\beta_0 + \sum_k \beta^k \phi^k\right)$, that is, not a function of m_i. We tested this assumption directly using the estimated value of β^m in the empirical analysis.

Annex 2. Data sources and manipulation

Population Estimates at July 2012

Source: We used mid-2012 population estimates for Lower Layer Super Output Areas 2011 by single year of age and sex, as they are the closest population estimates available to February 2013 (i.e., the month and year for the rest of statistics used in the analysis). The statistics are provided by the Office of National Statistics, Population Statistics Division.[6]

Manipulation: Using these statistics we computed through aggregation of single years of age and/or gender various population groups at LSOA 2011 level: total population, population aged 60 and over, population aged 65 and over, female population aged 65 and over, population aged 70 and over, and working age population (i.e., aged 16 to 64). Figure 5 presents the distribution of the population 65 and over at local authority level – this varied considerably, with the largest population 65 and over exceeding 250,000 (in Kent, Essex and Hampshire) and the smallest being 545 (Isles of Silly) and 1,106 (City of London).

[6] http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-320861

Benefits Claimants Data

Source: We used data on counts of benefits claimants at February 2013 (i.e., Attendance Allowance, Disability Living Allowance, Employment and Support Allowance, Income Support, Jobseekers Allowance and Pension Credit claimants) provided by the Department for Work and Pensions.[7] The statistics are at 2001 Lower Layer Super Output Area (LSOA).

Manipulation: As the analysis is performed at 2011 LSOA level, we matched 2001 to 2011 LSOAs by using the "Lower Layer Super Output Area 2001 to Lower Layer Super Output Area 2011 E+W Lookup" provided by the UK Data Service Census Support.[8] For LSOAs 2011 that resulted from a merge of two or more LSOAs 2001 (i.e., 145 LSOAs 2011), the count of benefits claimants was computed as the sum of benefits claimants from the respective LSOAs 2001. For LSOAs 2011 that resulted from a split of a LSOA 2001 (i.e. 881 LSOAs 2011), the count of benefits claimants was estimated as a share of benefits claimants from the respective LSOA 2001. The shares are based on the population living in a LSOA 2011 that resulted from a split divided by the sum of populations living in all LSOAs 2011 that resulted from that particular split. We used different population groups to compute the population shares for the various types of benefit claimants:

1. for Attendance Allowance claimants we used the population aged 65 and over;
2. for Disability Living Allowance claimants - the total population;
3. for Employment and Support Allowance, Income Support, Jobseekers Allowance claimants - the working age population (i.e., aged 16 to 64);
4. for Pension Credit claimants - the population 60 and over; while
5. for Disability Living Allowance and Pension Credit claimants aged 70 and over - the population aged 70 and over.

We could not estimate the count of benefit claimants for 146 LSOAs 2011 that resulted from a mix of merges and splits of LSOAs 2001. For these LSOAs, the values for the count of benefit claimants are set as missing.

Figures 6 and 7 illustrate the distribution by upper tier local authority of shares of Attendance Allowance claimants aged 65 and over and Pension Credit claimants aged 80 and over in the population 65 and over.[9] While the distribution of the count of Attendance Allowance claimants aged 65 and over and Pension Credit claimants aged 80 and over resembles that of the population 65 and over, the shares in the population 65 and over serve as a proxy for relative deprivation that is likely to be highly correlated with relative needs. The share of Attendance Allowance claimants aged 65 and over in the population 65 and over ranges from over 0.22 (in the case of Sandwell and Tower Hamlets) to about 0.10 (in the case of the City of London and Wokingham). Similarly, the share of Pension Credit claimants aged 80 and over in the population 65 and over ranges from 0.16 (Tower Hamlets) and 0.14 (Sandwell) to 0.04 (City of London and Wokingham).

Number of Care Home Beds

Source: Data on the number of care home beds and type of clients at February 2013 were extracted from the Care Directory statistics provided by the Care Quality Commission.[10] The statistics are at care home level.

[7] http://tabulation-tool.dwp.gov.uk/NESS/BEN/iben.htm
[8] http://ukbsrv-at.edina.ac.uk/html/lut_download/lut_download.html?data=lsoa01_lsoa11_ew_lu
[9] The aggregation at upper tier LA has been made directly from the original statistics at LSOA 2001 level. Therefore, it includes also the benefit claimants we could not assign to the 146 LSOAs 2011.
[10] http://www.cqc.org.uk/cqcdata

Manipulation: Before estimating the number of care home beds at LSOA 2011 level, we cleaned the data by dropping duplicated care homes (24 care homes),[11] corrected typos in the care home postal codes (1 care home), corrected the entry for Local Authority Area (10 care homes) and replaced missing values for Service User Band (i.e., type of client) using information from carehome.co.uk (7 care homes).

The number of care home beds for "Old Age/Dementia" clients at LSOA 2011 level was estimated in two steps. In the first step, the number of care home beds of the care homes that registered to serve either "Old Age" or "Dementia" clients or both was aggregated at postal code level. Then, using the November 2013 Office for National Statistics Postcode Directory Open Edition,[12] postcodes were matched to LSOAs 2011. In the second step, the care home bed numbers for "Old Age/Dementia" clients at postal code level were aggregated at LSOA 2011 level.

The "Number of care home beds for old age and dementia" is a measure of care supply. Not surprisingly the highest number of care home beds are found in areas with the largest population 65 and over, as the demand for care is higher; the correlation between the "Number of care home beds for old age and dementia at LA level" and "Population 65 and over at LA level" is 0.983. However, due to cost reasons, the highest concentration of care home beds for old age and dementia in the population 65 and over is in areas with relatively lower house prices: the highest concentration is for example in Middleborough (0.073), Torbay (0.069) and Bournemouth (0.068), while the lowest concentration is in the City of London (nil) and London boroughs (e.g., Hackney [0.014], Westminster [0.015] and Camden [0.021]; see Figure 8).

Residential Care Clients aged 65 and over

Source: Statistics 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 sampled Local Authorities (see Table 19; for more details see LG Futures (2014) Report on Engagement and Data Collection Activities). Two datasets were created: the first on the basis of clients' pre-care address, while the second on clients' care address. Both include the count of clients by six primary client types (i.e., Physical Disability, Mental Health, Learning Disability, Substance Misuse and Other Vulnerable People, and Not Allocated) and three types of residence (i.e., LA Staffed Residential Care, Independent Residential Care, and Nursing Care). Values at LSOA level of "1", "2", "3", and "4" were masked by Local Authorities (i.e., replaced by "*"), as this data has been classified as personal identifiable.

From the 60 sampled LAs, three submitted incomplete data (i.e., Birmingham, Peterborough and Sutton), while four were excluded (i.e., Bexley, Croydon, Hounslow and Enfield) 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.[13] The final sample included 53 Local Authorities, covering 14,003 LSOAs.

