Counting the cost of UK poverty

by Glen Bramley, Donald Hirsch, Mandy Littlewood and David Watkins

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How much does poverty cost the UK? People in poverty experience material and psychological harm, but there are also wider social consequences and tangible costs to the public purse.

This report estimates the total public financial cost of poverty, associated with additional spending on public services and the knock-on harm of poverty meaning that people need more future support from the state.

The report shows that:

- the public service costs of poverty amount to around £69 billion, with identifiable knock-on effects of child poverty costing a further £6 billion and knock-on effects of adult poverty costing at least £2.7 billion;

- this gives a total cost of poverty in the UK of around £78 billion;

- a large proportion of what we spend publicly (about £1 in every £5 spent on public services) is making up for the way that poverty damages people's lives.

Contents

List of abbreviations

ADL	Activities of daily living
AHP	Allied health professionals
CIN	Children in Need Census for England
CIPFA	Chartered Institute of Public Finance and Accountancy
DfE	Department for Education
ESA	Employment and Support Allowance
FE	Further education
FPNC	Free personal and nursing care
FSM	Free school meals
GDP	Gross domestic product
HE	Higher education
HRA	Housing revenue account
HSCIC	Health and Social Care Information Centre
ID2015	Indices of Deprivation for 2015
IADL	Instrumental activities for daily living
IMD	Index of Multiple Deprivation
LA	Local authority
LSOA	Lower super output area
MSOA	Middle super output area
NDTMS	National Drug Treatment Monitoring System
PHE	Public Health England
PSE	Poverty and Social Exclusion
SHS	Scottish Household Survey
SIMD	Scottish Index of Multiple Deprivation
SMD	Severe and multiple disadvantage

Executive summary

Poverty causes deep material and psychological harm to those who experience it. In addition, it causes widespread damage to society. The very existence of poverty in a rich country can be a source of collective shame, social tension and anxiety. These 'costs' to individuals and societies cannot be adequately expressed in financial terms, not least because they involve what many would see as a moral failing: the fact that a society with wealth and privilege does not adequately provide for its most economically disadvantaged members.

This report, however, is an attempt to estimate the more tangible cost that poverty brings to society, specifically in the form of the cost to the public purse. It updates an estimate of the cost of child poverty originally carried out in 2008, and extends it to the whole population. While acknowledging that such an estimate is only an approximation, the report's purpose is to illustrate the magnitude of the cost of poverty, in order to show the kinds of savings that a sustained reduction in poverty could bring.

Public costs are incurred on the one hand in measures to reduce or alleviate poverty, and on the other as a consequence of poverty's existence. The present report focuses on the latter. It estimates additional current spending on services associated with the existence of poverty. It also estimates some longer-term consequences of poverty to the Treasury, in terms of reduced revenues and increased benefit payments to people whose earnings potential will be damaged in the future by the experience of poverty today. It does not on the other hand count the cost of paying benefits to people on low incomes as a 'cost of poverty' (other than where the above knock-on effect can be identified). Since a strategy to reduce poverty is bound to combine measures to improve market incomes with the development of a sound social security system to address poverty by transferring income among those still unable to earn enough, adequate benefits are to a large degree one part of the solution to poverty. This would make it problematic to include the benefits bill as of poverty's 'cost'. Nevertheless, it is worth noting that the state spends about £70 billion on means-tested benefits and tax credits to those whose incomes excluding such payments would be below the poverty line. Other things being equal, improved market incomes would reduce such expenditure, but a system capable of eradicating poverty might increase it.

This report therefore focuses on two identifiable costs of poverty:

The **public service cost** part of the calculation derives from a wide range of evidence associating higher poverty levels with increased spending on various services. This is taken as an indication of how additional expenditure is required as a result of people's experience of poverty, and of experiences closely related to poverty. Poverty and social disadvantage affect people's lives in various ways that trigger additional public expenditure. In some cases, this is because of damage that poverty does to people's lives, such as the worse health of people in poverty, which necessitates additional health care spending. In others, the public services seek to intervene early to avert potential consequences of poverty, or to help people in poverty overcome reduced opportunities, for example by spending more on their education. Some additional spending is linked directly with their need for material help, such as in obtaining affordable housing. What all this spending has in common is that it tries to compensate for the damage caused by poverty, whether in terms of outcomes or opportunities.

Most of the evidence on services involves comparing spending levels across small areas with different poverty rates; some of it also draws on differences in use of services by individuals according to their poverty status. Such differences must be regarded as indicative of poverty costs, rather than as direct measures. Several factors must be taken into account when interpreting them:

- While some effort has been made to control for factors that can influence both poverty and spending on public services, these associations between higher spending and the extent of poverty do not necessarily demonstrate causation.

- This association, however, has been shown to be more than merely incidental. There has been ample evidence elsewhere to show how poverty can increase people's chances of requiring various forms of public assistance or treatment (for example via its effects on health), and some services are particularly designed to target people in poverty or material need (such as additional educational help for children in low income families), or to target deprived areas (such as area regeneration programmes).

- The precise extent of additional spending measured in this way is affected not just by the additional needs that poverty creates but by the degree of responsiveness in services in meeting them, which is not a constant. For example, where spending on a service becomes more focused on disadvantaged groups (such as when the Pupil Premium was introduced in schools), it may appear that the cost of poverty is rising, whereas if services in general are cut, or individuals required to pay privately for something that previously had been public, it may appear that the cost is falling. In other words, our estimate is a snapshot of the expenditure which appears to be associated with poverty at a point in time, given the policies and budgets applying at that time.

