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Abstract

Recent years have seen substantial reductions in public spending on social care for older people in England. This has not only led to large falls in the number of people over the age of 65 receiving publicly funded social care, but also to growing concern about the potential knock-on effects on other public services, and in particular the National Health Service (NHS). In this paper, we exploit regional variation in the reductions in public funding for social care to examine the impact on Accident and Emergency (A&E) departments in NHS hospitals. We find that reductions in social care spending on people aged 65 and above have led to increased use of A&E services, both in terms of the average number of visits per resident and the number of unique patients visiting A&E each year. We estimate that the average cut to social care spending for the older population over the period (£375) led to an increase of 0.09 visits per resident, compared to a mean of 0.37 visits in 2009. The effects are most pronounced among people aged 85 and above. This has also led to a modest increase in the cost of providing A&E care, increasing A&E costs by an additional £3 per resident for each £100 cut in social care funding.

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1 Introduction

Spending on many public services has fallen substantially in England in recent years, following the implementation of a widespread austerity programme after the global financial crisis of the late 2000s. This includes spending on social care for the older population. Between 2009-10 and 2015-16, public spending on social care for individuals over the age of 65 in England fell by 21%. This has resulted in a large reduction in the number of people receiving care: between 2009-10 and 2013-14, the number of recipients fell by a quarter, and it is likely that this number has continued to fall since. There is now growing concern about the impact of the reductions in funding for social care on a broad range of outcomes, including potential secondary impacts on other public services, and in particular, the National Health Service (NHS).

In this paper, we examine how recent cuts to public funding for social care for people aged 65 and over have impacted the use of Accident and Emergency (A&E) services in NHS hospitals. This expands on previous work that has examined the impact of social care provision on delayed exits from hospitals (Fernandez and Forder, 2008; Gaughan et al., 2015; Gaughan et al, 2017), and develops further evidence on the interdependence of hospital and social care services.

We begin by documenting the variation in public funding for adult social care and the use of A&E across England between 2009-10 and 2015-16. Controlling for both fixed and time-varying characteristics of the local area, we compare how changes in local spending on social care for residents aged 65 years and above are related to changes in the use of A&E services by these residents. This includes the probability of attending A&E, the annual number of visits, and the cost of treatment. We also examine how these estimates vary across age groups.

One concern with this approach is that areas with greater growth in social care spending could also have a larger change in the need for A&E services over time. For example, areas with growing but unobservable (to the researcher) needs may choose to protect social care spending from funding cuts. Such a case would bias our estimates towards zero, or understate the effects of social care cuts on A&E departments. We address these concerns by implementing a so-called 'Instrumental Variables' approach. This makes use of a variable which is correlated with the level of social care spending in an area in a given year, but should otherwise be unrelated to use of A&E services. We follow an existing public finance literature that employs a 'Bartik' (Bartik, 1991) or shift-share approach (Nakamura and Steinsson, 2014; Wilson, 2012), by predicting local area spending on social care spending using historical spending patterns. We 'instrument' social care spending in the current year with predicted spending by assigning the same share of observed national spending in the current year that the area accounted for in 2000. Due to the structure of local government finances, relative spending across areas remains stable over time. As a result, predicted spending is strongly related to actual spending, but is plausibly unrelated to any local area decisions or trends in needs that might determine both social care spending and hospital use.

We find four main results. First, the cuts to social care spending since 2009-10 have substantially increased the use of A&E by individuals aged 65 and over. On average, per person spending on social care fell by £375 over a six year period. This led to an additional 0.09 visits per older individual in 2015-16 compared to 2009-10, or almost an additional visit for every ten residents aged 65 and over. This compares to an average 0.37 visits per person at the beginning

of the period.

Second, the increases in A&E attendance are driven both by an increase in the number of unique visitors to A&E in each year, and an increase in the annual number of visits per patient. A cut of £375 in social care spending is associated with an increase of 3.8% in the probability of an individual aged over 65 attending A&E, relative to a baseline of 23% in 2009.

Third, the increase in the use of A&E services has led to an increase in the cost of providing A&E care. While the impacts on A&E attendance are relatively large, the impacts on the cost of care are quite modest. A cut of £100 is associated with an increase in A&E costs per resident of around £3. However, these estimates do not take into account any wider impacts on the use of other NHS services and so overall cost impacts may be larger if increased use of other services is substantial.

Finally, the impacts of these cuts are more evident among the oldest individuals. The estimated impact on the number of A&E visits of a cut to social care spending on all individuals aged 65 and above is 1.6 times larger among individuals aged 85 and over than those aged between 65 and 74. The estimated impact on A&E costs is 2.2 times larger. This could be explained either by the fact that older individuals are more common users of social care than younger individuals (and so are more affected by reductions in funding) or because the effects of removing social care for these older individuals is more severe.

These results contribute to a growing body of evidence that hospital and social care services are linked. Cuts to social care appear to have led to relatively large increases in the use of A&E services among the older population, one particular area of the NHS which has recently exhibited signs of strain.[1] This suggests that policymakers should consider health and social care together when making important decisions about either system.

The rest of the paper is organised as follows. Section 2 briefly sets out the existing literature on spillovers between hospitals and social care in England. Section 3 explains how public health and social care are organised and financed in England. Section 4 describes the data. Section 5 explains our empirical strategy. Section 6 presents the results of the analysis, and Section 7 concludes and discusses the policy implications of these results.

2 Previous literature

Our work extends an existing literature that has examined the relationship between social care provision and the use of NHS hospitals. In general, this body of work finds that there is some overlap between the use of social care and health care, and that the availability of social care is an important determinant of the use of NHS services. However, the size of the estimated effects vary across studies.

Forder (2009) uses variation in the availability of care and use of hospitals at the local area level to examine whether long-term residential care and hospital care are substitutes. He finds that there are substantial spillovers between spending on long-term care and hospital care, and estimates that a reduction in long-term care spending of £1 led to an increase of £0.35 in hospital spending. Fernandez and Forder (2008) uses data from local authorities in 1998-99

[1] See, for example, https://www.theguardian.com/society/2018/apr/12/a-and-e-waiting-time-eternal-winter-nhs-hospitals

and 1999-2000 to examine how variation in social care resources across local authorities are related to delayed discharges and emergency readmissions to hospital. They also find evidence of substantial spillovers between different types of care, and find that the increased availability of social care resources, and in particular the supply of residential and nursing home beds, reduces delayed discharges and emergency readmission rates.

Gaughan et al. (2015) conduct an analysis at the local authority level in England to examine the relationship between the number of care home beds and delayed discharges from local hospitals. They find that there are modest effects of bed availability on delayed discharges, with an increase in care home beds of 10% associated with a reduction in social care related delayed discharges of between 6% and 9%. They also find significant spillovers between local authorities, with lower availability of beds in neighbouring local authorities associated with a higher number of delayed discharges.

Gaughan et al. (2017) examine the impact of local supply of long-term care beds on exits from hospitals for hip fracture and stroke patients in England. They examine how care differs across patients treated in the same hospital but living in different local authorities. They find that the average length of hospital stay is over 30% shorter for hip fracture patients in the 20% of areas with the largest supply of care home beds, but there is little evidence of 'bed blocking' for stroke patients.

Much of this work focuses on the impact of the supply of certain social care services on exits from hospital. We contribute to this literature by examining the impact of changes to overall public spending on social care on the use of A&E departments. We study a period of time when funding for social care was decreasing, and focus on a particular hospital service where use has increased considerably over time.

3 Institutional background

3.1 Adult social care in England

Adult social care includes a broad range of non-medical services that support individuals with physical or learning disabilities, or physical or mental illnesses that cause them to have difficulty with activities of daily living such as housework, washing, or general mobility. Care can be temporary or long-term. In 2014-15, 26% of the population aged 65 and over in England living outside of a care home received some form of social care (Crawford and Stoye, 2017).