Manipulation: For each type of residence, we replaced missing values for Total Primary Clients with the sum of values for the respective primary client types. In total, 14 missing values were replaced for LA Staffed Residential Care, 60 missing values were replaced for Independent Residential Care, and 45 missing values were replaced for Nursing Care. Moreover, zero values of Total Primary Clients were replaced with the sum of values for the respective primary client types if at least one of

[11] Double entries in the Care Home register are sometimes due to a change in management.
[12] http://ukbsrv-at.edina.ac.uk/html/pcluts_download/pcluts_download.html?data=pcluts_2013nov
[13] http://www.hscic.gov.uk/catalogue/PUB13148/comm-care-stat-act-eng-2012-13-fin-data.zip

the latter values was different from zero: 19 zero values were replaced for LA Staffed Residential Care, 88 zero values were replaced for Independent Residential Care, and 195 zero values were replaced for Nursing Care.

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 (i.e., "*") with "*" mean values computed at LA level. The "*" mean value for residential care for LA *i* ($\bar{*}_{RCi}$) is 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:

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

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. The $\bar{*}_{RCi}$ and $\bar{*}_{NCi}$ values used to replace the masked values are presented in Table 20, along with the estimated number of LA supported permanent admissions to residential and nursing care at upper tier LA level. The estimates were obtained through the aggregation of the LSOA level data after replacing the masked values.

After replacing the masked values, the variables Total Primary Clients in Residential Care and Total Primary Clients in Nursing Care were used to compute **Gross** Weekly Residential Care Expenditures 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 in Table 21 were taken from the Personal Social Services Expenditure and Unit Costs - England, 2012-13, Final release [NS] reported by the Health and Social Care Information Centre.[14] The cost-weighted Gross Weekly Residential Care Expenditures for each LSOA *k* ($GWResCareExp_k$) are:

$$GWResCareExp_k = 528.40 \times ResCare_k + 507.40 \times NurCare_k$$

Non-residential Care Clients aged 65 and over

Source: Statistics at LSOA level on 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 collected by LG Futures from 60 sampled Local Authorities (see Table 22; for more details see LG Futures (2014) Report on Engagement and Data Collection Activities). Four LAs (i.e., Hammersmith and Fulham, Peterborough, St. Helens and Suffolk) could not submit all the data required and were not used in the analysis, while data from seven further LAs were

[14] http://www.hscic.gov.uk/catalogue/PUB13085

excluded due to apparent inconsistencies between counts of clients at LA level and RAP returns (i.e., Bexley, Cambridgeshire, Coventry, Croydon, Enfield, Hounslow, and Kensington and Chelsea). The dataset included counts by five primary client types (i.e., Physical Disability, Mental Health, Learning Disability, Substance Misuse, and Other Vulnerable People), eight components of service (i.e., Home Care, Day Care, Meals, Short-Term Residential Not Respite, Direct Payments, Professional Support, Equipment and Adaptions, and Other) and the Total of Clients. Values at LSOA level of "1", "2", "3", and "4" were masked by Local Authorities (i.e., replaced by "*"), as this data has been classified as personal identifiable.

Manipulation: Three components of service were used for the estimation of the Relative Needs Formulae: Total of Clients, Home Care, and Direct Payments. 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. In total, 83 missing values were replaced for Total of Clients, 82 missing values were replaced for Home Care, and 35 missing values were replaced for Direct Payments. Moreover, 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. In total, 13 zero values were replaced for Total of Clients, 206 zero values were replaced for Home Care, and 200 zero values were replaced for Direct Payments.

The masked values (i.e., "*") were replaced with "*" mean values computed at LA level. The "*" mean value for Total of Clients for LA *i* ($\bar{*}_{TCi}$) was computed as:

$$\bar{*}_{TCi} = \frac{RAPTotClient_i - \sum_j TotClient_{ij}}{N^*_{TCi}} \ , \forall \ TotClient_{ij} \geq 5$$

where $RAPTotClient_i$ stands for RAP Return of Total of Non-Residential Clients in the LA *i*, $TotClient_{ij}$ stands for Total of Non-Residential Clients in LA *i* and LSOA *j*, and N^*_{TCi} represents the total number of "*" values for the Total of Non-Residential Clients in the LA *i*.

The "*" mean value for Home Care for LA *i* ($\bar{*}_{HCi}$) is computed as:

$$\bar{*}_{HCi} = \frac{RAPHomCare_i - \sum_j HomCare_{ij}}{N^*_{HCi}} \ , \forall \ HomCare_{ij} \geq 5$$

where $RAPHomCare_i$ stands for RAP Return of Non-Residential Clients Receiving Home Care in the LA *i*, $HomCare_{ij}$ stands for Non-Residential Clients Receiving Home Care in the LA *i* and LSOA *j*, and N^*_{HCi} represents the number of "*" values for non-residential clients receiving home care in the LA *i*.

The "*" mean value for Direct Payments for LA *i* ($\bar{*}_{DPi}$) was computed as:

$$\bar{*}_{DPi} = \frac{RAPDirPay_i - \sum_j DirPay_{ij}}{N^*_{DPi}} \ , \forall \ DirPay_{ij}) \geq 5$$

where $RAPDirPay_i$ stands for RAP Return of Non-Residential Clients Receiving Direct Payments in the LA *i*, $DirPay_{ij}$ stands for Non-Residential Clients Receiving Direct Payments in the LA *i* and LSOA *j*, and N^*_{DPi} represents the number of "*" values for non-residential clients receiving direct payments in the LA *i*.

For both $\bar{*}_{TCi}$, $\bar{*}_{HCi}$ and $\bar{*}_{DPi}$, values that were out of the [0,5] range were dropped, as in this case aggregated LA data were considered to differ significantly from RAP returns: values for 29 LAs had to be dropped from $\bar{*}_{TCi}$ as well as values for 8 LAs from the $\bar{*}_{HCi}$ and $\bar{*}_{DPi}$. From the remaining, values smaller than the 5th percentile weighted by the number of stars at LA level (i.e., N^*_{TCi}, N^*_{HCi} and N^*_{DPi}

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. The final $\overline{*}_{TCi}$, $\overline{*}_{HCi}$ and $\overline{*}_{DPi}$ values used to replace the masked values for Total of Non-Residential Care Clients, Home Care Clients and Direct Payments Clients are presented in Table 23. The second part of Table 23 presents the estimated number of clients registered to receive community based services at upper tier LA level. The estimates were obtained through the aggregation of the LSOA level data after replacing the masked values.

After replacing the masked values, the variables Home Care Clients in Direct Payments Clients were used to estimate **Gross** Weekly Non-Residential Care Expenditures 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, 2012-13, Final release [NS] reported by the Health and Social Care Information Centre.[15] The cost-weighted Gross Weekly Non-Residential Care Expenditures for each LSOA k ($GWNonResCareExp_k$) are:

$$GWNonResCareExp_k = 187.50 \times HomCare_k + 172.90 \times DirPay_k$$

The cost-weighted gross weekly residential and non-residential care expenditures for the sampled LAs are presented in Table 24.

Census 2011 data

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

- Count of people aged 85 and over with substantial activities of daily life limitations (i.e., day-to-day activities limited a lot) at LSOA level – Census 2011 Table ID LC3302EW;[16]
- Count of households with members living as a couple (i.e., married or cohabiting) aged 65 and over at LSOA level – Census 2011 Table ID LC1102EW; [17]
- Count of homeowner households (i.e., home owned outright) aged 65 and over at LSOA level – Census 2011 Table ID LC4201EW;[18]
- Count of households with members aged 65 and over at LSOA level – Census 2011 Table ID LC4201EW;
- LSOA area (in hectares) – Census 2011 Table ID QS102EW; [19]

We used the share of homeowner households aged 65 and over in the total number households 65 and over as a measure of housing wealth. As illustrated by Figure 9, housing wealth is quite unevenly distributed, ranging from over 0.75 in Wokingham, South Gloucestershire, Havering, and Solihull to about 0.20 in the London boroughs of Hackney and Tower Hamlets.

