Slicing Up the Pie: Allocation of Central Government Funding of Care of Older People

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Abstract

The allocation of central government funds is a critical element in the equitable provision of local authority commissioned and provided services. A variety of approaches to allocating funding for social services for older people have been used over the years, most recently based on 'needs-based' formulae. In 2004, the Department of Health for England commissioned research to help inform the improvement and updating of the formula. The results of individual-level analyses were compared with the results obtained from analyses of small area (ward-level) data on service users. Both analyses were affected by problems of data availability, particularly the individual-level analysis, and the Department of Health and the (then) Office of the Deputy Prime Minister decided that the formula calculations should be based on the results of the small area analysis. However, despite the differences in approach, both methods produced very similar results. The correlation between the predicted relative needs weights for local authorities from the two models was 0.982. The paper discusses the strengths and weaknesses of each approach and developments that could allow a normative approach that would incorporate future policy objectives into formulae that, to date, have inevitably been based on historical data and service patterns.

Keywords: Local government finance, older people, social care, Relative Needs Formulae

Word Count: 9,327 (including appendix (349), acknowledgements (159) and references (1,425); excluding abstract, tables and figures)

Introduction

How resources are allocated to local authorities is of profound importance in providing at least the potential for an equitable system of delivery of social care. Much is made of the 'postcode lottery', by which what people get depends on where they live (Commission for Social Care Inspection 2008: 33). While much of this variation will reflect local policies, the availability of resources to meet local population needs is clearly fundamental.

Prior to Scottish and Welsh devolution, mainland Britain had two principal levels of government, central and local, and this remains the case for England. Most comparable nations have had at least three levels of government, including regional tiers. Local government in Britain has had a relatively wide range of responsibilities and has been responsible for functions that have been undertaken by higher levels of government elsewhere, but its financial powers have been weak (Newton 1980). Apart from the community charge, or poll tax, which was introduced in 1989 in Scotland and in 1990 in England and Wales, and abandoned in 1993, local taxes have been based on property values, and are politically unpopular and difficult to revise (Newton 1980).

Without central government grants, local authorities would have to rely on their own resources. In such a 'grantless society' (Newton 1980: 113), the local tax base and need for public services would have a critical effect. These factors are likely to be negatively related. Thus, increasing taxes or reducing services valued by the wealthier residents is likely to encourage such residents to leave the area, and be replaced by poorer people who cannot afford higher taxes, but do need public services. In contrast, an area with a good tax base could afford to reduce its tax rate or improve the services valued by the wealthier residents, thus attracting more such residents. In the grantless society, typified approximately by the United States, local authorities would be forced to adopt policies to attract the rich and discourage the poor, creating intense economic competition between authorities (Newton 1980).

Central government grants enable local authorities to provide the services that they are required to deliver. Although a number of responsibilities have been removed from local government in recent years (Orton and Davies 2009), grant income currently forms about 60 per cent of local authority income in England (Department for Communities and Local Government 2009). How this funding is allocated has the potential to support the redistributive system of the welfare state and achieve a degree of 'territorial justice' (Newton 1980: 105), whereby central government resources are distributed 'to each area according to the needs of the population of that area' (Davies 1968: 16).

There is little argument that the system should be equitable, but what this actually means and how best to put this into practice has been the subject of debate since the 1800s. In order to achieve geographical or spatial equity, there needs to be a balance of taxes and spending to ensure approximate geographical neutrality of fiscal treatment (Buchanan 1950). Boyne *et al.* (2001) identify three criteria of spatial equity: need, rights and effort. Since these cannot all be satisfied at the

same time, policy makers have to decide between patterns of spatial equity (Boyne *et al.* 2001). Social policy remains focused on social welfare, and ignores the role of fiscal and occupational welfare in providing more resources to those on higher incomes (Orton and Davies 2009). Thus, the allocation of resources according to need meets one criterion of social justice, but fails to take account of other criteria. Furthermore, if the distribution of services is completely determined by centrally defined indicators of local need, local authorities have no local autonomy (Judge 1978; O'Higgins 1987; Boyne and Powell 1991; Boyne *et al.* 2001; Powell and Boyne 2001). However, if territorial equity is defined in terms of potential, rather than actual outcomes, central government can achieve territorial equity through the payment of equalization grants, and local government can determine standards of provision, thus maintaining local autonomy (Heald 1983). In this case, interpersonal equity will be inconsistent with territorial equity.

A number of methods can be used for the allocation of central government grants, including political patronage, historical precedent, according to bids submitted by local authorities, and according to local expenditure (Smith 2007). A combination of each of these has been used in the past, but the development of rules in the form of mathematical formulae is becoming the favoured approach (Smith 2007). Such 'formula funding' involves the specification of the rules in advance, and is motivated by the desire to place a limit on aggregate expenditure, to share the limited expenditure in an optimal manner, to indicate the objectives of the funder, and to provide appropriate incentives (Smith 2007).

The distribution of central government grants to local authorities includes a mixture of specific grants for certain services and general grants. The assessments of spending need are calculated for individual services, which are either retained in specific grants or combined into general grants. Although local government is not restricted in its spending of general grants, central government requires local authorities to achieve certain standards of service and uses specific grants to fund services that are a national priority. Thus, in 2006/7 the specific Dedicated Schools Grant was introduced (Office of the Deputy Prime Minister 2006a) and the general grant reduced accordingly. However, the grant mechanism provides an overall allocation of funds and even specific grants cannot be expected to target individual elements of a local authority service. Variations between local authorities in the allocation of resources (the 'postcode lottery') need to be addressed by other mechanisms, but an overall allocation of resources according to clear principles, even if mathematically complex, is a necessary starting-point for providing local services.

This paper briefly reviews the history of central government funding allocation, before describing a unique study which allowed the direct comparison of alternative approaches to estimating the current Relative Needs Formula (RNF) for allocating expenditure for personal social services for older people in England. We then discuss the implications of the findings and aspirations for future approaches to allocating resources.

The Basis for Allocation of Funding

Central government has provided a recognizable system of grants to local authorities to support expenditure relating to national purposes since 1835 (Cmnd 6453 1976). The first grant was introduced to support the administration of justice, but a complex system of grants developed over the next century, supporting all major local government services (Foster *et al*. 1980). The first grants were percentage grants, distributed as a specific proportion of the local authority's expenditure on specific services (Chester 1951; Foster *et al*. 1980). Percentage grants were the main type of grant for the next 50 years, although the education grant was a unit grant, distributed according to units of service (Chester 1951).