Care can be provided either informally by family, friends and neighbours, or on a formal basis by trained professionals. In England, the vast majority of care is provided informally. However, formal care is still relatively common among the older population, and is often targeted towards individuals with more severe needs. In 2014-15, 9% of the non-institutionalised population aged 65 and above received some formal care.

Funding for care also comes from two sources: private financing or public funding. The majority of formal care received by individuals in 2014-15 was funded by the government (Laing-Buisson, 2017). Public funding is available for formal care for people with care needs above a certain threshold and limited financial means.

The majority of public care is organised and funded at the local level. This is the respon-

sibility of 152 local authorities (local governments). In 2015-16, local authorities in England spent £16.8 billion (2017-18 prices) on these services (Simpson, 2017).[2] In addition to social care services, local authorities are responsible for providing a number of other services.[3] Local authorities must therefore allocate funding across these services, and as a result, make some choices to prioritise certain services.

Social care spending varies considerably across different local authorities. This variation arises for three primary reasons: differences in the care needs of the local population, differences in the revenues of the local authority, and different choices made by local authorities over which local services to prioritise.

Differences in care needs lead to variation in spending levels across different local authorities, with areas with larger, older and sicker populations typically spending more on social care. Historically, differences in spending have been exacerbated by geographical differences in the eligibility criteria and means tests used to determine whether individuals can access public funding. This led to people with similar care needs receiving very different levels of support based on where they lived (Phillips and Simpson, 2017).

Following a government commission and subsequent reforms in 2014, the government introduced national minimum eligibility criteria, along with standardised processes for the assessment of care needs, in order to reduce this variation. However, local authorities still retain a degree of flexibility. They must satisfy the national minimum eligibility criteria, but are free to use a more generous financial means test should they wish to do so. They also have some control over the level of co-payments charged to care recipients, and the quality of care provided to those who are eligible. As a result, there remain significant differences in the level of net (accounting for fee income) spending on adult social care even between local authorities with similar local needs.

Public spending on social care also varies across local authorities due to differences in local revenues. Local authority revenues come from two primary sources: grants from central government and local taxation. Central government grants accounted for 59% of revenues in 2015-16. These are transfers from central government to local authorities, and can either be for general use or ring-fenced for specific purposes (e.g. to directly fund fire services).

Local tax revenues account for the remainder of local authority revenues. The majority of this revenue comes from council tax, a form of residential property tax, and taxes on business property. Areas with relatively small local tax bases are typically less able to raise their own revenue. Government grants were therefore traditionally allocated to both compensate for this, and some differences in local spending needs. However, a system of 'damping' arrangements set guaranteed minimum increases in funding and capped reduction in grants, meaning that the funding system was never fully needs-based.

Local authority revenues have fallen dramatically in recent years, following the implementation of a large-scale austerity programme by central government. Between 2009-10 and 2016-17,

[2]This figure includes transfers from the NHS to local authorities to pay for social care, and shared money as part of the Better Care Fund programme, which aims to pool health and social care budgets across health commissioners and local authorities.

[3]This includes housing, maintenance of local roads, waste collection and disposal, libraries and large areas of education.

real-terms local authority revenue from central government fell by 38% (Amin Smith et al., 2016). Given the reliance of local authorities on these grants, their spending power has been substantially decreased.

Cuts to grants were distributed equally across local authorities, meaning that the relative proportion of central funding distributed to each authority has remained unchanged over time. Local authorities have had some scope to increase local taxes to compensate for this: for example, areas have been allowed to introduce small increases (typically 1% or 2%) on council tax in the form of a 'social care precept'. However, statutory limits on council tax rates set by central government have limited the scale of these increases. The greater reliance of some areas on central government grants means that these areas have lost a greater share of revenue than other areas. In the face of these reductions in revenues, local authorities have been faced with decisions over which services they reduce spending on. This includes whether to protect social care spending at the expense of other local services.

As a result, cuts to social care spending vary geographically. Between 2009-10 and 2015-16, the median local authority reduced per capita spending on social care for older people by 31.4%. However, the 95th percentile of cuts was 48.4% and the 5th percentile only 6.9%. Figure 1 shows the geographic variation in cuts to real social care spending on individuals aged 65 and above over this period.

These differences in social care spending cuts reflect changing needs, reductions in revenue, and the choices made by local government. We will therefore need to carefully address the possibility that these choices are related to changing local needs that may also determine demand for A&E services when analysing the impact of social care spending on A&E use.

3.2 Public hospital care in England

The majority of health care in England is provided and funded by the government. Care is free at the point of use for all residents, and secondary (or acute) care is typically provided by large, publicly owned hospitals operated by the NHS. Hospitals are compensated by the government directly for providing care through a series of national tariffs.[4]

Emergency care is initially provided through Accident and Emergency departments attached to large hospitals. This care is not pre-planned, with patients arriving at hospital (either by ambulance or by other means) when required. Upon arrival, patients are triaged, and after undergoing basic treatment and preliminary investigations, will either be admitted to the hospital for further treatment or discharged home. Patients who are admitted for hospital will then be sent to a specialist ward (e.g. cardiology, urology etc) where they will often undergo a specific procedure or surgery.

3.3 Why might reductions in social care spending increase A&E use?

Reductions in the availability of social care could lead to the increased use of A&E services among the older population if the need for emergency care rises due to a lack of social care or

[4]Each treatment provided by hospitals is assigned to a Healthcare Resource Group (HRG), which groups procedures by the level of resources used. A set of national tariffs are then set for each HRG on an annual basis to determine transfers to hospitals.

poor quality social care. Social care may directly reduce the need for health care by reducing the incidence of certain events. For example, better care for diabetic patients could reduce diabetes-related hospitalisations by monitoring blood sugar, providing reminders to take medication and resulting in better nutrition. Quality social care may also prevent some falls and accidents among the older population.

The impact of cuts to social care funding on A&E departments will depend on the extent to which the quality and quantity of social care received by individuals has changed following the reduction in social care funding. As noted above, the majority of formal social care in England is financed and provided by local government. Table 1 shows how total spending on adult social care and the number of recipients of LA organised social care changed between 2009 and 2013. This shows that total spending on adult social care fell by 9.4% over four years. The fall in spending on social care for the over 65s was larger, falling by 19.6% from £9.2 billion in 2009 to £7.4 billion in 2013.

There is evidence to suggest that councils responded to cuts in social care budgets by adhering more strictly to eligibility criteria and limiting help only to those with 'substantial' or 'critical' needs (Humphries et al., 2016; House of Commons, 2017). As a result, the reduction in spending was accompanied by a large reduction in the number of people aged 65 and above receiving LA-organised social care. Between 2009 and 2013, the number of recipients fell by 25.6%. This means that 294,000 fewer individuals received any LA-organised care in 2013 than in 2009. The majority of these reductions came through a fall in the number of people receiving community-based care. Between 2009 and 2013, the number of community care recipients fell by 285,445 (29.8% of the 2009 total). This compares to a reduction of 6,680 (4.0%) and 4,320 (5.3%) for residential and nursing care respectively. Due to changes in councils' data reporting requirements, consistent data are not publicly available for social care receipt after 2013, but it is likely that receipt has continued to fall. One recent estimate suggests that the number of older people accessing publicly funded social care fell by more than 400,000 between 2009-10 and 2016-17 (Nuffield Trust, The Health Foundation and The King's Fund, 2017).

These reductions suggest that there were meaningful reductions in the number of people aged 65 and over receiving LA-organised social care between 2009 and 2013. These reductions were likely targeted mostly towards (on average) less severe cases. In addition, there may also have been reductions in the amount or the quality of care received by other recipients that are not captured by these data.