- The nature and strength of the evidence examined here is varied. In turning it into estimates of the cost of poverty, the analysis below tries to steer a reasonable path between high and low estimates, where possible taking a middle position, but the patchy nature of some of the data is another reason for treating the figures as indicative.

For the above reasons, the following estimates must be seen as illustrating how a very large amount of public service spending is addressing poverty and its consequences, but should not be treated as a means of monitoring accurately what poverty actually costs in every service from year to year. A concerted effort to eradicate poverty may well involve spending more initially on services that help break the long-term cycle of family poverty and its consequences, but bring longer-term social and economic benefits. Moreover, given that poverty so often goes hand in hand with other social disadvantages, the costs measured here would not be avoided merely by bringing people's incomes above the poverty line without tackling other associated forms of disadvantage.

The findings identify additional spending of £69 billion a year, or 20 per cent of the relevant service areas. Over 40 per cent of this total comes from health care, and most of the rest from school education, justice, children's and adults' social services and housing:

- **Health care** accounts for the largest portion of additional public spending associated with poverty, around £29 billion per year. There is a growing weight of evidence that health care utilisation and costs are strongly related to poverty, both as presently experienced and as a legacy from past experiences of poverty. This helps explain why, on the basis of multiple strands of evidence and using conservative estimates, around a quarter of all spending both in acute hospital care and in primary care can be attributed to greater use of these services by people in poverty. This difference is particularly great among adults of working age, for whom early onset of various conditions is more common among those on low incomes. Since health care is by far the biggest public service in the UK, this creates a huge additional cost. Three quarters of this comes from spending on acute care, due to the higher overall spend in this sector compared to primary care.

- **Schools** spending related to poverty accounts for around £10 billion of the annual cost of poverty. Like health, this is a very large service which costs more to deliver for those from disadvantaged backgrounds. There is acknowledgement that children in poverty are falling behind, and that schools need to make efforts to close the achievement gap. The introduction of the Pupil Premium in 2011 was an explicit acknowledgement that more needs to be spent to meet the needs of children in poverty, and has contributed to the growth in the public cost of child poverty since the original calculation in 2008. An increase in the targeting of resources within local authorities has also contributed to this growth, and just under 20 per cent of schools spending can be attributed to more being spent in areas where there is a greater take-up of free school meals.

- **Police and criminal justice** account for £9 billion of the total annual poverty cost. Crime is highly concentrated in poorer areas, and analysis of a range of statistical associations produces an estimate that just over half of all crime-related expenditure can be attributable to the additional crime

associated with poverty. This does not mean that crime would immediately halve were poverty to be eradicated, but the evidence suggests that over time, addressing the conditions in which crime has thrived would make a major contribution in reducing the incidence of offending and the associated public costs.

- **Children's services,** including both children's social services and early years provision, are estimated to include £7.5 billion additional spending associated with poverty. As with education, the relationship between child poverty and poor outcomes has caused services to focus on giving children from disadvantaged families a better start in life, and take-up of various early years services is greater among families in poverty. On this basis, about 60 per cent of spending on family services and 40 per cent of early years provision can be attributed to poverty.

- **Adult social care** is associated with £4.6 billion of the cost of poverty. This is one of the largest areas of local authority spending, with a significant degree of means testing of clients, and one for which demand is growing rapidly. Slightly over half of the additional cost is linked to services for younger adults, the remainder associated with older people. For these services, the relationship between expenditure and poverty mirrors that of the health sector, and accounts for around a quarter of all expenditure.

- **Housing** adds £4 billion to the annual public service cost of poverty. Social housing is targeted at people of limited means, and significant proportions of provision can be linked to low income. However, total spending on social housing is far lower than services such as health and education. Investment in new housing accounts for only a small part of the cost, with more coming from investments to improve existing housing stock and recurring expenditures on items such as homelessness.

Other areas with more minor costs attributable to poverty identified in this report are: public health, higher education, fire and rescue, transport and environmental services.

Certain **knock-on effects** of poverty can be identified through long-term studies that track individuals and show to what extent those who have previously experienced poverty have worse economic outcomes, such as higher unemployment rates or lower earnings. The greatest scope for such analysis is in comparing childhood experiences of poverty with outcomes in adulthood. The knock-on impact of experiencing poverty as an adult is harder to discern, since future outcomes may be linked to the same factors (such as low qualifications) that has caused someone to have low income in the first place.

In total, knock-on effects of £9 billion per year have been measured by this study, although the difficulty in identifying long-term effects suggest that the true cost is much higher:

- £4 billion in *lost tax revenues,* associated with 13 billion in lost earnings of individuals who have grown up in poverty. This is based on updated figures using the previous (2008) study's analysis of the earnings of adults according to whether their families had experienced hardship when they were teenagers, controlling for other factors. The £9 billion of these earnings that would have been retained by individuals are not counted as part of the cost in this report, as it focuses on public revenues, but this could also be regarded as a social cost in terms of reduced economic activity.

- £2.4 billion in *additional benefits* paid to the additional number of adults not working as a result of people having grown up in poverty, also based on the modelling in the original 2008 study.