In 1888, the specific grants, except the education grant, were replaced by the assigned revenue system, based on the proceeds of taxes levied by Parliament (Chester 1951). However, this system slowly broke down, and there was a slow reversal to percentage grants (Foster *et al*. 1980). Although there had been attempts to modify the system to reflect local needs and resources, in particular by Lord Balfour in a Minority Report to the 1901 Royal Commission on Local Government, it was the 1929 Local Government Act that introduced a formula to distribute grant according to local needs and resources. This was a 'block grant', designed to provide income for local authorities to use at their discretion, rather than for the funding of particular services, and which took account of needs and resources (Chester 1951). However, the grant only represented a small proportion of central government grants, and, despite being available for local authorities to use at their discretion, it was introduced to give the Treasury more control over local government spending than it had with percentage grants (Foster *et al*. 1980).

Following the Second World War, the 1948 Local Government Act introduced a system to compensate local authorities with low rateable values (Foster *et al*. 1980), on which local property taxes (the rates) were based, and in 1958 a needs element based on a formula was introduced, absorbing a number of grants for specific services into a general grant (Cmnd 209 1957).

The 1966 Local Government Act introduced a revised system of rate support grants (RSGs), which included an extended needs element, a resources element and a domestic element, designed to reduce the rate burden for householders (Ministry of Housing and Local Government 1966). As in 1958, the new grants replaced some specific grants, but certain services, most importantly the police, were still funded by specific grants. The system compensated local authorities for differences in their relative spending needs and in their taxable resources, in order to put local residents on a comparable footing wherever they lived (Cmnd 6813 1977). Since 1966, the system has been modified on several occasions, notably in 1981, when a new block grant system combined the needs and resources elements (Department of the Environment and Department of Transport 1980), but the general principle of compensating local authorities according to local circumstances has been maintained. A similar principle was adopted for the allocation of National Health Service funds (Department of Health and Social Security 1976).

The aim of block grants is to reflect the relative needs and costs to local authorities of providing services. Although the assessments of spending need are calculated for individual services, the grant is distributed as a general grant. The assessments of need are not normative (Department of the Environment and Department of Transport 1980) or intended to measure the actual amount needed to provide local services (Office of the Deputy Prime Minister 2006a), and involve judgements in the selection of formulae (Cmnd 6453 1976; Cmnd 6813 1977). Although local government is not restricted in its spending of general grants, central government requires local authorities to achieve certain standards of service, and distributes specific grants to fund services that are a national priority. Furthermore, when government policy is to control local authority spending, centrally-determined formulae can force local authorities to conform to the level of spending indicated (Powell and Boyne 2001).

The main aim of a formula-based approach is to account for multiple local factors that drive the need for services, but which are, to a reasonable degree, beyond the control of local councils (Smith 2007). It aims to ensure that councils have the financial means to provide the same level of support to eligible users of services. There are broadly two ways in which this equality can be assessed. The allocation formula can aim to provide councils with the resources to provide services for a given configuration of local needs, or it can aim to provide sufficient resources to achieve either the same outcomes for service users in each locality, or the same potential to achieve outcomes (Heald 1983; Glennerster *et al*. 2000). Since achievable outcomes are affected by needs, the amount of money required to achieve a unit of outcome (or capacity to achieve outcomes) would still have to be calculated. To date, formula methods have not taken the last step. The basis for equivalence has been the ability to provide services, not achieve outcomes.

Whether they use service or outcome metrics, these approaches are based on relationships between spending and performance as measured from current social care practice. The formulae are used to allocate a given total national budget between the 150 (until March 2009) councils. This implicitly assumes that current practice is appropriate. *Normative* approaches, instead, would involve resources being deployed according to criteria about the 'right' goals for the system. Such criteria can then justify adjustments being made to the observed relationships between spending and outcomes, which in turn would change the nature of the allocation of resources between councils. In effect, the process would give councils the resources needed to achieve the outcomes they *ought to be achieving* according to these normative criteria. This approach, which is not currently used in social care, therefore introduces a further step compared with current practice-based formula systems.

Formula-based approaches developed from previous approaches where allocations were based on past spending patterns. In particular, the procedure introduced for distributing Rate Support Grant in 1974 employed a statistical formula for the needs element for the first time (Cmnd 4741 1971). The formula was based on a regression analysis of the existing pattern of expenditure on services by local authorities. However, this resulted in high-spending authorities being rewarded and lower-spending authorities being penalized (Cmnd 6453

1976; Cmnd 6813 1977). Furthermore, the factors included changed from year to year, resulting in large changes to grant allocations, and a system of damping was employed in which the formula was based in part on the formulae for earlier years (Foster *et al*. 1980).

The principle of basing the allocation on need, taking into account both demand and supply factors, but independent of what local authorities actually chose to provide, was established by the Layfield Inquiry in 1976 (Cmnd 6453 1976). Bebbington and Davies (1980a) argued that, ideally, this need judgement should be a normative, cost-benefit, approach that was service user rather than service-oriented. However, this was not possible with available data, with the most important gap relating to expected benefits from packages of services. They proposed an approach for estimating a needs-based formula for older people's services that broke the link between the need indicator of the RSG formula and the pattern of variations between local authorities in spending. The starting-point involved allocating funds in proportion to the number of older people in the area, adjusted by (i) levels of need and (ii) the differing financial eligibility of people between councils.

In 1981/2, a new system of Grant Related Expenditure Assessments (GREs) was introduced, which assessed the costs of providing a 'typical standard of service' (Department of the Environment 1980: 2). For services for older people, categories of need and associated plans for the allocation of services were generated from definitions developed by social work researchers. Prediction equations for the membership of the need categories were then estimated from survey data (Bebbington and Davies 1980b). The equations were then applied to national data to make 'synthetic' estimates for the country as a whole. The allocation plans were constructed so that, given standard unit costs for each service, the overall allocation would be consistent with national expenditure on the service.