The share of couples aged 65 and over in the total number of households 65 and over offers an alternative indicator of needs, as couples may help each other in time need and access less LA care support. Again we find quite a lot of variation (see Figure 10), with LAs like Wokingham, Rutland, East Riding of Yorkshire, Isles of Scilly, Lincolnshire, South Gloucestershire and Dorset having more than 50 per cent of households 65 and over living as couples, while only about 25 per cent of households over 65 live as couples in the London boroughs of Hackney, Islington, Hammersmith and Fulham, and Lambeth.

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15 http://www.hscic.gov.uk/catalogue/PUB13085
16 https://www.nomisweb.co.uk/census/2011/lc3302ew
17 https://www.nomisweb.co.uk/census/2011/lc1102ew
18 https://www.nomisweb.co.uk/census/2011/lc4201ew
19 https://www.nomisweb.co.uk/census/2011/qs102ew

English Longitudinal Study of Ageing data

The English Longitudinal Study of Ageing (ELSA) began in 2002 drawing on the sample of individuals aged 50 and over from the Health Survey of England (1998, 1999, 2001). ELSA collects large amount of data on the individual and family circumstances and quality of life among older people. It explores the dynamic relationships between health and functioning, social networks and participation, and economic position of people during the pre-retirement period and after retirement.

We used ELSA data to estimate the number of individuals financially eligible under the new Care Bill for local authority social care support and Deferred Payment Arrangements. This data set provides a range of sound financial variables which are not routinely available at the regional level, but which determine eligibility. These data were used to model financial and DPA eligibility as outlined in the main text. The models included, variously, the respondent's sex, age group and number of activities of daily life (ADL) limitations; indicators for living alone, owning the accommodation (outright), receiving pension credit and receiving attendance allowance; and wave and regional controls. Summary statistics of these variables are presented in Table 25.

Table 19. Sampled Local Authorities – Residential 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 20. Means of masked values and estimated number of LA supported permanent admissions to residential and nursing care during 1 Apr 2012 and 31 Mar 2013 at Upper Tier LA level

Local Authority	Mean of masked value		Number of Permanent Admissions[a]	
	Residential Care	Nursing Care	Residential Care	Nursing Care
Bedford	1.7143	1.2069	153	29
Blackpool	1.9041	1.3721	182	43
Bracknell Forest	1.5517	1.8056	60	72
Bromley	1.3462	1.5600	71	105
Buckinghamshire	1.4020	1.3820	102	89
Cambridgeshire	1.8917	1.6292	254	178
Camden	1.3462	1.2857	61	34
Cheshire East	1.3462	1.2203	70	65
Cornwall	1.7973	1.1587	490	221
County Durham	2.2549	1.2121	640	98
Coventry	1.6804	1.2041	215	49
Derbyshire	2.2392	1.3785	948	212
Ealing	1.3462	1.2500	45	42
East Sussex	1.5473	1.4579	478	244
Essex	1.8974	1.2418	1,439	152
Gloucestershire	1.4040	1.4329	232	200
Hackney	1.3462	1.2500	26	23
Hammersmith and Fulham	2.2877	1.9686	26	50
Hampshire	1.7835	1.5929	1,074	842
Haringey	1.3462	1.2069	52	28
Hartlepool	2.1053	1.1587	104	23
Hillingdon	2.2877	1.9686	82	50
Isle of Wight	2.2877	1.9565	248	92
Kensington and Chelsea	1.3462	1.2500	13	12
Kent	1.9963	1.7761	1,340	1,096
Kirklees	1.6759	1.2667	306	74
Lancashire	2.0756	1.8133	1,496	399
Leicester	1.8584	1.2727	282	55
Lincolnshire	2.2877	1.7376	746	446
Manchester	1.7241	1.1587	255	62
Merton	1.3462	1.1957	39	47
Milton Keynes	1.6494	1.4583	165	52
North Somerset	1.9022	1.4655	244	63
Northumberland	1.9767	1.4333	296	96
Nottinghamshire	1.6645	1.3007	647	152
Oxfordshire	1.5667	1.7337	300	398
Reading	1.6667	1.7442	137	92
Rochdale	1.6591	1.2121	228	32
Sandwell	1.4956	1.5169	131	178
Sefton	1.9268	1.5909	347	179
Solihull	1.7931	1.9167	190	120
St Helens	2.2877	1.9686	109	92
Stockport	1.8473	1.6290	306	138
Suffolk	2.0607	1.9686	794	365
Surrey	1.7030	1.4752	713	341
Swindon	1.6667	1.3077	101	51
Torbay	2.2877	1.3889	156	18
Tower Hamlets	1.5476	1.3333	84	30
Waltham Forest	1.3462	1.2162	53	37
Westminster	1.8519	1.1887	58	56
Wiltshire	1.6596	1.4590	335	133
Wolverhampton	1.7500	1.4211	230	46
York	1.8824	1.5714	100	83

Notes: [a] Estimated using data collected on residential care clients at LSOA level.

Table 21. Unit costs

Service	Average gross weekly expenditure per older person at 31 March 2013 (£s)
Residential care (including full cost paying and preserved rights residents)	528.40
Nursing care	507.40
Home care	187.50
Direct payments	172.90

Table 22. Sampled Local Authorities – Non-Residential Care

LA code	LA name	LA code	LA name
E06000055	Bedford	E08000034	Kirklees
E09000004	Bexley[b]	E10000017	Lancashire
E08000025	Birmingham	E06000016	Leicester
E06000009	Blackpool	E10000019	Lincolnshire
E06000036	Bracknell Forest	E08000003	Manchester
E09000006	Bromley	E09000024	Merton
E10000002	Buckinghamshire	E06000042	Milton Keynes
E10000003	Cambridgeshire[b]	E06000024	North Somerset
E09000007	Camden	E06000048	Northumberland
E06000049	Cheshire East	E10000024	Nottinghamshire
E06000052	Cornwall	E10000025	Oxfordshire
E06000047	County Durham	E06000031	Peterborough[a]
E08000026	Coventry[b]	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[a]
E10000012	Essex	E08000007	Stockport
E10000013	Gloucestershire	E10000029	Suffolk[a]
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
E09000018	Hounslow[b]	E09000033	Westminster
E06000046	Isle of Wight	E06000054	Wiltshire
E09000020	Kensington and Chelsea[b]	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 23. Means of masked values and estimated number of clients registered to receive community based services provided or commissioned by the CASSR on 31 March 2013 at Upper Tier LA level