It is important to note that individuals may receive social care from informal sources or choose to self-finance care instead, either as a replacement for or in addition to public social care. The vast majority of social care in England is provided informally by spouses or children (Crawford and Stoye, 2017). An existing literature has also noted substantial substitution between informal and formal care (Bonsang, 2009; Charles and Sevak, 2005; Van Houtven and Norton, 2004), and publicly and privately funded care (McKnight, 2006) in a number of institutional settings. Cuts to the provision of publicly funded care may therefore have been addressed by increased provision of other types of care. Such a response would reduce the impact of funding cuts on the amount of assistance provided to the older population, and consequently reduce any effects on NHS hospitals.

4 Data

4.1 Local authority finances

In England, local authorities submitted annual returns to the Department for Communities and Local Government (DCLG) detailing their expenditures and incomes by service area throughout our period of interest. These returns include adult social care, and provides an additional breakdown of spending on individuals aged 65 years and older. Our analysis is based on the figures reported in these annual returns.

However, the net expenditure figures reported in these returns do not provide a consistent measure over time due to shifts in responsibilities between local authorities and the NHS, and the introduction of new funding arrangements over time. To account for this, we make a number of adjustments. These relate to particular spending programmes that shifted from the NHS to LAs over the period, and spending on social care financed from pooled budgets with the NHS.[5]

We also make a number of adjustments when constructing our measures of total local authority service spending. We exclude expenditure on public health, police, fires services and education due to transfers of responsibility between central and local governments which make spending figures inconsistent over time.[6]

Table 2 reports summary statistics at the local authority level. The first two columns show the mean and standard deviation of a number of characteristics in 2009-10. The remaining columns show the same statistics in 2015-16.

Revenues and consequently spending both fell considerably over the period. In 2009-10, mean local authority revenue was £420.2 million. This fell by 16.3% to £351.7 million by 2015-16. Spending on local services also fell by 16.9% over the period, with mean spending falling from £361.5 million in 2009-10 to £300.3 million.

Spending on adult social care was relatively sheltered from these cuts. In 2009-10, mean spending on adult social care (net of fee incomes) for local authorities in our sample was £122.0 million. This fell by 6.6% to £113.9 million in 2015-16. These cuts in spending were not replaced by contributions from residents towards their care, with fee income falling from £19.2 million to £18.8 million over the same period.

Spending on adult social care can be further divided between adults aged 18-64 years old, and those over 65. Spending in 2009-10 was divided roughly evenly between the groups. However, spending on the older age group fell by substantially more over the period. Mean net spending on the over 65s fell from £62.6 million in 2009-10 to £49.5 million in 2015-16, a cut of 21.0%. This compares to a real terms increase in spending on social care for younger adults. Over the same period, population growth was also strong for the over 65 age group. As a result, mean per capita social care spending for the over 65s fell by £375 per person (30.3%) between 2009-10 and 2015-16.

[5] We have assumed that the proportion of the Better Care Fund going to social care is uniform across the country. We have also assumed that the proportion of NHS transfers to LAs allocated to older people is the same as the proportion of LA adult social care spending that goes to older people.

[6] In combination, spending on education, police, fire and public health accounted for 49% of spending by councils in 2015-16 (including transfers from the NHS). This does not take into account spending by police and fire authorities, which had combined total service spending of just under £10 billion in 2015-16 (compared to £81 billion by councils).

4.2 Hospital Data

A key source of data for our analysis is the Hospital Episode Statistics (HES). HES contain the universe of all visits to publicly-funded hospitals in England, including information on all visits to A&E departments since 2009. The data record A&E treatment at the visit level and include a hospital identifier, local authority code, date of arrival, whether the patient arrived by ambulance, whether the patient was admitted for further treatment, broad diagnosis codes and basic patient characteristics such as age and sex.

The data include Healthcare Resource Group (HRG) codes for each episode. Hospitals in England are compensated through a system of national tariffs for each HRG, which allows us to construct a measure of the approximate cost of each visit by matching tariffs to the appropriate HRG. These costs are then adjusted to reflect each NHS provider's Market Forces Factor (MFF), which is an estimate of unavoidable cost differences between providers based on their geographical location.

We construct a number of measures of annual A&E use to capture the number of patients visiting the hospital, and the intensity with which they use these services (including the number of visits and the cost of these visits). We also create these measures for three different age groups (65-74, 75-84, 85+ years). This allows us to examine variation (across different age groups) in the impact of spending cuts.

Our analysis focuses on the English population aged 65 years and over, and covers the period between April 2009 and March 2016. We keep all A&E records for patients in this age group and time period. We then collapse the hospital data to the 'upper tier' local authority level, the unit of our analysis. There are currently 152 local authorities in England. We exclude from our final sample two small local authorities with unique funding arrangements, and four areas where the borders of the local authority change over time. We exclude a further three local authorities whose official returns include negative or implausibly low spending figures for one or more years. Our final sample therefore contains data for 143 local authorities in each financial year and 1,001 observations in total.

The HES data only contains information on individuals who attend hospital. We therefore link these data with official age-sex specific population data for each local authority in each financial year from the Office for National Statistics to account for other residents aged 65 and above. We use these data to construct per-capita measures of A&E use for the over 65s. This is further augmented with a number of measures of economic, social and health characteristics of the local authority to control for changes in these factors over time.

The use of A&E services by the older population has increased substantially over time. The total number of A&E visits by people aged 65 and over increased from around 2.9 million in 2009 to more than 3.9 million in 2015. Table 3 summarises a range of measures of A&E use by older people in 2009 and 2015. It presents statistics both for the entire over 65 population and for specific age groups. The average number of visits to A&E per resident aged 65 and over increased from 0.37 in 2009 to 0.45 in 2015. The proportion of over 65s making at least one visit to A&E during the year also increased from 23% to 26%. As we might expect, older people are both more likely to attend A&E at least once in a given year, and also have a higher mean number of visits. The mean number of A&E visits per resident aged 85 and over increased from

0.67 to 0.81 over the period, and the proportion making at least one visit to A&E increased from 40% to 44%.

In addition to increased visits to A&E, there was a modest increase in the mean number of admissions for further hospital treatment via A&E. The mean number of ambulance arrivals also increased. This was driven by increased use of those services among residents aged 85 and over. In contrast, there is little to no change among residents aged 65 to 74.

Table 3 also summarises estimated per-capita spending on A&E care. Mean spending per resident aged 65 and over increased by around 40%, from £39.78 in 2009 to £56.03 in 2015-16. Costs are higher for older individuals, reflecting both the greater number of visits made by this age group and a more severe case mix. In 2015, mean spending on a resident aged 65-74 was £37.79. The equivalent figure for the over 85s was £110.28.

5 Empirical strategy

We now turn to investigating the relationship between changes in public spending on social care and use of hospitals by the older population. Figure 2 shows the correlation between changes to public spending on social care and changes in the mean annual number of A&E visits by residents aged 65 and above between 2009-10 and 2015-16. The figure shows that the raw correlation between changes in per-capita care spending and A&E use is not statistically different from zero. However, this does not control for any other factors that might explain changes in both social care spending and the use of hospitals over this period. For example, it is likely that areas with the greatest growth in the number of older, sicker individuals (and therefore areas with the greatest increase in the need for both hospital and social care) would experience the greatest growth in the use of A&E services, while also choosing to protect social care spending for the over 65s in the local area. As a result of this, areas with smaller cuts to social care spending would also have larger increases in A&E attendance regardless of the effect of social care on the use of hospitals. If not accounted for, this would bias estimates of the impact of social care funding on the use of A&E towards zero.

We therefore now turn to a formal examination of the relationship between public funding for social care and hospital use. We first set out our baseline estimation strategy, which controls for many of the time-varying characteristics of each local area. We then discuss the potential endogeneity of social care spending decisions with respect to hospital use, and set out an instrumental variables strategy to address these issues.