Since its introduction, the needs-based approach has been reviewed and refined on several occasions. The system of GREs involved calculating a separate formula for each component service, and by 1989/90 there were 63 separate components. Many of the components accounted for a small proportion of the overall allocation, and the system was criticized for being complex and difficult to understand (Department of the Environment 1990). A new system of Standard Spending Assessments (SSAs) was introduced in 1990/1, which reduced services to seven major blocks: education, personal social services, police, fire and civil defence, highway maintenance, all other services, and capital financing. For services for older people, the SSA formulae were based on two categories, reflecting higher levels of dependency among residents in residential care and lower levels among recipients of domiciliary care, in a similar way to the previous GRE calculations. In 2001, the government announced that that it would replace the system of SSAs with new grant formulae in 2003/4 (Cm 5327 2001). The new system of Formula Spending Shares (FSS) retained the seven major service blocks, with some modifications to the components. This, in turn, was replaced in 2006/7 by Relative Needs Formulae (RNFs), which were expressed as proportions of the total relative needs for all authorities, rather than as amounts of funds (Office of the Deputy Prime Minister 2006a, 2006b).

Government policy has emphasized the importance of helping people stay in their own homes for as long as possible (Cm 4169 1998; Cm 6737 2006), and home care services have focused on increasing the number and intensity of home care visits (Department of Health 2004). Concerns that the distinction between care homes and domiciliary services had become increasingly blurred led to the introduction of a single formula (Bebbington 2002). The present RNF formula for older people covers provision for people aged 65 and over in care homes, day care, home care and home help services, and meals, together with the associated social work and administration costs.

The combination of the complexity of the task of estimating an equitable basis for allocation of funds and the need for transparency has plagued the process since its inception. In 2001 the government, recognizing that the formulae were likely to remain relatively complex, involving multiplicative as well as additive factors, proposed that their presentation should be simplified and follow a consistent format, of the form: basic allocation + deprivation top-up + pay-cost top-up + other top-ups (Office of the Deputy Prime Minister 2002). This method of presentation has been retained in the current RNF system.

Estimating Funding Formulae

Two approaches have been used for the assessment of needs for services that underpin the formulae. For personal social services for older people and children, a number of studies have employed *individual-level* data drawn from surveys of service recipients to identify factors associated with need, and which could be measured routinely, combined with secondary data about a sample of the general population from sources such as the General Household Survey (GHS) (Bebbington *et al*. 1980, 1983, 1996; Bebbington and Miles 1988; Bebbington 2002).

Individual-level analyses examine how the needs characteristics of the person affect their likelihood of being a care recipient and, for care recipients, how their needs affect the extent/costs of their care package. The results are applied to national data, such as census data, to calculate the expected – essentially the average – service expenditure per person in all council areas. In this approach, expenditure and needs data are linked at the individual level. This generally involves the collection of sample survey data to gather the necessary information on service recipients, since secondary data sources either do not include all the information required, for example on people receiving residential services, or are unlikely to reflect current patterns of service receipt.

An alternative approach, which is well established as a method for allocating resources across the NHS in England (Carr-Hill *et al*. 1994; Sheldon *et al*. 1994; Smith *et al*. 1994; Gravelle *et al*. 2003), and has been used for examining the determinants of expenditure on children's social services (Carr-Hill *et al*. 1999), is *small area analysis*. This involves the analysis of data collected at the local level, for example ward-level data, for routine, administrative purposes. Its application to adult social care, however, has been limited (but see Carr-Hill *et al*. 1999, and Glasby 2003). With small area analysis, expenditure is linked with needs (and

other) data by geographical correspondence, i.e., relating to the same small area. As long as existing datasets can be matched to the small area definition, these can be used instead of a bespoke survey.

Small area analysis takes the average per capita expenditure for a small area, for example an electoral ward, and estimates how the average value of the needs factors across the small area impact on this average expenditure. Thus, individuals are assumed to have the average characteristics of all people in that ward. The 'smaller' the small area, the nearer the analysis is to the individual-level approach, reducing to equivalence if the small area contains only one person.

The use of small area data is methodologically superior to working with large administrative area data, despite the attractions of the latter in being able to use routinely-available data, since it can mitigate the 'ecological fallacy' that may arise by using data at the local authority level (Carr-Hill *et al*. 1999; Smith 2007). This arises when relationships differ according to the level of analysis, due to the influence of other unknown or unmeasured factors working at the wider area (Blalock 1964: 99). For example, the provision of services depends on the political control of a local council, which, in turn is correlated with the level of need of people in the authority. Analysis at the local authority level would then under-estimate the impact of need on service use since low-service conservative authorities also have lower average need.

Small area analysis has been used in the health field to examine differential health care utilization rates, health status, and expenditure per capita, standardized for local circumstances, particularly local need factors. The empirical evidence has consistently shown that differences across areas (for example, in utilization) may result from variations in demand (for example, morbidity or expectations), variations in supply (for example, availability of facilities and physician judgement), and also statistical artefacts (for example, data errors or random variation) (Blundell and Windmeijer 2000; Oliveira 2002; Gravelle *et al*. 2003).

Study Design and Data

In 2004, the Department of Health commissioned both an individual-level and small area analysis to produce options for a (relative) need component in an improved and updated formula for allocating central government funding to councils in England with social service responsibilities (CSSRs). This provided a unique opportunity to compare the results of the two approaches.

Analysis Methods

Individual-level Analysis

The individual-level analyses drew on data from two specially-conducted surveys of care home admissions and home care service users, and data about service users and non-service users from the most recent sweep of the GHS (2001-2). Taken together, the data were weighted to reflect national proportions of people by

service type and benefit use (see Darton *et al*. 2006 for a full description of the study design and methodology).

The survey of admissions to care homes was planned to replicate a previous survey (Bebbington *et al*. 1996). A stratified sample of local authorities was drawn based on the proportion of non-white individuals among the population aged 75 and over, the type of authority and geographical distribution. Sixteen local authorities were recruited: six London boroughs, four metropolitan districts, four counties and two unitary authorities.

Using information provided by the local authorities and national statistics (NHS Health and Social Care Information Centre 2005), an estimated 2,613 admissions occurred in these authorities during the fieldwork period. Consent was obtained for 1,029 individuals, and data received for just 820 people aged 65 or over, representing 31 per cent of the estimated number of admissions. Financial information was obtained for 694 of these admissions.