	Mean of masked value			Number of clients registered[b]		
Local Authority	Total of Clients	Home Care	Direct Payments	Total of Clients	Home Care	Direct Payments
Bedford	2.9167	2.6735	1.4754	1,033	556	61
Birmingham	3.7912	3.3936	1.5016	6,950	4,130	644
Blackpool	2.3704	3.2000	1.8750	1,498	893	80
Bracknell Forest	3.3056	2.7447	1.5854	566	387	82
Bromley		4.0000	1.5517	na	1,435	182
Buckinghamshire	3.9524	2.5905	1.2702	5,669	1,485	321
Camden	3.2273	2.7561	2.1383	1,451	1,051	255
Cheshire East	3.8095	2.2468	2.3077	2,154	420	517
Cornwall		4.0000	1.4029	na	2,348	149
County Durham	2.9000	3.5584	2.1026	6,644	3,267	473
Derbyshire		4.0000	1.6655	na	5,002	602
Ealing		3.0577	2.3077	na	1,437	183
East Sussex		3.2530	2.3077	na	1,984	778
Enfield	a			2,220	na	na
Essex		2.7294	1.6611	na	4,620	1,036
Gloucestershire		2.2442	1.5604	na	1,447	380
Hackney	3.5926	3.1556	1.5441	1,635	870	134
Hampshire		1.0000	1.0000	na	4,364	527
Haringey	3.0000	2.7324	2.1702	1,263	724	286
Hartlepool	a	3.1818	2.1714	2,382	518	99
Hillingdon		1.6923	1.7308	na	1,934	156
Isle of Wight	3.3333	3.4706	2.1486	976	584	179
Kent		2.6850	1.4729	na	5,651	572
Kirklees	4.0000	3.1689	1.8535	5,703	1,431	329
Lancashire		1.0000	1.3608	na	4,986	361
Leicester	3.3333	3.5893	2.1370	2,615	1,754	348
Lincolnshire		3.3410	1.8664	na	2,893	548
Manchester	2.3704	2.7664	1.5504	2,823	1,581	266
Merton		4.0000	2.2727	na	576	154
Milton Keynes	2.4717	2.2405	2.2000	1,299	684	429
North Somerset	2.7692	2.8276	1.2195	1,266	785	41
Northumberland	3.2143	3.3690	1.5098	2,088	1,413	218
Nottinghamshire		4.0000	2.0679	na	1,378	941
Oxfordshire	4.0000	3.0870	2.2841	2,875	1,528	665
Reading	3.6875	3.3182	1.4000	908	631	45
Rochdale	2.3750	3.1053	2.2581	2,028	978	67
Sandwell	4.0000	3.3846	2.2411	1,644	1,035	381
Sefton	a	2.8333	2.0876	4,432	1,091	391
Solihull	4.0000	3.3051	1.8272	1,782	872	169
Stockport		1.0000	1.9603	na	1,425	258
Surrey		2.7854	1.9703	na	3,690	834
Sutton	3.7027	3.0244	1.6338	1,094	584	149
Swindon	3.4324	2.9333	1.5957	1,367	692	92
Torbay	2.3704	3.2200	2.1231	1,540	484	142
Tower Hamlets		4.0000	2.2959	na	911	221
Waltham Forest		2.3933	a	na	605	0
Westminster		4.0000	1.8594	na	999	146
Wiltshire		2.5149	1.7701	na	1,387	435
Wolverhampton	3.1714	2.6512	1.8761	1,322	864	249
York	a	3.0000	1.4130	3,430	702	45

Notes: [a] Missing value due to zero masked values. [b] Estimated using data collected on residential care clients at LSOA level.

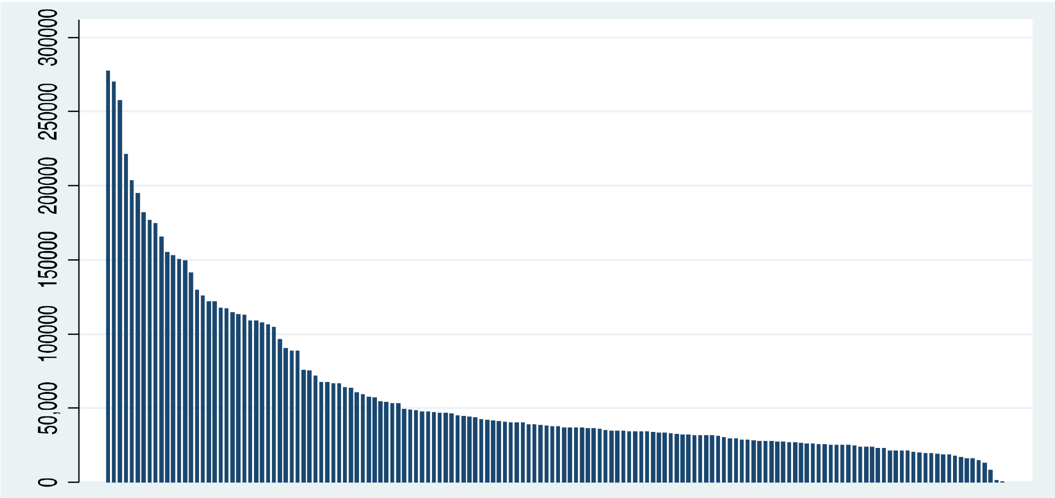
Table 24. Gross weakly residential and non-residential care expenditures by upper-tier local authority (cost-weighted)

Local Authority	Gross weakly residential care expenditures	Gross weakly non-residential care expenditures
Bedford	88,187	116,811
Birmingham	na	879,044
Blackpool	122,508	181,155
Bracknell Forest	59,219	81,551
Bromley	89,508	293,865
Buckinghamshire	137,971	326,481
Cambridgeshire	200,917	na
Camden	62,014	241,547
Cheshire East	89,257	183,830
Cornwall	364,134	475,695
County Durham	427,024	691,410
Coventry	130,758	na
Derbyshire	708,371	1,025,708
Ealing	58,647	306,365
East Sussex	372,907	526,793
Essex	824,602	997,850
Gloucestershire	302,051	333,120
Hackney	33,082	183,638
Hammersmith and Fulham	40,686	na
Hampshire	848,690	909,368
Haringey	54,135	184,403
Hartlepool	70,534	115,655
Hillingdon	74,532	385,217
Isle of Wight	187,350	145,351
Kensington and Chelsea	16,858	na
Kent	1,203,191	1,163,214
Kirklees	186,730	325,926
Lancashire	994,227	1,017,002
Leicester	173,978	388,243
Lincolnshire	635,576	642,157
Manchester	154,577	327,835
Merton	55,543	136,686
Milton Keynes	110,577	209,192
North Somerset	169,840	153,958
Northumberland	223,320	299,882
Nottinghamshire	396,366	425,396
Oxfordshire	299,227	418,473
Reading	109,415	129,806
Rochdale	124,304	197,093
Sandwell	167,043	274,254
Sefton	251,404	271,632
Solihull	149,127	193,675
St. Helens	111,222	na
Stockport	209,635	310,931
Suffolk	610,140	na
Surrey	583,580	818,061
Sutton	na	131,205
Swindon	78,930	141,504
Torbay	103,107	118,748
Tower Hamlets	54,642	214,038
Waltham Forest	57,484	119,926
Westminster	62,153	210,854
Wiltshire	247,549	316,171
Wolverhampton	144,704	197,007
York	92,375	142,619