5.1 Fixed effects

We estimate the following baseline specification:

$$y_{it} = \beta SC_{it} + \delta X_{it} + \mu_i + \gamma_t + \epsilon_{it} \tag{1}$$

where y_{it} is a measure of A&E use in local authority i in financial year t. SC_{it} represents the level of per capita public funding for social care provided to adults aged 65 and over in local authority i in year t. X_{it} captures a range of time-varying local area characteristics associated with the use of A&E care. μ_i controls for permanent differences in A&E use across

local authorities, and γ_t captures the national time trend in A&E use between 2009 and 2015. ϵ_{it} is an error term. β is the object of interest, and represents the impact of public social care spending on the use of NHS A&E departments by the older population. Identification arises from within-area variation in social care spending over time.

We estimate this specification for a number of outcomes related to A&E use. First, we examine annual visits per resident (65+) to study the overall change in the use of A&E. Second, since an increase in the mean number of visits per resident could be explained by an increase in the number of unique visitors to A&E (or, in other words, an increase in the probability of a resident aged 65 year and above attending A&E at least once in a given year), an increase in the number of visits per each patient (conditional on attending A&E at least once), or both. We therefore examine these outcomes directly to understand which mechanism is driving any changes in A&E attendance. Finally, we also examine A&E costs, number of visits to A&E in an ambulance per resident and the number of admissions to hospital via A&E.

The identifying assumption of the model is that, conditional on X_{it}, μ_i and γ_t, public social care spending is uncorrelated with the error term. This assumption would be violated if there are unobservable differences in factors associated with both the use of hospital care and the level of social care spending. The inclusion of local authority fixed effects will control for permanent differences in the underlying need and access to care across local authorities. However, it is plausible that areas with larger changes in spending on adult social care may also have larger growth in the need for A&E services. To address this we include a rich set of local area characteristics in X_{it} that could plausibly be related to the need for both hospital and social care. This includes the size and composition (age and gender) of the population, claimant rates for various means-tested and disability-related benefits, local economic conditions and measures of the socio-economic composition of the local population.

The identifying assumption would still be violated if there are remaining unobserved factors that cause changes in A&E use, and that are also correlated to changes in social care spending. This could be the case, for example, if local authorities use the expectations of local hospitals for future use of A&E when setting their adult social care budgets. To address this concern we use instrumental variables analysis.

5.2 Instrumental Variables

We follow a 'Bartik' or 'shift-share' approach to construct our instrument (Bartik, 1991). This follows an existing literature that uses historical patterns of public spending to instrument for potentially endogenous local public spending decisions (e.g. Nakamura and Steinsson, 2014; Wilson, 2012). This approach predicts social care spending in each local authority in each financial year by allocating a share of *observed* national social care spending according to the *past* distribution of spending across local authorities.

Formally, we predict spending in each area i for each financial year t, $\hat{SC}_{it}$, in the following way. First, we calculate the share of national social care spending that took place in area i in our baseline financial year (2000) as follows:

$$\delta_{i,2000} = \frac{SC_{i,2000}}{\sum_{i=1}^{150} SC_{i,2000}} \tag{2}$$

We then predict spending for each area in each financial year between 2009 and 2015 by multiplying the observed national spending in year t, SC_t, with the 2000 share:

$$\hat{SC}_{it} = \delta_{i,2000} * SC_t \tag{3}$$

For a valid instrument, we require a variable that is (i) related to changes in the level of public spending on adult social care but is (ii) otherwise unrelated to changes in the use of hospitals over the same period. The Bartik approach provides an instrument that potentially fulfils both criteria. The historical pattern of spending should have strong predictive power for how spending evolves in each local authority. The reliance of local authorities on central government grants for much of their revenue means that relative revenues across different areas do not fluctuate significantly from year to year. As a result, even though the exact level of social care spending in each local area changes over time (and will decrease or increase more quickly in particular areas due to local conditions), the rankings of local authorities in terms of their share of national social care spending remains stable. Figure 3 plots predicted per resident spending against observed per resident spending. It also plots a 45 degree line, where predicted and observed spending are equal. It shows that our measure of predicted spending is highly correlated with observed spending, with a correlation coefficient of 0.89. This suggests that our instrument will fulfil the first criterion.

However, predicted changes to spending are independent of the recent choices that specific local authorities make with regard to their social care spending. The national level of spending will reflect changes to central government spending and the combined choices of all local authorities. Predicted spending therefore reflects these aggregate decisions, as no single authority budget alone is large enough to have a sizeable impact on the national trend, and will not be related to local area trends or needs.

The identifying assumption could still be violated if areas with different historical shares of spending have different trends in A&E use over time. In other words, if areas with a higher share of spending in 2000 (and therefore a higher predicted share of spending throughout the period) would have experienced stronger growth in A&E use over this period regardless of social care spending then the instrument would not be valid. In this case our estimates would be biased towards zero, underestimating the impact of cuts to social care funding on the use of A&E. Conversely, if areas with smaller shares in 2000 would have experienced stronger growth in A&E use over the period, the estimates would overstate the impact of the cuts. As a robustness check, we repeat our analysis using different base years to predict social care spending, and find that the results are insensitive to the choice of base year.

6 Results

We first study aggregate measures of A&E use and subsequent admissions to hospitals, including both the number of unique visitors to A&E and the average number of visits among the population aged 65 and above, before examining how this estimated effect varies across patient age.

6.1 Baseline results

Table 4 shows the estimated impact of per capita social care spending on the annual number of A&E visits made by individuals aged 65 and above. The first column simply regresses the mean number of A&E visits per resident aged 65 and above on per capita public spending on social care for the over 65s (expressed in £100s) and a set of financial year dummies. The estimated coefficient on social care is positive and statistically significant, indicating that areas with greater per capita social care spending also have a greater average number of A&E visits made by their older population.

Column two adds a set of time-varying demographic and economic characteristics to control for local need for hospital services. The inclusion of these controls reverses the sign on the coefficient of interest, which becomes weakly significant. This indicates that areas with higher per capita social care spending also have higher need for hospital care. The third specification includes the same set of time-varying controls along with local authority fixed effects. This controls for permanent geographical differences in the need for hospital care. The magnitude of the coefficient of interest falls slightly and is no longer statistically significant different from zero.

The final column shows results from the IV estimation. The estimated coefficient on per capita social care spending is now negative and statistically significant at the 5% level. Our results indicate that a £100 increase in per capita social care spending is associated with 0.03 fewer visits to A&E per resident aged 65 and above. This is a relatively large effect. Between 2009 and 2015, the mean per-capita spend fell by £375. Our estimates imply that a cut in per capita spending of this size has increased the mean number of visits to A&E per 65+ resident by 0.09 per year: that is, almost an additional visit to A&E for every 10 residents aged 65 years and above. This compares to a mean number of visits of 0.37 in 2009.

These results indicate that reductions to social care spending did increase the use of A&E departments by older individuals. This could be caused by two mechanisms: an increase in the number of unique patients using A&E, or an increase in the number of visits made by pre-existing patients. Table 5 explores the first channel by repeating the analysis with the proportion of the local over 65 population who made at least one visit to A&E over the course of the year. Again, the estimated coefficient on per-capita spending in the IV specification is negative and statistically significant at the 5% level. This suggests that the additional visits of A&E are at least partly driven by an increase in the number of people using this type of care. Our estimates imply that the mean reduction in per-capita spending (£375) increased the proportion of over 65s making at least one visit to A&E by 3.8 percentage points, relative to a mean of 23.0% in 2009.