- £1.4 billion in *Employment and Support Allowance* attributable to higher claim rates in poorer parliamentary constituencies. This is associated with evidence that the experience of poverty has serious long-term consequences for physical and mental health, and therefore helps explain why in deprived areas more people receive benefits related to health and disability.

- £1.3 billion in *Pension Credit* attributable to higher claim rates in poorer areas. People receiving the means-tested Pension Credit have been unable to build up sufficient retirement income of their own, and this is linked to poverty and low income throughout working life.

It will be noted that the identified 'knock-on' effects of poverty, especially during adulthood, are considerably smaller than the current effects measured in this report (although in absolute terms, both are large). This should *not* be taken to suggest that costs of poverty linked with current services spending are much larger in size than the longer-term impact on people's ability to earn, and hence tax receipts and benefit payments. The problem is rather that such knock-on effects are difficult to count. Simply showing that people in poorer areas have less earnings power and more need of help from the state is largely tautologous. Demonstrating that it arises from past experience of poverty is not easy. The specific estimates of knock-on effects included here are likely therefore to be only the tip of the iceberg.

In conclusion, this study shows that over four per cent of GDP (£78 billion) can be associated with the cost of poverty. This is slightly more than the entire public deficit last year. The purpose of the study is illustrative rather than being a precise calculation: we have drawn attention to many reasons why the costs we identify may not disappear entirely were everybody's income to be brought above the poverty line. Nevertheless, the magnitude of these figures suggests that tackling poverty effectively would bring huge rewards. About a fifth of spending on public services is associated with poverty, and much of this is devoted to remedying its effects. Putting public effort into helping people thrive is ultimately more fruitful than having to spend money picking up the pieces of broken lives.

1 Introduction

The persistence of poverty is a scar on rich countries. The United Kingdom collectively earns £1.9 trillion a year (GDP), equivalent to £29,000 for every man, woman and child in the country. Yet around half a million citizens visit food banks each year (making a total of over a million visits: Trussell Trust, 2015) , and over one in five families with children are at least 25 per cent short of having the minimum income that people think is needed to participate in society (Padley *et al.*, 2015). The consequences of poverty fall first and foremost on those who experience it, who face financial and material hardship and social stigma.

Yet poverty is also costly to society as a whole, in both intangible and tangible ways. The divisions and insecurities that it can create are impossible to quantify fully, but are illustrated in the resources that some families are willing to devote to keeping *away* from poverty, including in choices of where they live and where their children go to school. A recent illustration of this is the advent of 'poor doors' on mixed-tenure estates, to keep tenants of affordable housing apart from their wealthier neighbours (Social Integration Commission, 2015). Wilkinson and Pickett (2009) suggest that less equal societies are also less happy societies, and the presence of a group of people without the resources to participate fully in society clearly has consequences beyond their own private hardship.

Some negative consequences of poverty to society as a whole are more quantifiable than others. This report seeks to identify some measurable consequences of poverty to the economy and to the public purse. In doing so, it recognises that this is only a segment of the overall picture of poverty's effects. However, by showing that even these quantifiable costs are very large, it seeks to demonstrate that poverty is bound to be costly for everyone, not just those directly affected by it.

The report updates and extends previous estimates of the cost of child poverty (Hirsch, 2008; Hirsch, 2013). It aims as far as possible to extend this to identifiable costs that arise as a consequence of poverty throughout people's lives.

Approaches to measuring and interpreting the cost of poverty

What to include

This report does not seek to place a value on the direct cost to individuals and households of suffering from poverty. Rather, it focuses on costs to the public purse of the existence of poverty. Broadly speaking, it uses income measures as indicators of poverty, particularly the common measure of living below 60 per cent of median income, while also drawing on evidence using other definitions of low income and deprivation.

Even in the context of its financial and economic cost to the Treasury, it is not straightforward to define the cost of poverty. An underlying difficulty is that the state can spend money both on trying to reduce poverty and on dealing with its consequences. Benefits to low income families can be seen either as a response to poverty (the consequence of households having too low market incomes) or as part of the solution (stable social protection is needed to avoid people falling into poverty). The same could be said of schemes to help people to avoid unemployment or get better jobs: in their absence, poverty would be higher, so to some extent they are responses to poverty that would otherwise exist, but this does not necessarily make them a cost of poverty that people have actually experienced. Other forms of social expenditure can be both a consequence of present poverty and an attempt to avert it in the future. For example, the state spends more on educating children who are in poverty, to help compensate for disadvantages which could otherwise cause family poverty to persist into the next generation.

The approach taken by this report is to count tangible costs that arise from the existence of current poverty, conceived as low final income, related to its consequences both now and in the future. Some of these costs relate to the damage caused by poverty (e.g. spending on poor health resulting from material

deprivation), some relate to giving help to relieve the difficulties of living on a low income (e.g. providing affordable housing), some seek to help people avoid passing on the effects of poverty (e.g. helping a disadvantaged child to progress) and some are the knock-on effects of poverty that these compensatory measures have not been able to address (e.g. the extra cost of supporting adults whose lives have been damaged by growing up in poverty). Insofar as today's preventative measures succeed, including these knock-on effects of past poverty may end up to some extent as over-counting (since future knock-on effects could be lower), but on the other hand it would be premature to conclude in advance that intergenerational effects will diminish greatly as a result of today's policies.