Table 25. Summary statistics (mean values) ELSA data

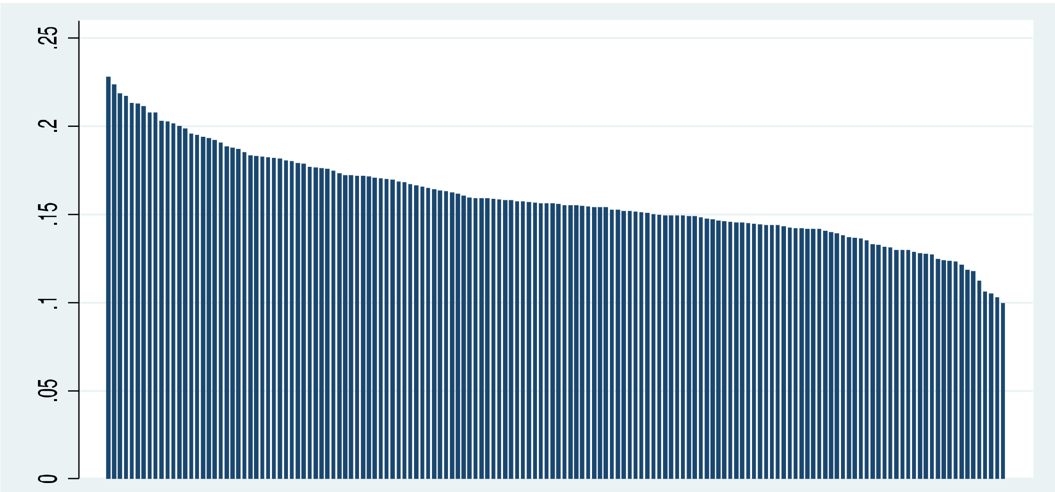
Variables	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Female	0.555	0.556	0.560	0.545	0.545
Age group: 65 to 74	0.575	0.557	0.527	0.589	0.570
Age group: 75 to 84	0.343	0.354	0.349	0.311	0.327
Age group: 85 and over	0.082	0.089	0.124	0.100	0.104
Owns home (outright)	0.680	0.718	0.710	0.738	0.751
Attainment Allowance claimant	0.084	0.088	0.089	0.084	0.081
Pension Credit claimant	0.140	0.147	0.130	0.118	0.110
Lives alone	0.359	0.360	0.360	0.335	0.324
No. of activities of daily life limited (==0)	0.730	0.725	0.731	0.738	0.751
No. of activities of daily life limited (==1)	0.136	0.146	0.136	0.134	0.123
No. of activities of daily life limited (==2)	0.064	0.062	0.057	0.061	0.059
No. of activities of daily life limited (==3)	0.033	0.030	0.036	0.030	0.028
No. of activities of daily life limited (>=4)	0.036	0.036	0.040	0.037	0.039
Region: North East	0.068	0.066	0.068	0.066	0.066
Region: North West	0.131	0.131	0.119	0.121	0.114
Region: Yorkshire and the Humber	0.107	0.108	0.113	0.107	0.104
Region: East Midlands	0.091	0.096	0.095	0.099	0.101
Region: West Midlands	0.112	0.109	0.109	0.112	0.114
Region: East of England	0.115	0.118	0.124	0.123	0.128
Region: London	0.093	0.088	0.089	0.084	0.084
Region: South East	0.159	0.161	0.162	0.168	0.165
Region: South West	0.123	0.123	0.122	0.121	0.123
Observations	5,541	4,741	4,562	5,167	5,350

Figure 5. Population aged 65+ by Upper Tier LA



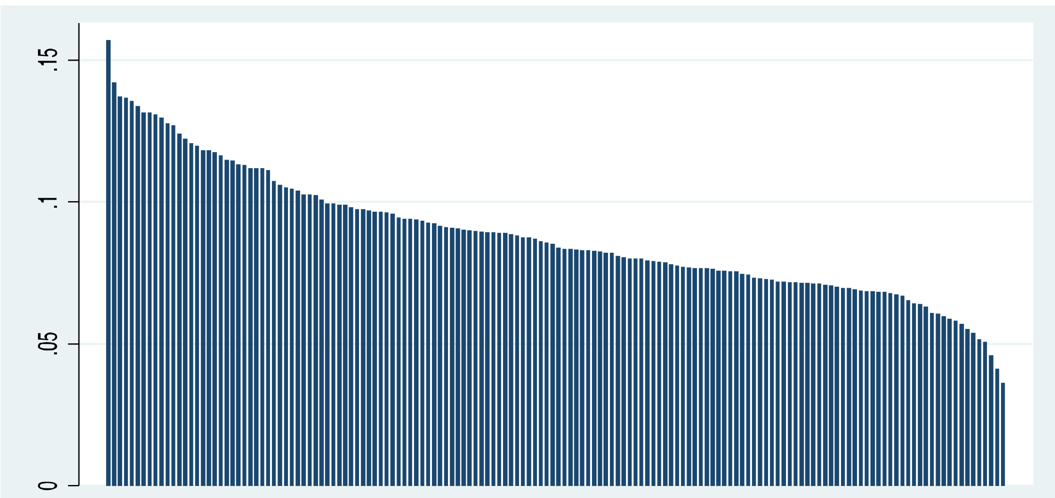
Data source: ONS, Mid-2012 Population Estimates.

Figure 6. Share of Attendance Allowance claimants aged 65+ in population aged 65+ by Upper Tier LA



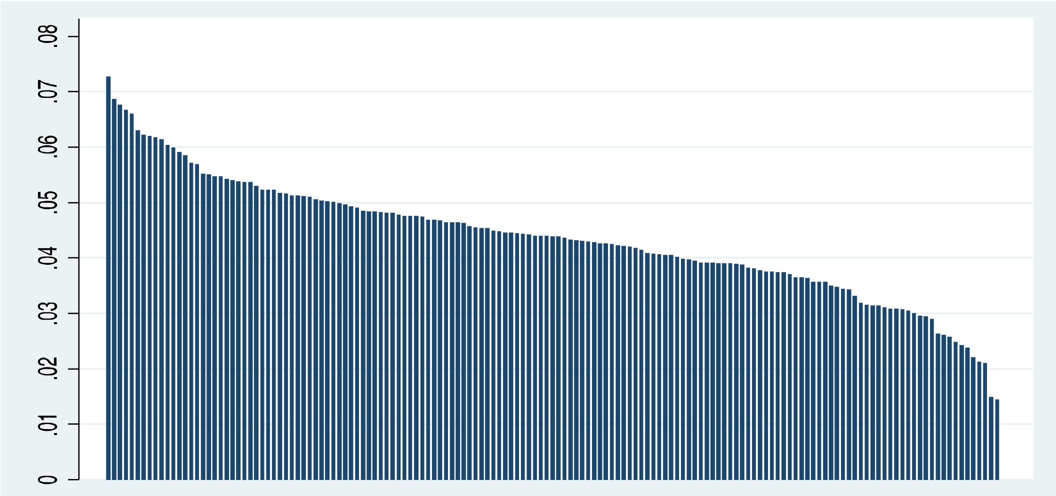
Data source: DWP, Attendance Allowance claimants at February 2013; ONS, Mid-2012 Population Estimates.