The home care study was conducted in 13 of the authorities, following the withdrawal of two counties and one metropolitan district. Home care service users were stratified by the intensity of the service they received: non-intensive (up to 10 hours per week) and intensive (over 10 hours per week) (Department of Health 2004). Users of intensive home care were over-sampled, and the respondents re-weighted for the analysis. A sample of 1,391 individuals was approached, 45 per cent of whom refused, with levels of opting-out slightly higher for the intensive stratum, but not substantially so. Data were received for 384 people, representing 49 per cent of the issued sample and about 28 per cent of the sample selected. A proxy interview was conducted in 81 cases. Of the 384 individuals, 375 were 65 or over. In the light of the poor response to the survey, the data were augmented with the data available on service users in the GHS.

Small Area Analysis

The small area analysis was conducted at census ward level. There were 7,987 census wards in England in 2003. Activity data were available from 17 councils, totalling 775 wards, giving just under a 10 per cent sample. The councils included three counties, three metropolitan districts, five unitary authorities, three inner London and three outer London boroughs.

As part of a parallel study on the need component of the formulae for younger adults (Carr-Hill *et al*. 2006), service use data for older people were collected by downloading service records from councils. In total, 76,325 records were downloaded, indicating service use (home care, care homes etc.) and the address of the person. Ward-level totals of service use were obtained using these addresses. Data were only available on use, not on intensity of use.

As described above, ward characteristics act as a proxy for the characteristics of the individual. These were required for the time when service decisions were made – i.e. the 'pre-care' address. The pre-care address was not supplied for care home residents for 212 wards, and care home use was imputed for these wards

using data where pre-care addresses were available (see Darton *et al*. 2006 for details).

Explanatory Factors

Although service receipt will be influenced by a variety of personal circumstances, the explanatory factors included in the final formula are limited to those beyond local authority control, and which are available at a local authority level. The choice of these indicators was informed by previous analysis and the relevant literature. In addition, the availability of data that can act as indicators of the relevant concept (e.g. people's need, people's income, etc.), which are routinely available so that the formula can be applied consistently across authorities and year-on-year, is also a constraining factor.

The first set consisted of *financial benefits* data. The receipt of Attendance Allowance is a good indicator because it reflects local levels of care need, but is not means-tested. Eligibility for Attendance Allowance requires an application based on information that has significant parallels to that required for an assessment for social services. The receipt of Pension Credit is a direct indicator of low income and is therefore a good predictor of the use of means-tested local authority-funded social care (Department of Health 2003, 2005a). Areas with high levels of Pension Credit receipt are likely to be more deprived, generating more demand. Furthermore, this demand for services is more likely to be from people eligible for state-supported services.

A second set of indicators included *demographic factors* and, more particularly, age distributions. Age is a well-known determinant of service use. It may drive service use directly, but it is also a proxy indicator because it is highly correlated with disability-related long-term conditions. The older the population, the more demand would be expected.

A third set of factors included service users' *circumstances*, relating to family, housing and income. Tenure (broadly whether people are renters or owner-occupiers) is indicative of income and accommodation-related needs, although it is a poor indicator of the suitability of accommodation. People who rent are more likely to use council-funded social care.

Household composition – whether a person lives alone – is a pointer to the availability of informal/unpaid caring, especially by spouses or cohabitants (Pickard 2001). The social care system relies on informal carers and, where this is absent, public service demand is higher. As noted above, the formula approach aims to account for factors beyond the control of local authorities. However, using household composition in the model means accounting for current social care practice, i.e. heavy reliance on informal care. Thus it is not ideal, since effectively giving fewer funds to areas with high potential informal care supply reinforces the reliance on informal caring in those areas.

As discussed above, it is important to allow for the fact that service use will depend in part on levels of supply of services in the small area analysis. One way of

accounting for this effect is to examine supply prices. If these are high relative to the average, supply and, therefore, service use will be lower than average, given needs.

With the exception of the supply price indicator, both individual-level and small area analyses started with the same set of empirical indicators to make the adjustments in the formula. For need (mainly) the indicators were: age distribution, sex, marital status, ethnic group, household size, household composition, the relationship to the head of household/household reference person, limiting longstanding illness, and the receipt of Attendance Allowance (AA) or Disability Living Allowance (DLA). For wealth (mainly – these are also proxies for need) the indicators were: housing tenure, and the receipt of Pension Credit.

Analysis and Results

Individual-level Analysis

Specification

The aim of the analysis was to predict the level of service use. The measure of service use used as the predicted (dependent) variable was the gross weekly cost of the local authority-provided services. National average unit costs were used, based on the latest figures available at the time, the Department of Health PSS EX1 figures for 2003/4 (Department of Health 2005b). High cost community services packages were capped at the cost of nursing home care.

Table 1 describes the sample and presents descriptive statistics for unweighted and weighted versions of the predictors that were included in the equations for the individual-level analysis. Pension Credit replaced Income Support in 2003 and so was not available in the 2001-2 GHS. Pension Credit receipt was imputed for the GHS sample by applying the income rules for Pension Credit at 2001/2 benefit levels to the income recorded, and then weighted by relative actual uptake (see Darton *et al*. 2006 for details).

Estimation

For the econometric model, a two-step analysis identified: (i) the probability that a person with given characteristics will be a service user, either of home care or care in a home; (ii) the cost of those services, given that someone is a service user. A logistic model was used to predict the probability that someone is assessed for services, and an Ordinary Least Squares (OLS) model for the cost. Cost data often have a rightward skew, i.e. a relatively small number of very high-cost cases, so it is usual to consider a transformation of the costs of services to adjust for this, but, unusually, this was found to be unnecessary.

The results of the two-step model are shown in Table 2.[1] The predicted demand by each individual from the two-step model is the product of the two parts: the expected probability of being a service user, and the expected cost if that person was a service user. In theory, an overall allocation formula could be created as the product of the formulae from each step. However, this creates significant practical challenges, being too complex to be applied to the available counts from census and benefits data. Moreover, there is a preference to avoid non-linear formulae in the grant calculations.

In order to generate a 'linear approximation' of the two-step model, an OLS model was fitted for the entire sample, as shown in Table 3. The correlation of the predicted cost from equation 2 in Table 3 with the predictions from the two-step model was 0.85. This was reassuring: the best-fitting equation was giving a reasonably close approximation to the theoretical model. However, the explanatory power of the variables included in the equations for costs was limited ($R^2 = 0.17$ in each case), and Ramsey's RESET (regression specification error test) (Gujarati 1995) indicated that the equations were misspecified ($p < 0.005$).