In taking the approach of looking at the effects of poverty as represented by low *final* income, the report notes but does not include the cost of benefits, except as knock-on effects of previous experience of poverty. In total, the UK spends about £46 billion on means-tested benefits, without which recipients are likely to have been below the poverty line. A further £29 billion is spent on tax credits, but an estimated 20 per cent of this goes to households not in poverty, even before tax credits, meaning that £23 billion could be associated with poverty (estimate produced by New Policy Institute for this exercise, 2015). These sums are not included in the total figure in this report because to do so could imply that there is some means of eradicating poverty that makes financial support for households on low market incomes unnecessary. While some measures to improve market incomes could in themselves reduce the need for benefits, there will always be a need to support those unable to escape poverty through their own earnings. Any comprehensive anti-poverty strategy will need to combine measures that allow people to fulfil their potential, reduce their costs and support their incomes through adequate social security. Given the fact that so many people relying on benefits at present fall below the poverty line, it is quite possible that such a strategy would involve spending more on benefits than today.

Most of the cost identified in this report is spending on public services

The biggest element of the cost of poverty considered below is how much public spending on services results from the existence of poverty. Poverty can trigger additional service spending in various ways. These include:

- Spending that arises from spending triggered by particular needs, where poverty increases these needs. The clearest example of this is health care. The greater incidence of ill-health among people on low incomes places additional demands on the health service.

- Spending that seeks to prevent or mitigate the effects of poverty on individuals and households and spending on services that address social problems that are greater in areas where poverty is high. Were poverty not to exist, how much less would need to be spent on such services? This report estimates such costs by comparing expenditure in areas with higher and lower levels of poverty and deprivation. In doing so it controls for some characteristics of these areas that would still be present were poverty not to exist – such as an older demographic profile that contributes to higher expenditure on health care. This exercise is far from perfect, since poverty and other social problems are intertwined, and nobody can say exactly what a world without poverty would look like. As far as possible, we control for factors other than poverty that may be contributing to higher spending, but where such factors interact so closely with poverty itself that their separate effect cannot be controlled for (such as high unemployment), we label the associated additional spending as a poverty cost. Thus, the estimate can be interpreted as illustrating the extent to which poverty and the conditions surrounding it bring additional costs to the Treasury. Better-off households can to some extent shield themselves from the direct effects of poverty by trying to limit their interactions with people on low incomes, but they will still have to help pick up the bill for the social problems that result.

Knock-on fiscal costs

In addition to higher spending on services, poverty can cause damage to individuals that affects their future economic fortunes and thereby has consequences for the public purse, both by lowering the tax base and by raising the future support that the state pays to families on low incomes. There will also be other knock-on effects, including on future services spending, but it would be difficult to distinguish

these from current service spending without risking double counting. (In a 'steady state', part of the higher current service costs identified in deprived areas will reflect the fallout of previous experiences of poverty by these areas' residents.) Estimates of the long-term effects of poverty in this report are therefore confined to effects on the public purse via taxes and benefits. Such effects are not easy to measure because of the many factors that affect people's earning capacity, of which past experience of poverty is only one. However, modelling work based on cohort studies has shown clear evidence that children who grow up in poverty have worse employment and earnings prospects in adulthood, even after controlling for other factors. Moreover, in more limited ways, it is also possible to observe knock-on effects for low income in one period of adulthood for the capacity to generate income later on in life, and some cautious estimates of the cost of this are possible.

Principles of estimation

It is important to emphasise that the estimate of the cost of poverty produced in this report is an illustration of the kind of costs that poverty can bring to society, not a comprehensive or precise calculation. Our estimates are therefore taken with some caution. The nature and strength of evidence is highly variable in different areas of this study. Where evidence is weakest, the estimates seek to err on the most cautious side. Where the magnitude of an effect is subject to a range of values depending on assumptions, we generally aim to take a middle assumption.

'Costs' identified in other studies that have not been included

There is no single 'correct' way to estimate the cost of poverty. It is worth noting that two other attempts to make such estimates, from the United States and Canada respectively, have taken different approaches from the present estimate for the United Kingdom.

Holzer *et al.*, (2007) considers the economic costs for the United States of children growing up poor. The resulting estimate is divided about evenly between a health cost, a crime cost and an output/productivity cost, with each of these reckoned to be around 1.3 per cent of GDP. The first two of these rely mainly on theoretical costs not included in the UK estimate. In the case of health, most of the extra cost is due to the value assigned to lost years of life due to the lower life expectancy of children growing up in poverty. The cost of crime figure is principally related to the theoretical monetary cost to people of being victims of crime, based on a question 'how much would you be willing to spend on measures that prevented you from being a victim of this crime?' Both these calculations are valid as economic valuations of damage caused by poverty. However, it is not possible to say that in the absence of poverty, GDP would be higher, or public spending lower, by those amounts. On the contrary, longer life expectancy might for example raise public spending on pensions or health care. Since the UK calculations have been made partly to investigate to what extent reducing poverty will bring offsetting financial benefits to the state and to society, it is not considered valid to include theoretical calculations based on how much people would value the absence of poverty and its effects.