Figure 7. Share of Pension Credit claimants aged 80+ in population aged 65+ by Upper Tier LA



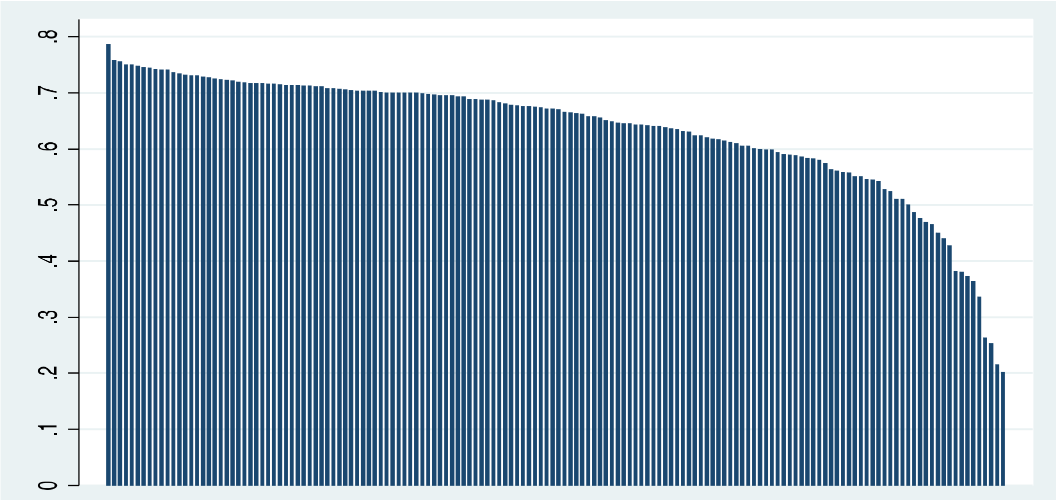
Data source: DWP, Pension Credit claimants at February 2013; ONS, Mid-2012 Population Estimates.

Figure 8. Concentration of care home beds for old age and dementia in population 65+ by Upper Tier LA



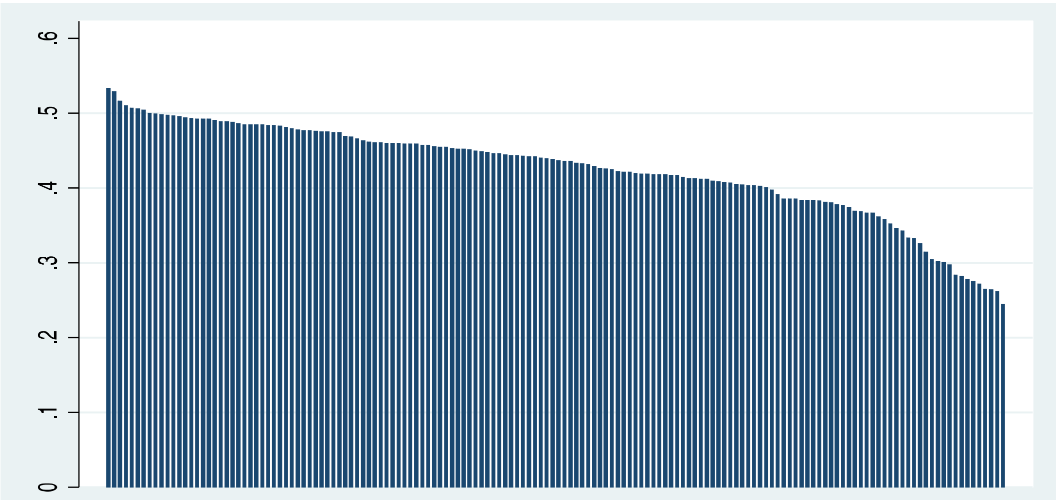
Data source: CQC, Care Directory Statistics February 2013; ONS, Mid-2012 Population Estimates.

Figure 9. Share of (outright) homeowner households 65+ in total households 65+ by Upper Tier LA



Data source: Census 2011, Table ID LC4201EW.

Figure 10. Share of households 65+ living as a couple in total households 65+ by Upper Tier LA



Data source: Census 2011, Table ID LC1102EW.

Annex 3. Exemplifications

	Add assessments		Supported clients		Need		DPAs	
	Per 65+	Total	Per 65+	Total	Per 65+	Total	Per 65+	Total
Barking and Dagenham	0.0068	0.0022	0.0090	0.0031	0.0083	0.0028	0.0082	0.0028
Barnet	0.0071	0.0057	0.0065	0.0057	0.0067	0.0057	0.0069	0.0058
Barnsley	0.0063	0.0043	0.0066	0.0049	0.0065	0.0047	0.0059	0.0043
Bath and North East Somerset	0.0073	0.0039	0.0061	0.0036	0.0064	0.0037	0.0065	0.0037
Bedford	0.0069	0.0029	0.0059	0.0027	0.0062	0.0028	0.0063	0.0029
Bexley	0.0075	0.0047	0.0059	0.0040	0.0064	0.0042	0.0071	0.0047
Birmingham	0.0069	0.0159	0.0081	0.0200	0.0077	0.0187	0.0083	0.0202
Blackburn with Darwen	0.0067	0.0022	0.0070	0.0024	0.0069	0.0024	0.0075	0.0026
Blackpool	0.0071	0.0032	0.0073	0.0036	0.0073	0.0035	0.0084	0.0040
Bolton	0.0067	0.0048	0.0067	0.0053	0.0067	0.0051	0.0069	0.0053
Bournemouth	0.0074	0.0040	0.0071	0.0042	0.0072	0.0041	0.0077	0.0044
Bracknell Forest	0.0065	0.0016	0.0058	0.0015	0.0060	0.0015	0.0055	0.0014
Bradford	0.0063	0.0074	0.0068	0.0086	0.0067	0.0083	0.0069	0.0086
Brent	0.0058	0.0032	0.0070	0.0042	0.0067	0.0039	0.0065	0.0038
Brighton and Hove	0.0068	0.0041	0.0073	0.0047	0.0072	0.0045	0.0080	0.0050
Bristol, City of	0.0075	0.0070	0.0077	0.0077	0.0077	0.0075	0.0082	0.0081
Bromley	0.0074	0.0065	0.0057	0.0054	0.0062	0.0058	0.0068	0.0063
Buckinghamshire	0.0068	0.0099	0.0051	0.0080	0.0056	0.0086	0.0053	0.0081
Bury	0.0067	0.0034	0.0061	0.0033	0.0063	0.0034	0.0068	0.0036
Calderdale	0.0062	0.0035	0.0062	0.0037	0.0062	0.0036	0.0062	0.0037
Cambridgeshire	0.0068	0.0118	0.0057	0.0107	0.0060	0.0110	0.0054	0.0100
Camden	0.0051	0.0021	0.0075	0.0033	0.0068	0.0030	0.0065	0.0028
Central Bedfordshire	0.0066	0.0046	0.0054	0.0041	0.0058	0.0042	0.0055	0.0040
Cheshire East	0.0071	0.0087	0.0055	0.0073	0.0060	0.0078	0.0061	0.0079
Cheshire West and Chester	0.0070	0.0073	0.0060	0.0067	0.0063	0.0069	0.0063	0.0070
City of London	0.0055	0.0001	0.0060	0.0001	0.0059	0.0001	0.0068	0.0001
Cornwall	0.0070	0.0138	0.0059	0.0126	0.0062	0.0130	0.0061	0.0129
County Durham	0.0062	0.0098	0.0069	0.0117	0.0067	0.0111	0.0063	0.0104
Coventry	0.0075	0.0058	0.0071	0.0059	0.0072	0.0059	0.0079	0.0065
Croydon	0.0067	0.0051	0.0062	0.0050	0.0063	0.0050	0.0069	0.0055
Cumbria	0.0071	0.0124	0.0060	0.0114	0.0063	0.0117	0.0067	0.0125
Darlington	0.0062	0.0020	0.0062	0.0021	0.0062	0.0021	0.0063	0.0021
Derby	0.0071	0.0045	0.0068	0.0046	0.0068	0.0046	0.0072	0.0049
Derbyshire	0.0070	0.0171	0.0061	0.0162	0.0064	0.0165	0.0061	0.0159
Devon	0.0072	0.0208	0.0058	0.0181	0.0062	0.0189	0.0062	0.0188
Doncaster	0.0065	0.0056	0.0065	0.0061	0.0065	0.0060	0.0060	0.0055
Dorset	0.0073	0.0129	0.0055	0.0105	0.0060	0.0112	0.0057	0.0108
Dudley	0.0070	0.0069	0.0066	0.0070	0.0067	0.0070	0.0068	0.0071
Ealing	0.0065	0.0040	0.0070	0.0046	0.0069	0.0044	0.0074	0.0048
East Riding of Yorkshire	0.0065	0.0080	0.0052	0.0069	0.0056	0.0072	0.0051	0.0066
East Sussex	0.0072	0.0148	0.0060	0.0132	0.0063	0.0137	0.0066	0.0143
Enfield	0.0070	0.0046	0.0066	0.0046	0.0067	0.0046	0.0073	0.0051
Essex	0.0070	0.0309	0.0059	0.0281	0.0062	0.0289	0.0061	0.0286