Small Area Analysis

Specification

In the small area analysis service use was measured for each ward by totalling the number of people who were receiving each service, weighted by the gross weekly unit costs of that service using Department of Health PSS EX1 figures. The resulting total was divided by the ward population over 65.

The variables used in the estimation differed slightly from the individual-level model. These choices were pragmatic and driven by the specification that offered the best fit empirically. First, tenure was measured by the proportion of people renting rather than owning, although the two measures are almost equivalent since very few people neither rent nor own their accommodation. Second, the age effect indicator chosen was the proportion of the population over 90. Although the population over 85 was also highly significant, there was greater collinearity with other variables which were also measuring the effect of need. In only just over half of one per cent of wards were there no people over 90. Descriptive statistics for the sample are provided in Table 4.

There are two issues in taking supply prices into account. First, how are such prices defined? As noted above, we are interested in the *relative* prices not the absolute level of prices. The price variable was based on a service-weighted unit cost for each local authority, divided by the equivalent national service-weighted

[1] The analysis was undertaken using SPSS 13.0 (SPSS Inc. 2004).

unit cost. The Area Cost Adjustment was used to account for input cost differences between areas[2] (see Darton *et al*. 2006).

Clearly, local unit costs will be based on prices paid, which are also associated with local demand, so the second issue is to ensure that we just reflect the relative supply price. To this end, an instrumental variables approach was used which generated a predicted value of the price variable, derived from factors likely to be correlated with supply conditions but not with demand (for example, local wage rates, provider density, etc.) (Greene 1990).

Estimation

Multiple regression techniques were used to estimate coefficients for the independent variables. A range of regression models were estimated in order to explore the robustness of the results. Details of the estimation are given in the Appendix.

A formula for predicting service costs expressed in rates per capita was based on the model adjusted to allow for the supply price effect and match actual expenditure across the sample (model 1 in the Appendix).

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

Comparison of Approaches

Despite the differences in approach, both methods produced very similar results. The same overall set of indicators was used for both approaches, and although there are some small differences in final specification, the common variables had the same signs and the same high level of significance. The models have good face validity. Despite being limited to routinely available data, the results of the small area analysis did not suggest problems of omitted variables. However, the equations for costs in the individual analysis had limited explanatory power and failed the specification error test, suggesting that better equations could be obtained by including further predictive factors.

To investigate the correlation of results between two approaches, each equation was applied to the 2004/5 data for the 150 local authorities in England. Figure 1 (parts 1 and 2) shows the predicted relative needs weights for the small area and

[2] The Area Cost Adjustment is a relatively crude indicator that is estimated by central government and used to allow for the fact that prices in London and certain parts of the South East are higher than in the rest of England.

individual-level models for each local authority. Each series has been scaled so that the mean needs level equals unity, and the results have been sorted from lowest to highest for the small area series. It shows the very high degree of correlation between the results from the two formulae (the Pearson correlation is r = 0.982).

The series show almost identical results until the highest 10 or so cases (except for the Isles of Scilly, which was treated slightly differently, and is in any case an outlier). For the highest 10 or so cases (the right hand end of Figure 1, part 2) the individual-level model predicts lower values than for the small area model. Table 5 shows the distribution of the predicted values for each council. Again, the results were very similar. This similarity is also clear from the kernel density plots of the distribution for each of the two series (Figure 2).

Some of the few differences in the formulae were due to the availability of data. For example, in the small area analysis, the population aged over 90 was preferred to the population aged over 85 for computing the age variable for the rates model. The survey of admissions also indicated the increasing importance of this age group among admissions to care homes, but it was not possible to derive a corresponding variable for the GHS data, and so the effect of redefining the age groups to identify those aged over 90 could not be examined.

The use of similar variables in both approaches would lead us to expect high correlation. Nonetheless, the important finding here is that given the same set of data – albeit in a different form – the coefficient estimates, and therefore the implied allocation formula parameters, would lead to a very similar allocation of resources.

Discussion

Historically, a variety of approaches to the allocation of resources to local authorities have been suggested and adopted, both in terms of general principles and ways of putting the principles into practice. Currently, a needs-based formula approach is used, and much of the policy debate has focused on whether a small area or individual-level analysis should be used to generate the formula.

Each approach has strengths and weaknesses. A primary methodological strength of individual-level analysis is that service use and needs characteristics relate to the same person, whereas in small area analysis they are associated by geographical correspondence. Even in areas that are ‘small’ there is some, albeit modest, chance of area-level effects influencing the relationship between service use and needs. A potential methodological weakness of individual-level analyses is the requirement to infer, from a sample of individuals, a formula to apply at an area level. This problem is avoided if the sample is representative and if the aggregation and weighting procedures are sound. Potentially, small area approaches are better placed to take account of legitimate (i.e. external) area-level influences such as levels of supply, especially of independent sector providers.

Small area analysis does well on practical grounds. The collection of individual-level data is more costly, and sensitive to low response rate problems, whereas small area analysis uses routine data, although the quality of such data can still vary between councils.

An important requirement for both approaches is access to substantial amounts of good data, and both analyses were affected by problems of data availability. For the individual-level analysis, the responses to the two surveys were much lower than had been achieved in previous studies. Small sample sizes mean lower levels of precision and wider error margins. There are also questions about the representativeness of the achieved samples. Weighting the sample can help, but weighting can only be based on a limited number of factors. The average age and level of dependency of residents admitted to care homes was greater than in 1995, suggesting that the achieved sample was likely to be fairly representative of the individuals admitted to care homes in 2005. However, the home care survey may have been more likely to have under-represented individuals with greater care needs. The equations for costs had limited explanatory power and failed the specification error test. This suggests that, without the restrictions placed on the eligible predictive factors by the RNF approach, better equations could have been obtained, as in earlier studies (e.g. Darton and Knapp 1984).