Table 6 reports the estimated relationship between per-resident spending on social care and the per-resident cost of A&E use. In all specifications the coefficient is negative, although it is not statistically different from zero when using OLS or when including fixed effects. When using the IV specification, the coefficient of interest is negative and much larger in magnitude, and is statistically significant at the 1% level. Cutting public per capita social care by £100 per head is associated with an increase in per capita A&E spending of £2.96. This compares to mean costs of £39.78 in 2009. Importantly, these estimates only capture the impact on the cost

of providing A&E care. Any wider cost impacts of providing care - including (more expensive) inpatient care and non-hospital care (e.g. GP appointments) - would therefore not be included in these estimates.

Table 6 also reports the estimated impact on the number of admissions to hospital via A&E and the number of arrivals at A&E by ambulance. In both cases, the IV estimates of the coefficient of interest are negative but not significantly different from zero. This could indicate that there is no meaningful effect on these outcomes, or that we lack the statistical power to detect changes in these lower frequency (relative to A&E visits) events.

Overall, our results indicate statistically significant impacts on the use of A&E services by older people as a result to changes to social care spending. Our results suggest that cuts to social care spending have resulted in more visits to A&E on average for older individuals, in addition to an increase in the probability of attending A&E at all in a given year. This has led to a modest rise in the costs of providing A&E care. It is possible that cuts to social care spending have also had an impact on other parts of the NHS, patient outcomes or wider welfare, but these are not examined in this analysis.

6.2 Results by age group

In this section, we examine how our estimated impacts of social care spending on A&E use vary across patients in different age groups. Older people are, on average, more common users of social care than younger people. As a result, we would expect them to be more affected by reductions in funding. They may also be more severely affected by the removal of social care if their health and care needs are more severe. Unfortunately, we cannot observe actual spending on different age groups in the data in order to separate these channels. However, we do observe the age of all patients. We therefore consider how cuts to per capita spending on all individuals aged 65 and above affects the outcomes for three separate age groups: those aged between 65 and 74, those aged between 75 and 84, and those aged 85 and above.

Table 7 displays the estimated impact of per capita social care spending on the mean number of visits to A&E for residents in each age group using the IV specification. In all cases, the coefficient is negative and statistically significant at the 5% level. The effects are largest for the oldest individuals, shown in column three. The estimates indicate that a reduction in social care spending of £100 per 65+ resident is associated with an increase in the mean number of A&E visits per 85+ resident of 0.030. This compares to estimates of 0.019 and 0.025 for residents aged 65-74 and 75-84.

Table 8 displays the estimated impact on the proportion of residents in each age group having at least one A&E visit over the year. The coefficient is statistically significant for each group, indicating that cuts to social care spending are associated with an increased proportion of residents attending A&E at each age group. In this case the magnitude of the effect is only slightly larger for the oldest age group.

We also consider whether the residents that do visit A&E over the year do so more often. That is, we examine the intensity of A&E use, conditional on having attended. Table 10 shows the estimated impact on the mean number of A&E visits per *patient*, by age group. The results indicate no significant impact for residents aged 65 to 74 or 75 to 84. However, for the oldest

patients, the coefficient is negative and significant at the 10% level. Our estimates suggest that a £100 cut to social care spending per 65+ resident is associated with an increase of 0.02 in the mean number of A&E visits per patient. This means that residents aged 85 and over who used A&E over the year did so more intensively as a result of social care cuts.

Table 9 shows the estimated impact on A&E costs for each group, expressed in costs per resident in each age group. The coefficient is negative and strongly significant for each age group, with larger effects for older residents. These results indicate that a cut of £100 to per capita spending on all residents aged 65 and above would result in an increase in A&E costs among residents aged 65 to 74 of £1.97 per head. This compares to an equivalent figure of £4.42 for residents aged above 85 years old.

These results suggest that cutting spending on social care for the over 65 population has the biggest impacts on the rates of A&E use among the oldest population. This could be because over 85s are more likely to use care, and therefore are more affected by the cuts. It could also be because the effects of removing social care for these older individuals is more severe. Unfortunately we cannot distinguish these effects due to a lack of consistent data on spending for different age groups. This remains an important extension for future research.

7 Conclusion

Between 2009-10 and 2015-16, public spending on social care for those aged 65 and above fell by a dramatic 21% in England. This has led to a growing policy interest in the impact of these cuts on a range of outcomes, including the quality and quantity of social care provided to residents, their individual outcomes, and any consequences for other government services. In this paper, we study the impact of these cuts on Accident and Emergency departments in NHS hospitals. This is an important part of the NHS that has experienced rapid growth in patient numbers over the same period of time that funding for social care has fallen.

We find that cuts to social care have led to a significant increase in the number of visits made to A&E by those aged 65 and over, with almost an additional visit for every ten people over the age of 65. We also find evidence of a significant increase in the proportion of older people making at least one visit to A&E over the year due to the cuts in social care funding. Our results indicate that the effects are most pronounced for the oldest members of the population, who are likely to have the greatest care needs.

Reductions in budget cuts for local authorities have led to a reduction in the number of people aged 65 and over receiving LA-organised care: between 2009-10 and 2013-14, the number of recipients fell by a quarter. These reductions have been mostly achieved by reducing assistance for those with the least severe needs. This is reflected in the fact that the majority of reductions in volume came through a fall in the number of people receiving community-based care rather than in the number of people receiving residential or nursing care. Further cuts to budgets would require further cutbacks in services, and would affect gradually more severe cases. Further cuts in social care spending may therefore have more pronounced impacts in future.

The increased use of A&E services has also led to an increase in the cost of providing A&E care. We estimate that a reduction of £100 in per capita public spending on social care for

older people results in an additional £3 of spending per resident on A&E care. This impact is modest, and reflects the relatively low cost of providing care to individual patients in A&E. However, our analysis is limited to the effects of social care spending on a particular type of hospital service, and must be seen in the context of wider evidence on the impact of recent cuts. Our analysis does not examine the potential effect on individuals' quality of life, and the costs of providing A&E services are dwarfed by the costs of providing services to admitted patients in hospital. Many of the potential negative impacts associated with reduced social care availability may be primarily seen in increased use of General Practitioner services, privately funded social care, or in greater use of informal care provided by friends, family and neighbours. New data on the individual receipt of both primary and secondary health care and social care will be key in addressing more of these issues, and collecting such data should be a priority for policy makers seeking to better understand the wider impact of social care cuts and the relationship between different types of care.

References

1. Amin Smith, N., Phillips, D., Simpson, P., Eiser, D. and Trickey, M. (2016), 'A time of revolution? British local government finance in the 2010s', Institute for Fiscal Studies (IFS), Research Report R121.

2. Bartik, T. (1991), 'Who Benefits from State and Local Economic Development Policies?' Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

3. Bonsang, E. (2009), 'Does informal care from children to their elderly parents substitute for formal care in Europe?', *Journal of Health Economics*; 28:143-154.

4. Charles K., & Sevak. P (2005), 'Can family caregiving substitute for nursing home care?', *Journal of Health Economics*; 24(6):1174-1190

5. Fernandez, J. & Forder, J. (2008), 'Consequences of local variations in social care on the performance of the acute health care sector', *Applied Economics*; 40(12):1503-1518.

6. Forder, J. (2009), 'Long-term care and hospital utilisation by older people: an analysis of substitution rates', *Health Economics*; 18(11):1322-38.

7. Gaughan, J., Gravelle, H., Siciliani, L. (2015), 'Testing the bed-blocking hypothesis: Does higher supply of nursing and care homes reduce delayed hospital discharges?', *Health Economics*; 24(S1):32-44.

8. Gaughan, J., Gravelle, H., Santos, R., & Siciliani, L. (2017), 'Long-term care provision, hospital bed blocking, and discharge destination for hip fracture and stroke patients', *International Journal of Health Economics and Management*; 17:311-331.