Gateshead	0.0060	0.0036	0.0074	0.0048	0.0070	0.0044	0.0065	0.0041
Gloucestershire	0.0072	0.0137	0.0059	0.0121	0.0062	0.0126	0.0063	0.0128
Greenwich	0.0059	0.0026	0.0075	0.0035	0.0070	0.0033	0.0063	0.0030
Hackney	0.0042	0.0012	0.0095	0.0030	0.0080	0.0025	0.0069	0.0021
Halton	0.0064	0.0020	0.0067	0.0023	0.0066	0.0022	0.0068	0.0023
Hammersmith and Fulham	0.0049	0.0014	0.0077	0.0023	0.0069	0.0020	0.0065	0.0019
Hampshire	0.0068	0.0287	0.0052	0.0235	0.0057	0.0251	0.0054	0.0240
Haringey	0.0053	0.0020	0.0073	0.0030	0.0068	0.0027	0.0069	0.0028
Harrow	0.0072	0.0041	0.0062	0.0038	0.0065	0.0039	0.0066	0.0040
Hartlepool	0.0060	0.0016	0.0069	0.0020	0.0066	0.0018	0.0066	0.0019
Havering	0.0076	0.0054	0.0063	0.0048	0.0066	0.0050	0.0074	0.0056
Herefordshire, County of	0.0069	0.0046	0.0058	0.0041	0.0061	0.0043	0.0059	0.0041
Hertfordshire	0.0068	0.0202	0.0060	0.0192	0.0062	0.0195	0.0060	0.0190
Hillingdon	0.0070	0.0042	0.0062	0.0040	0.0064	0.0040	0.0069	0.0044
Hounslow	0.0060	0.0027	0.0066	0.0032	0.0065	0.0031	0.0063	0.0030
Isle of Wight	0.0072	0.0040	0.0059	0.0036	0.0063	0.0037	0.0067	0.0040
Isles of Scilly	0.0058	0.0001	0.0053	0.0001	0.0054	0.0001	0.0038	0.00004
Islington	0.0044	0.0013	0.0090	0.0030	0.0077	0.0025	0.0067	0.0022
Kensington and Chelsea	0.0049	0.0016	0.0066	0.0024	0.0061	0.0021	0.0059	0.0021
Kent	0.0068	0.0308	0.0058	0.0284	0.0061	0.0291	0.0060	0.0288
Kingston upon Hull, City of	0.0054	0.0032	0.0079	0.0051	0.0072	0.0046	0.0064	0.0041
Kingston upon Thames	0.0073	0.0025	0.0060	0.0023	0.0064	0.0023	0.0070	0.0026
Kirklees	0.0065	0.0072	0.0061	0.0072	0.0062	0.0072	0.0062	0.0072
Knowsley	0.0063	0.0024	0.0078	0.0033	0.0074	0.0030	0.0083	0.0034
Lambeth	0.0048	0.0019	0.0084	0.0035	0.0074	0.0030	0.0071	0.0029
Lancashire	0.0071	0.0256	0.0063	0.0244	0.0065	0.0248	0.0069	0.0265
Leeds	0.0063	0.0116	0.0065	0.0130	0.0064	0.0126	0.0062	0.0122
Leicester	0.0063	0.0039	0.0078	0.0052	0.0074	0.0048	0.0074	0.0049
Leicestershire	0.0072	0.0143	0.0056	0.0121	0.0061	0.0128	0.0060	0.0127
Lewisham	0.0057	0.0025	0.0077	0.0036	0.0071	0.0033	0.0071	0.0033
Lincolnshire	0.0066	0.0166	0.0057	0.0155	0.0059	0.0158	0.0054	0.0145
Liverpool	0.0061	0.0067	0.0081	0.0096	0.0075	0.0087	0.0081	0.0095
Luton	0.0066	0.0027	0.0063	0.0027	0.0064	0.0027	0.0068	0.0029
Manchester	0.0059	0.0047	0.0089	0.0075	0.0080	0.0067	0.0081	0.0068
Medway	0.0068	0.0043	0.0059	0.0041	0.0062	0.0042	0.0065	0.0044
Merton	0.0069	0.0027	0.0063	0.0026	0.0064	0.0026	0.0072	0.0029
Middlesbrough	0.0061	0.0021	0.0071	0.0026	0.0068	0.0025	0.0072	0.0026
Milton Keynes	0.0061	0.0029	0.0064	0.0033	0.0063	0.0032	0.0054	0.0028
Newcastle upon Tyne	0.0061	0.0040	0.0079	0.0056	0.0074	0.0051	0.0075	0.0052
Newham	0.0053	0.0018	0.0089	0.0033	0.0079	0.0029	0.0074	0.0027
Norfolk	0.0068	0.0217	0.0059	0.0203	0.0062	0.0207	0.0056	0.0190
North East Lincolnshire	0.0067	0.0032	0.0065	0.0034	0.0065	0.0033	0.0066	0.0034
North Lincolnshire	0.0065	0.0034	0.0061	0.0034	0.0062	0.0034	0.0058	0.0031
North Somerset	0.0073	0.0053	0.0058	0.0046	0.0062	0.0048	0.0064	0.0049
North Tyneside	0.0063	0.0038	0.0071	0.0046	0.0068	0.0044	0.0068	0.0044
North Yorkshire	0.0066	0.0141	0.0054	0.0124	0.0058	0.0129	0.0055	0.0123