Regarding the small area analysis, two related data issues arose. First, although in many respects a strength of small area analysis, the use of routine data meant that the modelling was limited to data which were routinely available *at the small area*. The aim was to create a formula to apply at council level using routine data, but some data were only available at the local authority level, and not at the small area (e.g. ward) level. Second, where this lack of availability concerns critical data, a bespoke collection can be made, but this too can suffer from problems of low survey response. Ideally, the study would have had downloads from all 150 councils but, in the end, and despite heroic attempts to convince councils, only 17 made data available. Using a sample is not a problem *per se* as long as the sample is representative (at ward level). In this case, there are no reasons to suppose this sample was biased, but a larger sample would have been better.

Despite the theoretical differences, data problems in each, and the data sets being constructed in different ways, the two methods produced very similar results. In particular, the relative needs weights for each council were almost identical, adding to the confidence one might have in statistical approaches to estimating needs formulae. In the event, the Department of Health and the (then) Office of the Deputy Prime Minister decided that the formula calculations should be based on the results of the small area analysis.

Practical issues of data availability are inherent in using a statistical formula-based approach. There is also a limitation in only being able to base the formulae on factors that are measured and updated routinely. However, any approach (statistical or otherwise) that recognizes the importance and relevance of needs and cost factors in the allocation of resources must be so limited.

A potentially more significant problem with the approach is that it is inherently *backward looking*. Future deployment of resources is guided by a formula based on current practice, i.e. current care planning, and the current configuration and types of services. There is no reason to believe that these current patterns are the right patterns, given reasonable efficiency and equity criteria (Wanless 2006). For example, is the balance between residential and home-based care appropriate? Is the use of direct payments, personal budgets, extra care housing, equipment, and so on at levels aspired to for the future?

An alternative, *normative*, approach uses a set of efficiency and equity principles to guide the deployment of resources, based on the estimated relationships between the costs and benefits of different services. For example, a cost-effectiveness rule might require that services are deployed only to the point where the extra cost of providing additional support is no more than society's willingness to pay (i.e. extra value) for those services (Wanless 2006; Netten and Forder 2007). The relative cost-effectiveness of care services needs to be established in (well-designed) studies that are usually based on individual-level surveys of service use, although small area approaches can be used. Cost-effectiveness also differs according to the needs of people using services, and the application of a cost-effectiveness rule will differ according to the financial circumstances of potential recipients. Thus the allocation of resources between local areas will still need to be adjusted according to relative need; it is still a formula-based approach in this respect. But, the major strength of the normative approach is that, given relative need, the amount of support is based on agreed criteria, not historical practice.

The individual-level work collected outcomes metrics which could be used for this purpose. The Wanless Social Care Review made preliminary calculations of cost-effectiveness for home care services in order to comment on the appropriateness of national resourcing levels for social care. This work could be built upon to develop a normative allocation system for deploying resources to local authorities.

There are significant practical and conceptual problems, however. First, the principles on which resources are deployed (e.g. cost-effectiveness and equity rules) need to be agreed and specified in a way that can be used in practice. Second, this approach is hugely demanding of data and evidence, and cannot be undertaken comprehensively at a council level at present. As such, statistical formula-based approaches still have an important role to play. The grant mechanism provides an overall allocation of funds and even specific grants cannot be expected to target individual elements of a local authority service. Variations between local authorities in the allocation of resources (the 'postcode lottery') need to be addressed by other mechanisms, but an overall allocation of resources according to clear principles, even if mathematically complex, is a necessary starting-point for providing local services. But perhaps the results should be modified as far as possible by normative principles to reflect forward-looking service objectives.

Conclusion

Despite the theoretical differences, data problems in each case, and the data sets being constructed in different ways, the individual-level and the small area level analyses produced very similar results in terms of the relative needs weights for local authorities. Developments incorporating normative principles have the potential to allocate resources according to agreed criteria, not historical practice, but these will need at least as much negotiation as the present system and will be hugely demanding of data and evidence. An overall allocation of resources according to clear principles, even if mathematically complex, will continue to be necessary, even if it forms part of a more forward-looking approach to allocating resources.

Appendix

A multi-level (random effects) approach was used in the small area estimations.[3] This recognizes that groups of wards in different council areas could differ in a systematic way, as a result, for example, of council-wide policies regarding the use of social care services. An 'instrumental variables' approach was used to allow for the inclusion of an endogenous 'price' variable.

Instrumental variable models are known to be sensitive to the choice of excluded instruments. To examine this, two versions of the Generalized Least Squares (GLS) random effects model with instrumental variables were estimated, the alternate model (model 2) having a slightly different specification of the excluded instruments to the main model (model 1). To explore specification issues and to gauge robustness of the small area estimations, a two-stage least squares (2SLS) model with fixed area effects was also estimated (model 3). The results showed that the instrumental variables used in the analysis were well specified and sufficiently 'strong'. Finally, an ordinary least squares (OLS) model was estimated with fixed effects dummy variables, and where the price variable was replaced with its predicted value using the instruments, i.e. from the first stage of the 2SLS model (model 4). In contrast to the individual-level analysis, Ramsey's RESET test did not indicate omitted variable bias in the OLS analysis. Although there are no specific omitted variable tests for the GLS models, the inclusion of squared and cubed values of the predicted cost from the base model – which is the RESET test methodology – showed no significant additional explanatory power. This is a strong indication of a good specification, i.e. no omitted variables. Table 6 reports the four sets of estimation results.[4] The results were very similar; in fact, the correlation between the predicted values of the main model (model 1) and each of the other three models was over 99 per cent. The impact of the endogenous variable, price, was somewhat sensitive to the choice of instruments, as anticipated. However, the consequences for the parameter estimates for the other variables, and for the overall predicted effects for the different models, were very minor.

[3] The estimations were undertaken using Stata 8 (StataCorp 2003).

[4] As well as the rates per capita model, an alternative was estimated with totals per ward. This produced very similar results.