Laurie (2008) estimates the cost of poverty to the province of Ontario, Canada, which was subsequently copied in other provinces. This study brings in a wide range of costs, but as the report acknowledges, most of the total is due to the assumption made about 'productivity'. This is essentially that poverty among the working age population is a reflection of the inability of working age people to realise their economic potential. The report therefore imagines how much privately retained income and income tax would increase if poor households were able to be more productive and had their income raised to that of the second quintile. This type of cost estimate is essentially different from what is being expressed in the UK report. The Canadian calculation largely adds up how much less income people have in aggregate as a result of being below the income poverty line, compared to if they were in the income quintile above it. In this respect, it simply gives a total of how much less people have on lower incomes than if they had higher incomes (while also observing that if people were better off they would pay more income tax). Note that while GDP and income tax effects are included in the estimate below, this is only in the context of future consequences of poverty in damaging economic potential, rather than an observation that low incomes exist at a point in time.

2 The public service costs of poverty

Rationale and methodology

The essence of the method used in this part of the study is to look at the relationship between spending on particular services and the poverty level of the people receiving them. In comparing groups of people who are poor with those who are not, we use two main approaches:

- comparing people who live in poorer/more deprived neighbourhoods with those living in less poor/more affluent neighbourhoods;

- comparing individuals/households who are poor, in various senses, with those who are not.

The main data sources we use are either administrative, for example budgeting/resource allocation systems or client record systems, or household survey-based, for example where questions have been asked about frequency of usage of selected local services. These data may provide direct numbers on the cost of service provided, but often they provide numbers of users or intensity of service usage, which then need to be linked to financial data.

In general, we take the average actual 'increment' in service spending associated with being poor as our measure of the 'cost of poverty'. The key underlying assumptions are these:

- Public services do respond, generally positively, to greater needs and demands associated with poverty/poorer groups.

- The current average degree of responsiveness of services to poverty is the measure used of the 'cost of poverty'.

- The extra service activity/spending associated with poverty can be predominantly attributable to poverty, directly or indirectly, rather than to some third or confounding factor.

There a number of limitations to these assumptions that need to be borne in mind. The way these assumptions apply does vary between different services, and by the same service it can vary over time. This variation is particularly significant for measurement purposes in the case of the first assumption, of services' responsiveness to poverty-related need. In some services, this is confounded to some extent by the 'inverse care law', which states that some more advantaged groups with 'sharper elbows' are good at getting access to services in inverse relation to need (Le Grand 1982; Goodin and Le Grand 1987). Even services structured to privilege more needy groups may vary the weighting they give to economic need, through changes in deprivation-related funding formulae or through the extent of programmes specifically targeted at more needy groups. This variable is important to bear in mind, because it can make it appear that poverty is becoming more 'costly' to society if policies become more focused on tackling it, or less costly if they become less focused. (While it could be argued narrowly that directing less money to help needy groups or areas is indeed a cost saving, there could be greater costs to the public purse later on if this unmet need causes people's lives to go into a downward spiral whose consequences the state eventually has to deal with.) This should make us cautious in particular about how we interpret any change in the measured cost of poverty over time.

In some cases the first assumption of directing help to those in need is reinforced by overt, institutional policies. For example, school funding in England contains a specific element called the Pupil Premium which gives more resources to schools with more poor children (measured by free school meals); this is overlaid on an existing set of national-to-local authority and local authority-to-school funding formulae which themselves include elements for poverty/deprivation/high/special needs. In other cases, the link

with policy is less direct, although it may provide implicit support to the above assumptions, as in the case of health care. Here, the measures we use are based on the actual use of services, which might be termed 'expressed need' or 'demand'. While there is quite a strong relationship with poverty, some might argue that this is not as strong as it should be. As discussed above, in some cases the 'inverse care law' means that better-off groups with lower needs secure better services, while in others there is a tilting of services towards the more needy but to different degrees over time. The second assumption bypasses the normative question of what is the 'right' degree of responsiveness of service to poverty, and reports on the current level as the de facto 'cost', limited to the amount that society is choosing to respond.

With regard to the first assumption, we recognise that there are some services which are either used more by the better off, or which are used fairly evenly across the socio-economic spectrum, or which are 'public goods', such as roads, which cannot be meaningfully allocated in this way. In all of these cases we score the cost of poverty as zero.

With regard to the third assumption, we do try where possible to control for possible confounding factors. For example, where we have suitable data, such as from a household survey or Census small area data, we test models using appropriate forms of regression analysis to try to pinpoint the specific influence of poverty while controlling for other potentially confounding factors, such as demographics (e.g. age). However, some judgement is used here in terms of which variables to include as 'controls' and which to exclude, on the grounds that they are too closely related to poverty to enable a reliable separation of their effects. Our approach could be characterised as 'giving the benefit of the doubt' to poverty. For example, in the case of health care, we omit variables relating to disability and long-term health conditions, because these are indeed strongly related to both health care service use and to poverty. It is also important to reiterate here that even where confounding factors have been controlled for, the associations measured do not demonstrate causation.