9. House of Commons (2017), Housing, Communities and Local Government Committee, 'Adult social care inquiry' (HC 1103)

10. Humphries, R., Thorlby, R., Holder, H., Hall, P. & Charles, A. (2016), 'Social care for older people: Home truths', The King's Fund

11. Laing-Buisson (2017), 'Care of Older People UK Market Report', 28th edition.

12. McKnight, R. (2006), 'Home care reimbursement, long-term care utilization, and health outcomes,' *Journal of Public Economics*, 90(1-2):293-323.

13. Nakamura, E. & Steinsson, J. (2014), 'Fiscal Stimulus in a Monetary Union: Evidence from US Regions.' *American Economic Review*, 104(3):753-92

14. Nuffield Trust, The Health Foundation & The King's Fund. (2017), 'The Autumn Budget: Joint Statement on Health and Social Care'.

15. Phillips, D. & Simpson, P. (2017), 'National standards, local risks: the geography of local authority funded social care, 2009-10 to 2015-16', Institute for Fiscal Studies (IFS), Research Report R128.

16. Simpson, P. (2017), 'Public spending on adult social care in England', Institute for Fiscal Studies (IFS), Briefing Note BN200.

17. Van Houtven, C. & Norton, E. (2004), 'Informal Care and Health Care Use of Older Adults', *Journal of Health Economics*; 23:1159-1180.

18. Wilson, D. (2012), 'Fiscal Spending Jobs Multipliers: Evidence from the 2009 American Recovery and Reinvestment Act.' *American Economic Journal: Economic Policy* 4(3):251–82.

Table 1: Social care spending and receipt, 2009 to 2013

	2009	2010	2011	2012	2013
Spending on adult social care (£m)	£18,000	£17,700	£17,100	£16,400	£16,300
Spending on social care for over 65s (£m)	£9,200	£9,000	£7,900	£7,500	£7,400
Over 65s receiving LA-organised social care	1,147,460	1,029,860	989,710	895,795	853,460
of which:					
Community-based care	*957,420*	*844,865*	*801,357*	*711,615*	*671,975*
Residential care	*167,410*	*160,360*	*166,375*	*164,185*	*160,730*
Nursing care	*81,625*	*76,805*	*78,273*	*78,925*	*77,305*

Note: Consistent data on care receipt unavailable beyond 2013-14. Spending figures rounded to nearest £100,000 and expressed in 2017-18 prices. Social care spending on the over 65 population has been calculated on the basis of assumptions set out in Section 3.2. Receipt of community-based, residential and nursing care does not sum to the total due to some people receiving more than one type of care in a year.

Table 2: LA characteristics in 2009 and 2015

	2009		2015	
	Mean	S.D.	Mean	S.D.
LA finances				
Total revenues (£000's)	420,220	264,328	351,727	235,858
Service spending (£000's)	361,537	228,385	300,313	202,583
Net SC spending on adults (£000's)	121,994	90,683	113,985	86,635
Income from ASC fees (£000's)	19,186	16,041	18,772	15,610
Net SC spending on over 65s (£000's)	62,581	46,689	49,450	36,626
Per capita SC spending on over 65s (£)	1,238.75	430.55	863.73	314.17
Demographic characteristics				
Population aged 65+	57,011	49,579	65,861	58,753
Share of total population aged 65+ (%)	15.46	3.59	17.00	4.50

Note: Figures shown are for the 143 local authorities included in our final sample. Grant reliance is defined as the share of total LA revenues (including NHS transfers) coming from central government grants. Social care spending on the over 65 population has been calculated on the basis of assumptions set out in Section 3.2. Per capita spending on the over 65 population is spending per resident aged 65+. Real median earnings are taken from the Annual Survey of Hours and Earnings and are based on gross weekly earnings for all workers. All figures expressed in 2017-18 prices.

Table 3: Accident and Emergency use in 2009 and 2015

	Aged 65+		Aged 65-74		Aged 75-84		Aged 85+	
	2009	2015	2009	2015	2009	2015	2009	2015
Mean visits to A&E	0.37	0.45	0.28	0.32	0.42	0.51	0.67	0.81
Proportion visiting A&E	0.23	0.26	0.18	0.20	0.26	0.29	0.40	0.44
Mean admissions via A&E	0.18	0.20	0.10	0.11	0.21	0.24	0.41	0.48
Proportion admitted via A&E	0.13	0.13	0.08	0.08	0.15	0.16	0.15	0.16
Mean ambulance arrivals	0.21	0.22	0.11	0.11	0.24	0.27	0.50	0.58
Proportion having ambulance arrival	0.21	0.22	0.08	0.07	0.16	0.17	0.16	0.17
Per capita A&E spending	39.78	56.03	28.78	37.79	45.16	64.48	74.78	110.28

Note: Figures shown are for the 143 local authorities included in our final sample.

Table 4: Estimated impact of social care spending on mean visits to A&E per +65 resident

	Mean visits to A&E per +65 resident			
	(1) OLS	(2) OLS	(3) FE	(4) IV
Per capita social care spending on +65s (£00's)	0.021***	-0.005*	-0.002	-0.025**
	(0.002)	(0.003)	(0.002)	(0.012)
Share of population aged 65-74		0.715	0.795	2.10
		(0.821)	(1.20)	(1.55)
Share of population aged 75-84		2.55	0.324	0.032
		(1.902)	(2.118)	(2.649)
Share of population aged 85+		-8.331***	-5.260	-4.113
		(2.766)	(5.707)	(6.659)
Female share of 65+ population		0.024***	0.004	0.008
		(0.006)	(0.006)	(0.005)
Proportion +65s claiming PCGC		0.006***	0.009**	0.017***
		(0.001)	(0.004)	(0.006)
Proportion +65s claiming disability benefits		0.006***	0.009	0.006
		(0.002)	(0.007)	(0.006)
Proportion adults claiming carer's allowance		-0.012	0.028	0.061
		(0.033)	(0.040)	(0.046)
Proportion adults claiming income component of ESA		-0.001	-0.003	-0.015
		(0.009)	(0.011)	(0.014)
Real median gross weekly earnings (£000's)		0.018	-0.006	0.003
		(0.012)	(0.011)	(0.014)
Observations	1,001	1,001	1,001	1,001
R-squared	0.416	0.708	0.361	0.108
Number of local authorities	143	143	143	143
First stage F statistic	-	-	-	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.

Table 5: Estimated impact of social care spending on the proportion of +65s using A&E

	Proportion +65s visiting A&E			
	(1) OLS	(2) OLS	(3) FE	(4) IV
Per capita social care spending on +65s (£00's)	0.008***	-0.002	-0.001	-0.010**
	(0.001)	(0.001)	(0.001)	(0.005)
Share of population aged 65-74		-0.001	0.681	1.197*
		(0.332)	(0.593)	(0.717)
Share of population aged 75-84		1.282	0.996	0.881
		(0.793)	(1.145)	(1.316)
Share of population aged 85+		-2.987***	-3.533	-3.079
		(1.127)	(2.709)	(3.014)
Female share of 65+ population		0.011***	0.004	0.006**
		(0.003)	(0.003)	(0.003)
Proportion +65s claiming PCGC		0.003***	0.005**	0.008***
		(0.001)	(0.002)	(0.003)
Proportion +65s claiming disability benefits		0.002***	0.003	0.002
		(0.001)	(0.004)	(0.003)
Proportion adults claiming carer's allowance		-0.000	0.018	0.031
		(0.014)	(0.021)	(0.023)
Proportion adults claiming income component of ESA		-0.003	-0.003	-0.007
		(0.004)	(0.005)	(0.006)
Real median gross weekly earnings (£000's)		0.007	-0.000	0.003
		(0.005)	(0.006)	(0.006)
Observations	1,001	1,001	1,001	1,001
R-squared	0.374	0.655	0.267	0.094
Number of local authorities	143	143	143	143
First stage F statistic	-	-	-	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.