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Figure 1: Exemplifications of relative needs formulae (part 1)

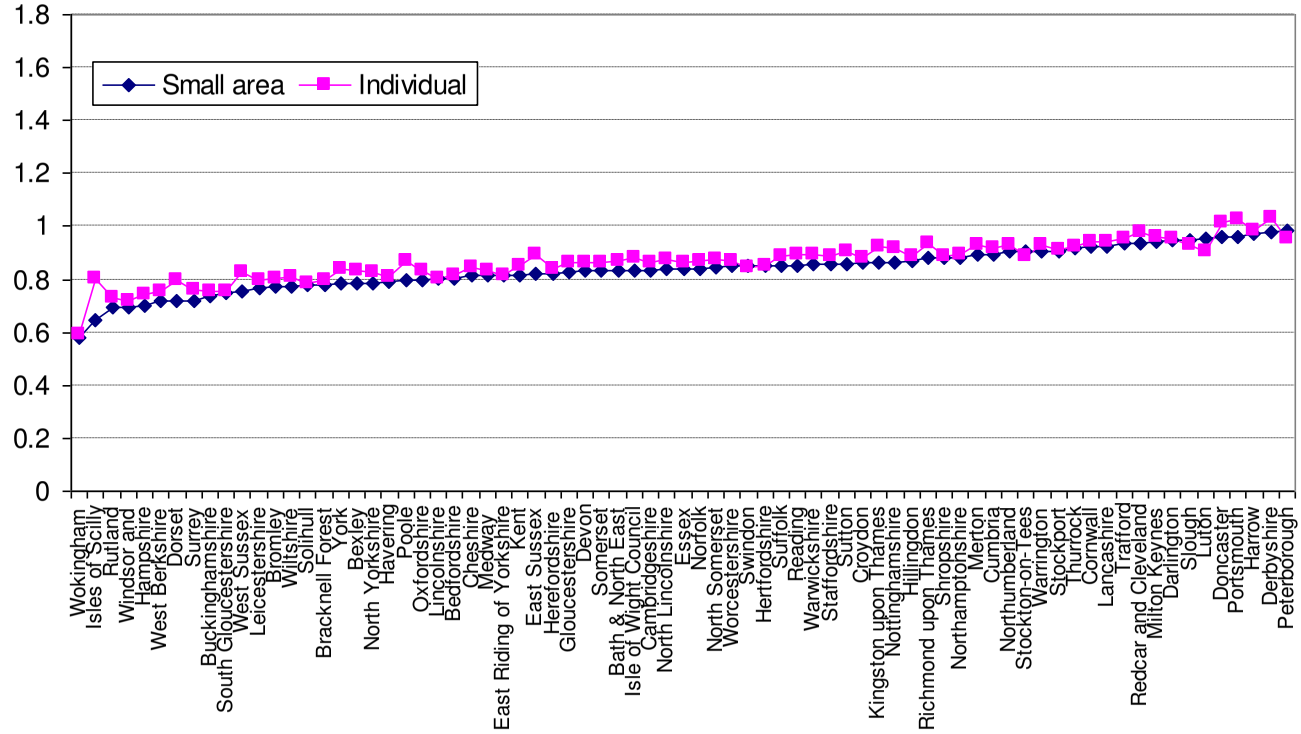


Figure 1: Exemplifications of relative needs formulae (part 2)

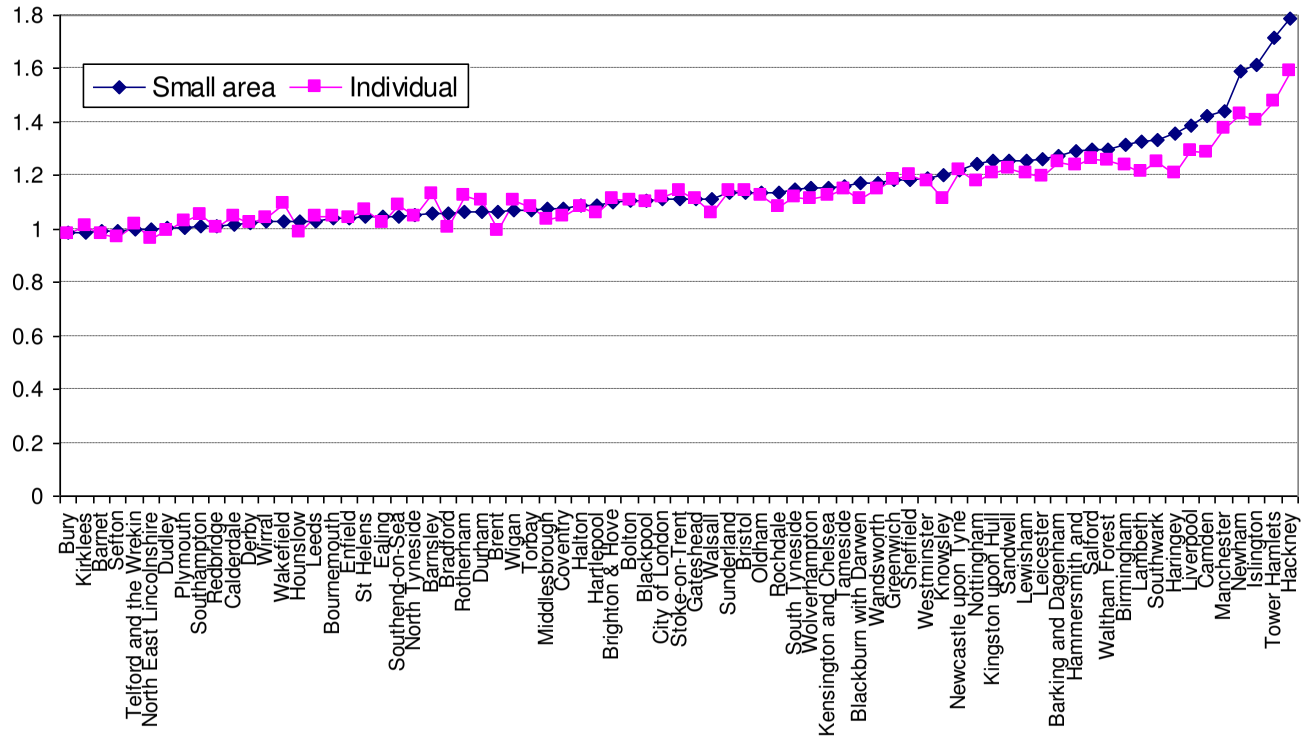
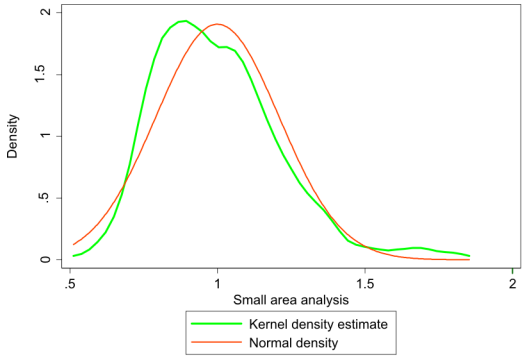