Northamptonshire	0.0066	0.0122	0.0059	0.0118	0.0061	0.0119	0.0057	0.0111
Northumberland	0.0061	0.0066	0.0060	0.0071	0.0060	0.0069	0.0053	0.0061
Nottingham	0.0065	0.0038	0.0080	0.0051	0.0076	0.0047	0.0077	0.0048
Nottinghamshire	0.0070	0.0169	0.0060	0.0157	0.0062	0.0161	0.0062	0.0159
Oldham	0.0065	0.0036	0.0068	0.0041	0.0067	0.0040	0.0071	0.0042
Oxfordshire	0.0069	0.0122	0.0054	0.0105	0.0059	0.0110	0.0055	0.0104
Peterborough	0.0068	0.0029	0.0068	0.0031	0.0068	0.0030	0.0066	0.0030
Plymouth	0.0068	0.0048	0.0066	0.0051	0.0067	0.0050	0.0067	0.0050
Poole	0.0073	0.0037	0.0060	0.0033	0.0064	0.0035	0.0065	0.0036
Portsmouth	0.0070	0.0033	0.0071	0.0036	0.0071	0.0035	0.0075	0.0037
Reading	0.0068	0.0020	0.0065	0.0021	0.0066	0.0021	0.0070	0.0022
Redbridge	0.0076	0.0042	0.0069	0.0042	0.0071	0.0042	0.0077	0.0046
Redcar and Cleveland	0.0064	0.0029	0.0062	0.0030	0.0063	0.0030	0.0061	0.0029
Richmond upon Thames	0.0070	0.0030	0.0059	0.0028	0.0062	0.0028	0.0070	0.0032
Rochdale	0.0063	0.0033	0.0070	0.0040	0.0068	0.0038	0.0071	0.0039
Rotherham	0.0064	0.0048	0.0067	0.0055	0.0066	0.0053	0.0057	0.0046
Rutland	0.0065	0.0009	0.0049	0.0007	0.0053	0.0008	0.0044	0.0006
Salford	0.0063	0.0035	0.0077	0.0047	0.0073	0.0043	0.0073	0.0043
Sandwell	0.0067	0.0052	0.0085	0.0071	0.0079	0.0065	0.0078	0.0065
Sefton	0.0070	0.0068	0.0066	0.0069	0.0067	0.0068	0.0076	0.0078
Sheffield	0.0063	0.0091	0.0071	0.0110	0.0069	0.0105	0.0063	0.0097
Shropshire	0.0068	0.0074	0.0058	0.0068	0.0061	0.0070	0.0060	0.0069
Slough	0.0061	0.0013	0.0071	0.0016	0.0069	0.0015	0.0065	0.0015
Solihull	0.0074	0.0050	0.0060	0.0043	0.0064	0.0045	0.0067	0.0048
Somerset	0.0070	0.0135	0.0059	0.0121	0.0062	0.0125	0.0060	0.0123
South Gloucestershire	0.0072	0.0055	0.0056	0.0046	0.0060	0.0049	0.0061	0.0049
South Tyneside	0.0059	0.0027	0.0079	0.0039	0.0073	0.0035	0.0069	0.0033
Southampton	0.0065	0.0034	0.0072	0.0040	0.0070	0.0038	0.0069	0.0038
Southend-on-Sea	0.0075	0.0039	0.0068	0.0038	0.0070	0.0038	0.0074	0.0041
Southwark	0.0048	0.0018	0.0091	0.0037	0.0079	0.0031	0.0067	0.0027
St. Helens	0.0070	0.0038	0.0066	0.0039	0.0068	0.0038	0.0072	0.0041
Staffordshire	0.0069	0.0186	0.0058	0.0169	0.0061	0.0174	0.0060	0.0172
Stockport	0.0072	0.0063	0.0062	0.0058	0.0065	0.0060	0.0074	0.0068
Stockton-on-Tees	0.0063	0.0032	0.0061	0.0034	0.0062	0.0033	0.0061	0.0033
Stoke-on-Trent	0.0067	0.0044	0.0072	0.0051	0.0070	0.0049	0.0072	0.0050
Suffolk	0.0069	0.0173	0.0059	0.0160	0.0062	0.0164	0.0058	0.0154
Sunderland	0.0060	0.0048	0.0074	0.0064	0.0070	0.0059	0.0067	0.0056
Surrey	0.0072	0.0237	0.0053	0.0189	0.0058	0.0203	0.0059	0.0208
Sutton	0.0071	0.0033	0.0060	0.0030	0.0063	0.0031	0.0071	0.0035
Swindon	0.0067	0.0033	0.0061	0.0033	0.0063	0.0033	0.0060	0.0031
Tameside	0.0065	0.0038	0.0069	0.0044	0.0068	0.0042	0.0071	0.0044
Telford and Wrekin	0.0064	0.0027	0.0065	0.0029	0.0065	0.0029	0.0060	0.0027
Thurrock	0.0068	0.0023	0.0067	0.0025	0.0067	0.0024	0.0065	0.0024
Torbay	0.0074	0.0039	0.0068	0.0038	0.0069	0.0039	0.0073	0.0041
Tower Hamlets	0.0041	0.0011	0.0098	0.0028	0.0082	0.0023	0.0066	0.0018
Trafford	0.0072	0.0044	0.0063	0.0042	0.0066	0.0042	0.0071	0.0046

Wakefield	0.0062	0.0058	0.0064	0.0065	0.0064	0.0063	0.0054	0.0054
Walsall	0.0069	0.0053	0.0073	0.0060	0.0071	0.0058	0.0072	0.0059
Waltham Forest	0.0065	0.0028	0.0074	0.0034	0.0071	0.0032	0.0074	0.0034
Wandsworth	0.0057	0.0026	0.0074	0.0036	0.0069	0.0033	0.0072	0.0035
Warrington	0.0068	0.0038	0.0058	0.0035	0.0061	0.0036	0.0065	0.0038
Warwickshire	0.0069	0.0118	0.0057	0.0106	0.0061	0.0109	0.0059	0.0107
West Berkshire	0.0065	0.0027	0.0051	0.0023	0.0055	0.0024	0.0049	0.0021
West Sussex	0.0071	0.0203	0.0058	0.0177	0.0061	0.0185	0.0064	0.0195
Westminster	0.0049	0.0020	0.0074	0.0033	0.0067	0.0029	0.0062	0.0027
Wigan	0.0066	0.0059	0.0063	0.0060	0.0064	0.0060	0.0065	0.0061
Wiltshire	0.0068	0.0100	0.0056	0.0089	0.0059	0.0092	0.0055	0.0087
Windsor and Maidenhead	0.0068	0.0028	0.0053	0.0024	0.0057	0.0025	0.0054	0.0024
Wirral	0.0072	0.0074	0.0068	0.0076	0.0069	0.0075	0.0078	0.0085
Wokingham	0.0070	0.0029	0.0044	0.0020	0.0051	0.0022	0.0049	0.0021
Wolverhampton	0.0067	0.0045	0.0077	0.0056	0.0074	0.0053	0.0077	0.0055
Worcestershire	0.0071	0.0132	0.0058	0.0118	0.0062	0.0122	0.0060	0.0119
York	0.0072	0.0041	0.0058	0.0036	0.0062	0.0037	0.0067	0.0040

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