We therefore do not claim to show direct evidence of causal links between poverty and the additional spending incurred. However, it is important that a wide range of other research has shown that the need for such spending does arise from experiences of poverty. For example, poor health often reflects a history of poverty and disadvantage. It can also be argued that there are some causes of illness (congenital conditions, genetics, behaviour) which are independent of poverty but nevertheless more prevalent among lower income groups, such that even if poverty were eliminated, health spending would still be higher than it is at present for non-poor groups, even after a generation had passed (to pick up the longer term effects argument). Similar lines of argument might be developed around criminal justice – that part of crime may be attributable to a genetic component of 'criminal predisposition', for example. It is well beyond the scope of this study to measure the influence of such factors, and the results need to be interpreted with this caveat in mind.

In general, we place quite a lot of emphasis on evidence drawn from the analysis of service utilisation at small neighbourhood area level. This is because we believe it is quite powerful evidence, typically linking hard, 'big' data on actual service usage with a relatively sophisticated and well-established and accepted system for measuring neighbourhood deprivation. This small area relationship has the added advantage that it potentially shows the sum of all the ways poverty can influence spending in an area – through the long-term impacts on the local population, through the current effect on individuals in an area, and through current 'area effects': the disadvantage of living in an area where poverty is high. We regard small area variation as much more indicative of objective variation in need and demand than local authority level variation, which may be distorted by different policy responses of different councils (Carr-Hill *et al.*, 1997). This is particularly problematic now given the skewed nature of the cuts applied to English local government spending since 2010, which has substantially 'flattened out' the degree of discrimination between poorer and more affluent areas (Hastings *et al.*, 2015). In other words, spending on local government services in England has become less skewed towards poverty at local authority level, even though it may be becoming or remaining more skewed at individual and small area level.

Analysis of micro-data from household surveys can also be of value, particularly where the measure of usage allows quantification of the intensity of usage (e.g. frequency). It is possible with such sources to include a range of measures in regression models, not just demographic controls as mentioned above but

also different measures of poverty - both individual and neighbourhood-based. In some cases we can include indicators of past poverty and other experiences of deprivation.

As a point of detail, we generally look at data for neighbourhood deprivation across the bands of the Index of Multiple Deprivation (IMD) or its Scottish equivalent (SIMD). These bands are generally constructed from the overall score and ranking across all domains. However, when seeking a cardinal measure of poverty attributable to these bands, we generally use the IMD 'Low Income Score' measure, which is a valid, scale-independent continuous measure, readily interpretable as the proportion of the population who are in low income poverty, based on the take-up of means-tested benefits and enhanced by tax credit and taxable income data. (The index is based on the numbers receiving: Income Support, Jobseekers Allowance, Employment and Support Allowance, Pension Credit, a combination of Working Tax Credit and Child Tax Credit, and asylum seekers' subsistence support.) It can be shown that the low income score is very highly correlated with the overall IMD index. By using the low income score we can readily talk about the number or percentage 'in poverty' and attribute expenditure amounts to these people.

The sections of this part of the report discuss different services in turn. In each case we try to identify the relevant national totals of expenditure, distinguishing the four countries of the UK. While only some major elements of services are analysed specifically, we have to make some judgements about whether other elements could be assumed to have a similar relationship with poverty to those analysed, or alternatively no relationship. Such assumptions are necessary in getting up to an account of all relevant public expenditure in each country. Similarly, we typically only analyse services in one or two of the UK countries, and therefore make similar assumptions about the comparability of the other UK countries when 'grossing up' to a UK level.

Health care

Box 1: Overview of evidence and cost calculation for health care

Approach: The cost of health care associated with poverty is estimated in our main calculation in terms of additional uses of hospital beds or primary care by people living in areas where poverty is higher. Specifically, the aim has been to measure how much additional health care activity, particularly bed-days and prescriptions issued, is associated with higher rates of poverty in areas that are more deprived.

Evidence: Data comparing hospital bed-days/other episodes to poverty rates in small areas are available recently in Scotland, but in England we only have older data. In order to produce as robust a figure as possible, we have triangulated five main strands of evidence for acute health care:

- recent Scottish data on hospital episodes;
- older data on hospital bed usage from England;
- data from the health domain of the IMD for England considering differences in morbidity, mortality, and mental health disorders by small area;
- data from the UK Poverty and Social Exclusion Survey on self-reported health conditions in relation to poverty; and
- data on the actual resource allocation formula used in England.

For primary care, we combine analysis of primary care prescriptions data by small area deprivation level with analysis of GP consultation rates based on household survey data for Scotland.

For public health, we combine information on the breakdown of budgets with data on the geographical association of smoking and drug/alcohol treatment programmes with poverty.

Controls and interpretation of findings: The modelling used in these calculations corrects for certain features of local areas and/or individuals, other than poverty, that could help explain high health usage, including having a high percentage of older people or being an area where a high proportion of people have done jobs in certain industries. On the other hand, it has not been able to control for or separate certain factors with a closer association with poverty, for example smoking behaviour. Overall, we consider the evidence of the poverty-acute health care costs link to be strong, supported by previous research and the formal resource allocation system.

Result: All strands of evidence pointed to a similar proportion of both acute and primary health care costs, around 25 per cent, being attributable to poverty. This leads to an estimate of poverty costing **£21.8 billion** in additional spending on acute health care, **£7.1 billion** on primary health care and **£1.6 billion** on public health.