Figure 2: Kernel density plots for exemplifications



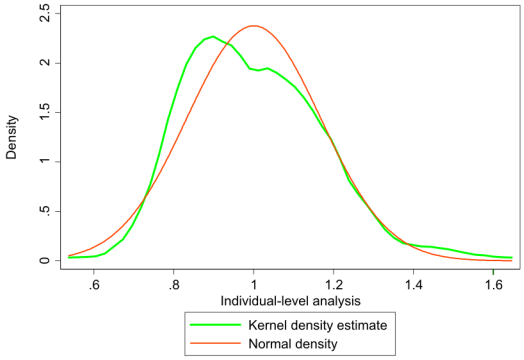


Table 1: Descriptive statistics for independent variables for individual-level analysis (3748 cases with complete data)

Variable	Unweighted				Weighted
	Non-service users (%)	Home care[a] (%)	Care home admissions (%)	All cases (%)	All cases (%)
Age 65–74	57.9	20.9	9.8	49.7	55.8
Age 75–79	21.6	17.8	12.0	20.3	20.2
Age 80–84	13.5	26.6	25.1	15.9	14.2
Age 85+	7.0	34.7	53.0	14.1	9.8
Living alone	36.6	64.4	74.3	42.9	36.4
Married/living as married	57.0	22.9	15.0	49.7	56.8
Single living with others	6.5	12.7	10.7	7.5	6.9
Renting (LA or private)	27.7	52.3	72.1	34.4	27.7
Limiting longstanding illness	38.3	82.5	94.8	48.0	45.4
Pension Credit	39.0	50.6	46.0	43.7	23.3
Attendance Allowance/DLA	10.2	74.6	54.4	20.6	22.7
No. cases	3028	354	366	3748	3748

Note:
[a] Home care service users include individuals from 2001-02 GHS and 2004 survey.

Table 2: Two-part model for predicting cost of CSSR-funded services from individual-level data

Variable	Proportion of weighted combined sample in category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	56	0.000	ref	1.00	0.00	ref
75–79	20	0.656	**	1.93	1.67	ns
80–84	14	1.372	**	3.94	21.95	ns
85+	10	2.127	**	8.39	52.90	*
Household composition						
Living alone	36	0.732	**	2.08	-5.61	ns
Married/living as	57	0.000	ref	1.00	0.00	ref
Single living with others	7	0.303	ns	1.35	-10.31	ns
Renting (LA or private)	28	0.352	*	1.42	11.89	ns
Lt. longstanding illness	45	1.488	**	4.43	96.75	**
Benefits recipient						
Pension Credit	23	0.774	**	2.17	56.78	**
AA/DLA	23	1.180	**	3.26	-90.71	**
Constant		-5.753	**	na	112.29	**
No. cases (unweighted)		3748			706	
R^2		0.40			0.17	

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

Table 3: Linear approximation for predicting cost of services from individual-level data

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

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

Table 4: Descriptive statistics for small area analysis

Variable	Cases	Mean	Std Dev.	Min.	Max.
Rates					
Price	775	0.972	0.092	0.691	1.295
AAclaim_p65	775	0.136	0.042	0.029	0.262
Rentingp65	775	0.301	0.178	0.016	0.880
One_persp65	775	0.344	0.077	0.146	0.694
PCclaim_p65	775	0.282	0.138	0.039	0.829
Pop90p65	775	0.040	0.018	0.000	0.138
Population					
Pop65	775	1020.835	618.821	41	3386
Costs					
Totncost_p65	775	12.381	5.593	(0)	33.042
Totncost_p65 (pre-care only)	565	11.283	4.918	1.273	28.569

Table 5: Comparing the distribution of predicted values from small area and individual-level analyses

Statistic	Small area	Individual-level
Min.	0.58	0.59
Max.	1.79	1.59
Mean	1.00	1.00
Std Dev.	0.21	0.17
Median	0.99	0.98
25% Quartile	0.84	0.87
75% Quartile	1.11	1.11
Range	1.21	1.00
Kurtosis	1.57	0.52
Skewness	1.00	0.62

Table 6: Estimation of expenditure per ward as a rate per head of population 65 plus from small area data

	Model 1 (main) GLS random-effects[b]		Model 2 GLS random-effects[c]		Model 3 2SLS (fixed effects)[c]		Model 4 OLS[c]	
Model coefficients and significance probabilities								
Variable	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
AAclaim_p65	21.08	<0.001	22.19	<0.001	24.61	<0.001	24.71	<0.001
Renting_p65	4.08	0.006	4.20	0.005	4.21	0.004	4.20	0.005
One_pers_p65	5.46	0.024	6.72	0.007	6.19	0.008	6.23	0.021
PCclaim_p65	16.39	<0.001	15.33	<0.001	15.93	<0.001	15.91	<0.001
Pop90_p65	72.98	<0.001	69.33	<0.001	69.53	<0.001	69.38	<0.001
Price[a]	-12.11	0.016	-27.68	<0.001	-24.83	<0.001	-25.28	<0.001[d]
Constant	10.52	0.034	25.55	0.001	22.53		22.95	
Diagnostic tests and model characteristics								
Rho[e]	0.28		0.33					
R^2	0.42		0.42		0.67		0.67	
Wald or F-test	589.12	<0.001	587.57	<0.001	76.08	<0.001	262.63	<0.001
Underidentification test[f]					461.11	<0.001		
Weak identification test[g]					275.80			
Crit vals (Stock-Yogo)								
5% max IV relative bias					16.85			
10% max IV size					24.58			
Overidentification test[h]					5.81	0.121		
Endogeneity test					7.73	0.005		
RESET omitted var test							1.06	0.366
Number of wards	775		775		775		775	
Number of groups	17		17		17		17	

Notes:
[a] Endogenous variable.
[b] Excluded instruments: Aca, Wage_avsq, Wage_md, Area, Areasq, Density.
[c] Excluded instruments: Aca, Wage_avsq, Wage_md, Area, Density.
[d] Assumes non-stochastic variable.
[e] Fraction of variance due to area effects (random effects error).
[f] Anderson canon. corr. LM statistic.
[g] Cragg-Donald Wald F statistic.
[h] Sargan statistic.