Table 6: Estimated impact of social care spending on admissions via A&E, ambulance arrivals and estimated A&E costs per +65 resident

	A&E costs per +65 resident			Mean admissions via A&E			Mean ambulance arrivals		
	(1) OLS	(2) FE	(3) IV	(4) OLS	(5) FE	(6) IV	(7) OLS	(8) FE	(9) IV
Per capita social care spending on +65s (£00's)	-0.52	-0.31	-2.96***	-0.002	0.001	-0.002	-0.001	0.000	-0.000
	(0.32)	(0.21)	(1.14)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.006)
Demographic controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001
R-squared	0.802	0.637	0.489	0.639	0.238	0.203	0.561	0.157	0.157
Number of la_num	143	143	143	143	143	143	143	143	143
First stage F statistic	-	-	27.45	-	-	27.45	-	-	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.
Mean admissions and and ambulance arrivals are calculated per resident aged 65 and over. Demographic controls included are: the share of the total population aged 65-74, the share of the total population aged 75-84, the share of the population aged 85+, and the female share of the 65+ population. Economic controls include the proportion of +65s claiming Pension Credit Guarantee Credit, proportion of +65s claiming disability benefits, proportion of adults claiming carer's allowance, proportion of adults claiming the income component of Employment and Support Allowance, and real median gross weekly earnings.

Table 7: Estimated impact of social care spending on A&E visits, by age

	Mean A&E visits, for ages:		
	65 - 74	75 - 84	85+
	(1)	(2)	(3)
	IV	IV	IV
Per capita social care spending on +65s (£00's)	-0.019**	-0.025**	-0.030**
	(0.010)	(0.010)	(0.013)
Demographic controls	Y	Y	Y
Economic controls	Y	Y	Y
Observations	1,001	1,001	1,001
R-squared	-0.010	0.174	0.355
Number of local authorities	143	143	143
First stage F-statistic	27.45	27.45	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.
Demographic controls included are: the share of the total population aged 65-74, the share of the total population aged 75-84, the share of the population aged 85+, and the female share of the 65+ population. Economic controls include the proportion of +65s claiming Pension Credit Guarantee Credit, proportion of +65s claiming disability benefits, proportion of adults claiming carer's allowance, proportion of adults claiming the income component of Employment and Support Allowance, and real median gross weekly earnings.

Table 8: Estimated impact of social care spending on the proportion of residents visiting A&E , by age

	Prop. visiting A&E, for ages:		
	65 - 74	75 - 84	85+
	(1)	(2)	(3)
	IV	IV	IV
Per capita social care spending on +65s (£00's)	-0.008**	-0.008**	-0.009*
	(0.004)	(0.004)	(0.005)
Demographic controls	Y	Y	Y
Economic controls	Y	Y	Y
Observations	1,001	1,001	1,001
R-squared	0.008	0.171	0.296
Number of local authorities	143	143	143
First stage F-statistic	27.45	27.45	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.
Demographic controls included are: the share of the total population aged 65-74, the share of the total population aged 75-84, the share of the population aged 85+, and the female share of the 65+ population. Economic controls include the proportion of +65s claiming Pension Credit Guarantee Credit, proportion of +65s claiming disability benefits, proportion of adults claiming carer's allowance, proportion of adults claiming the income component of Employment and Support Allowance, and real median gross weekly earnings.

Table 9: Estimated impact of social care spending on estimated A&E costs, by age

	A&E costs per resident, for ages:		
	65 - 74	75 - 84	85+
	(1)	(2)	(3)
	IV	IV	IV
Per capita social care spending on +65s (£00's)	-1.97**	-3.29***	-4.42***
	(0.78)	(1.09)	(1.57)
Demographic controls	Y	Y	Y
Economic controls	Y	Y	Y
Observations	1,001	1,001	1,001
R-squared	0.367	0.526	0.636
Number of local authorities	143	143	143
First stage F-statistic	27.45	27.45	27.45

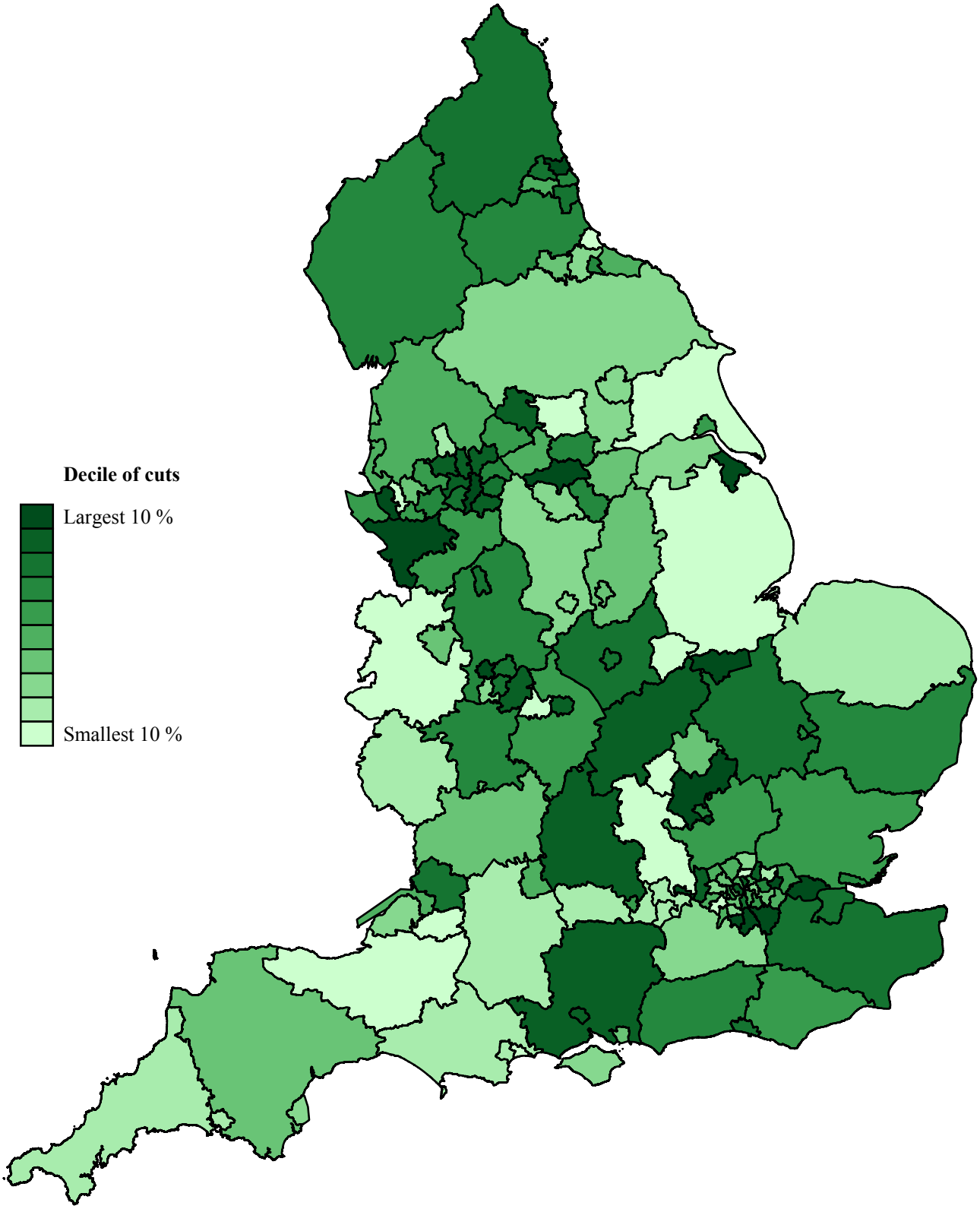
All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.
Demographic controls included are: the share of the total population aged 65-74, the share of the total population aged 75-84, the share of the population aged 85+, and the female share of the 65+ population. Economic controls include the proportion of +65s claiming Pension Credit Guarantee Credit, proportion of +65s claiming disability benefits, proportion of adults claiming carer's allowance, proportion of adults claiming the income component of Employment and Support Allowance, and real median gross weekly earnings.