Health care is the largest service provision programme of public expenditure in Britain, second only in spending total to the 'Social Protection' programme which of course is mainly dominated by transfer payments (pensions, benefits, etc.), which are not considered in this study. Health spending increased rapidly in the 2000s and is formally 'protected' in current spending reviews, albeit still subject to 'efficiency savings' and absorption of significant cost pressures. Table 1 shows that health care spending, primarily through the NHS, accounted for £134.5 billion in total in the UK in 2014, about 23 per cent of all 'identifiable' public expenditure.[1]

Table 1: Health service expenditure across the UK by country, 2010 and 2014

Country	Health service expenditure (£ million)			
	2010 current	**2014 current**	**2010 capital**	**2014 capital**
England	94,147	108,000	4,206	3,731
Scotland	10,287	11,231	591	319
Wales	5,758	6,152	389	292
N Ireland	3,393	3,687	203	225
UK identifiable	113,584	129,070	5,389	4,567

Source: H M Treasury (2015), HMR_CRA_2015_Chapter_A_Tables A11
Note: At outturn prices.

Health care spending is important for this study, firstly because of its sheer scale, but secondly because of the growing weight of evidence that health care utilisation and costs are strongly related to poverty, both as presently experienced and as a legacy from past experiences of poverty. Health care will be a much bigger part of the story in this study than in the predecessor study, which only focused on child poverty, because the usage of health care by adult age groups is far greater than the usage by children, and as we show below the association with poverty is markedly stronger for adults than for children.

The analysis in this chapter will focus on the two largest components of health care spending, acute hospital services and primary health care services (mainly based around family practitioners/GPs), with briefer reference to some other elements (e.g. mental health, maternity, geriatric). We will draw particularly on evidence from administrative data on service utilisation – hospital episode statistics, prescriptions – and on household survey data about people's use of services such as GPs. These data are drawn from England, Scotland or both. In some cases, data from different sources can be 'triangulated'. With both types of data, we generally present a simple 'bivariate' analysis, showing the relationship

between utilisation and poverty, as well as some analysis using regression modelling to explore the influence of several measures of poverty while controlling for other socio-demographic and environmental factors thought to influence health. We also triangulate these estimates by utilising data from a large scale individual/household survey, the UK Poverty and Social Exclusion Survey. However, we start by reviewing the research and policy background to resource allocation in the health service.

Resource allocation research and policy

There is of course very extensive research on aspects of the relationship between poverty and health. This includes work on the causes and patterns of particular diseases (epidemiology) as well as more general work on the relationships between poverty, other socio-economic and demographic factors and morbidity and/or mortality. There is also growing attention given to the connections between health, behaviour and wider aspects of well-being and quality of life, and work on provision of and access to health care as they affect different groups. A strong theme in much recent work has been on persistent inequalities in health outcomes and the factors underlying these (Marmot, 2010; 2015; Dorling, 2013; Wilkinson and Pickett, 2009; Davey-Smith *et al.*, 2001), although some had pressed for attention to these issues much earlier (Townsend *et al.*, 1982).

It is widely accepted that, as shown in data presented below, there is rather a strong relationship between poverty and ill-health or poor health outcomes. What are less clearly understood and documented are the causal pathways that underlie and account for this strong association (Payne, 2006). More extreme and persistent poverty can clearly affect physical ill-health directly, for example through inadequate nutrition, or cold/damp/insanitary housing conditions. There is growing evidence and acceptance that an important causal pathway may run through mental ill-health, which is strongly affected by the stresses imposed by living in poverty while itself frequently triggering serious episodes of physical ill-health (Wilkinson, 1996; Payne, 2006, pp. 286–7; Layard and Clark 2015;). At the same time, there has also been growing public health concern about a range of behaviours which can have significant adverse impacts on physical health, particularly addictions such as smoking and alcohol, lack of exercise and poor diet. While such potentially damaging behaviours are also, to varying degrees, correlated with poverty, it may be questioned whether there is a necessary and unavoidable relationship involved, or whether individual agency and choice may be invoked, and possibly modified through different kinds of interventions and incentives. A further obvious point on causality is that it can run in both directions; in other words, some people may be poor because of their ill-health, for example preventing them from working, rather than vice versa.

It is also clear that current health status and use of health care services will reflect the accumulation of experiences over a lifetime (going back to the womb) as well as current experiences. So we would expect to find that the health status of somebody aged in their 60s today would reflect the conditions (including poverty) into which they were born and brought up in childhood, their experiences of poverty and other adverse life events/traumas over their adult life, including for example job loss, insecurity or unemployment, the physical and mental stresses of their occupation, quality of relationships, the quality of their housing and neighbourhood environment, and so forth. So the observed correlation of ill-health with poverty today may reflect all of these past influences as well as contemporary conditions. Conversely, it would also follow that, lifting people out of poverty today will not fully offset these past influences on current health status; it would take a long time for such socio-economic intervention to fully overcome accumulated adverse health factors. There has in fact been considerable research literature trying to untangle past and contemporary influences on health, based mainly on the longitudinal birth cohort studies (Power *et al.*, 1996, 1999; Manor *et al.*, 2001). These studies show that socio-economic status through childhood and later life stages has a cumulative effect on adult poor health, and that these effects do not primarily work through education or social mobility (so discounting one type of reverse causation account). These studies also concluded that self-rated health and limiting longstanding illness are valid health measures.