Table 10: Estimated impact of social care spending on mean visits to A&E conditional on attendance during the year, by age

	Mean A&E visits per patient		
	65 - 74	75 - 84	85+
	(1)	(2)	(3)
	IV	IV	IV
Per capita social care spending on +65s (£00's)	-0.009	-0.019	-0.022*
	(0.011)	(0.012)	(0.012)
Demographic controls	Y	Y	Y
Economic controls	Y	Y	Y
Observations	1,001	1,001	1,001
R-squared	0.269	0.355	0.434
Number of local authorities	143	143	143
First stage F-statistic	27.45	27.45	27.45

All standard errors displayed in parentheses are clustered at local authority level. ***p<0.01, **p<0.05, *p<0.1
F-statistic reported for the first stage is Kleibergen-Paap rk Wald F-statistic.
Demographic controls included are: the share of the total population aged 65-74, the share of the total population aged 75-84, the share of the population aged 85+, and the female share of the 65+ population. Economic controls include the proportion of +65s claiming Pension Credit Guarantee Credit, proportion of +65s claiming disability benefits, proportion of adults claiming carer's allowance, proportion of adults claiming the income component of Employment and Support Allowance, and real median gross weekly earnings.

Figure 1: Cuts to local authority social care spending on the older population, by spending reduction decile



Note: Local authorities have been assigned to deciles based on the percentage change in social care spending on the over 65 population between 2009 and 2015.

Figure 2: Changes in the mean number of A&E visits by the over 65 population vs changes in per capita public social care spending between 2009-10 and 2015-16

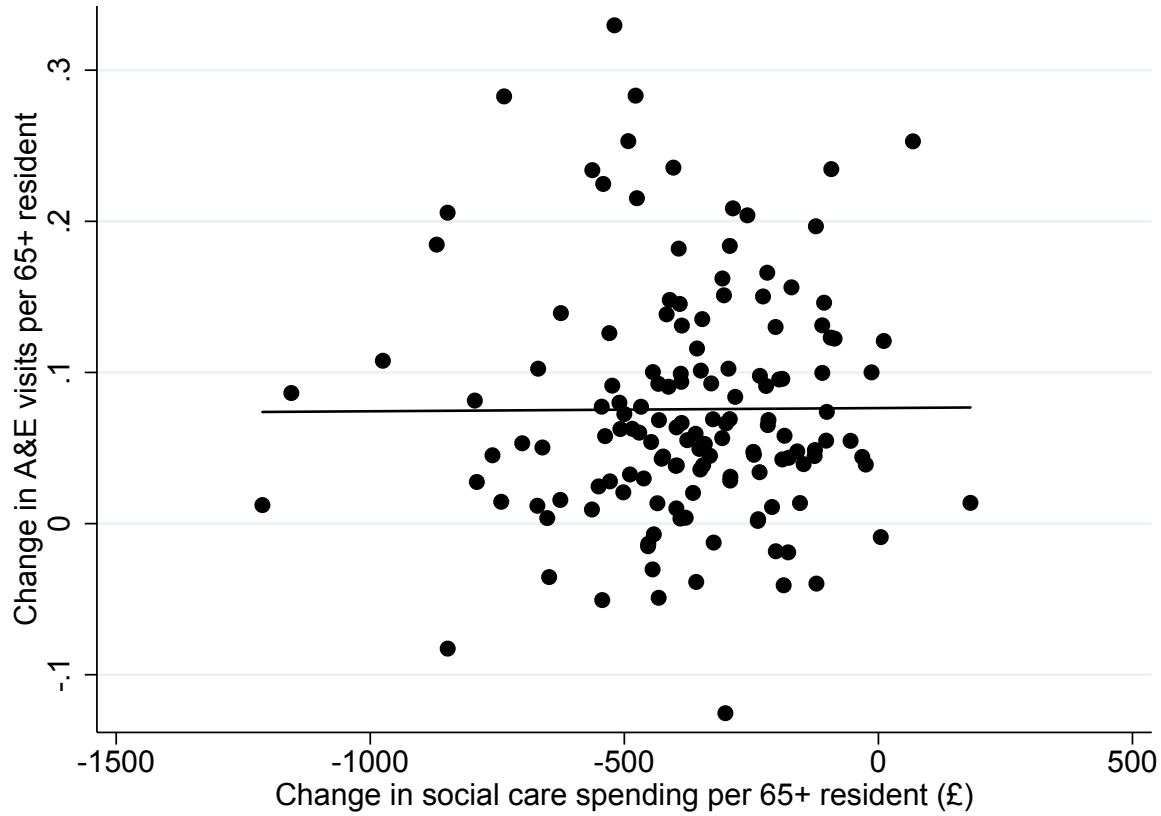
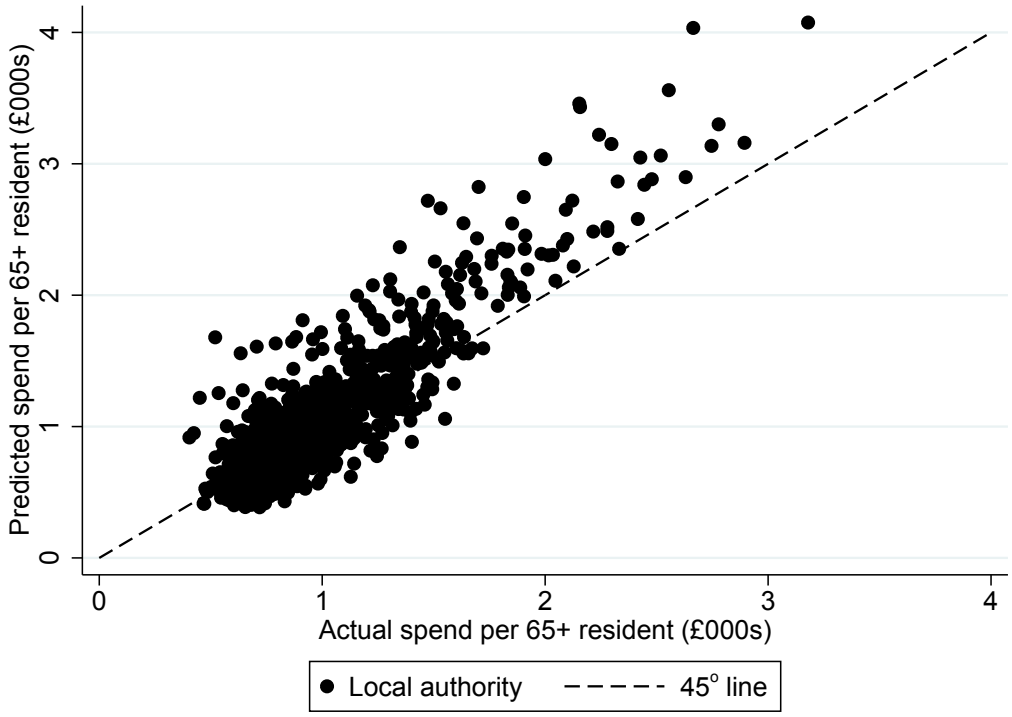


Figure 3: Predicted per resident spending vs observed per resident spending



Notes: (1) All figures in £000s per resident aged 65 years and above; (2) 45 degree line shows the correlation if actual spending is equal to observed spending.