It is not practical or appropriate to offer a comprehensive literature review on all of the relationships between health and poverty in the context of this study. So far as the issue of the public service costs of poverty are concerned, probably the most important aspect of research and policy is the resource allocation mechanism used for NHS services. Here, we can point to an extended story of a system paying

increasingly sophisticated attention to evidence of the relationship between measures of health care needs, including those associated with socio-economic background, and the resources allocated to health services/providers to respond to those needs. In the 1980s a system was progressively introduced known as RAWP ('Resource Allocation Working Party') which based health care need on a combination of population age structure and standardised mortality ratios, as a proxy for differential incidence of ill-health-related need (Mays and Bevan, 1987). In the 1990s this was criticised for not measuring morbidity and health care need more directly, and was supplanted by a system based on the statistical analysis of health care service utilisation at small area level, which also took account of variations in supply/availability of services (Carr-Hill *et al.*, 1994; Diderichsen *et al.*, 1997; Morris *et al.*, 2004). This system was in place for a considerable period but again became exposed to some criticism, for example for not recognising the interactions between age and deprivation weightings, not reflecting direct epidemiological and survey-based morbidity evidence, and not considering evidence of systematic differential budgetary pressures (Asthana *et al.*, 2004; Asthana and Gibson, 2008, Stone and Galbraith, 2006).

The whole issue was subject to a comprehensive review in the 'CARAN' study (Morris *et al.*, 2007), which put these critical comments and suggestions to a range of systematic tests. The current methodology in England builds on these earlier models and reviews, but moves to an 'individual level' model capable, in principle, of allocating resources to a lower 'GP practice' level (NHS England Analytical Services, 2014; Bardsley and Dixon, 2011; Dixon *et al.*, 2011). It should also be mentioned that there has been a parallel process of development of resource allocation formulae in Scotland, where the current 'NRAC' formula of 2009 replaced the 'Arbuthnott' formula of 2001, which itself replaced the 'SHARE' formula dating from the 1970s (albeit the basic structures of these formulae are claimed to be very similar). Evidence that allocating more resources to deprived areas makes a worthwhile difference to outcomes is presented in Barr *et al.*, (2014).

It is particularly pertinent to look at the way poverty and other socio-economic factors are reflected in these allocation formulae, alongside demographic age factors, and cost-related factors (higher employee and property costs in London, and rural cost factors). The model now used for the main resource allocation target for clinical commissioning groups under 'Person-Based Resource Allocation' in England is based on statistical prediction of health care utilisation costs, and includes (a) individual level factors of age and sex, prior diagnoses in previous years, and use of private health care; (b) small area level socio-economic factors indicating poverty (social renting, disability living allowance claims), educational disadvantage (adults with no qualification, students), income (area type='mature city professionals'), and health needs (asthma prevalence); (c) supply variables (e.g. quality of stroke care, MRI imaging access, catchment population of main trust) plus dummy variables for Primary Care Trusts (Dixon *et al.*, 2011; Bardsley and Dixon, 2011). It can be seen that 'poverty', or socio-economic disadvantage, is represented, more indirectly than directly, by a number of these variables. But perhaps more importantly, insofar as ill-health reflects poverty and socio-economic disadvantage, it will also be reflected indirectly through the prior diagnoses factors under (a) above. Furthermore, the overall resource allocation makes an additional adjustment for 'unmet need', recognising that some people/groups have health needs which are not met by the existing system; an arbitrary 10 per cent of resources are allocated to this, distributed in proportion to the standardised mortality ratio for under-75s (times population); this factor will also be correlated with poverty.

It should be noted that this allocation formula generates a target level of resources. The actual allocation is governed by the previous year's allocation, the 'distance from target', and a general 'pace of change' factor. Thus, actual allocations will be a weighted combination of the new target, earlier formulae/targets, and historic spending patterns. The main point to underline is that the formulae and targets entail a substantial skewing of expenditure towards poorer areas and populations, as a result of the combination of effects described above. This can be seen from Table 2, which shows the pattern of targets (£ per head), adjusted crudely for age mix of population, across the gradations of area from affluent to poor, using quintiles of the 2015 IMD 'Low Income Score' measure.

Table 2: Relationship of 2013 resource allocation target for clinical commissioning groups in England to poverty level

Income deprivation quintile (clinical commissioning groups)	Low income score	Age-adjusted target £ /head
Q1 (least deprived)	0.082	991
Q2	0.115	1043
Q3	0.142	1098
Q4	0.174	1180
Q5 (most deprived)	0.225	1325
Total	0.147	1125
Difference (Q5-Q1)	0.142	334
Average cost of poverty		344
Percentage of total cost		30.6%

Source: Author's analysis of clinical commissioning group allocation table data linked to ID2015 Low Income Score.
Note: Simple age-adjustment performed using data underlying Table 3

The (age-adjusted) spending target rises from £991 in the least poor quintile (of clinical commissioning groups), where 8.2 per cent of people are on low income, to £1,325 in the poorest quintile, where 22.5 per cent of people are on low income. From these differences we can infer an average extra cost per unit of poverty, and then multiply this by the mean level of poverty to give the part of the spend per head that can be attributed to poverty, which is £344 per head or 30.6 per cent of overall expenditure target. In other words, in gross terms, it appears that the mainstream health care formula in England is allocating nearly one third of expenditure in proportion to the poverty level, or other factors that are correlated with it. It is doing so primarily because the evidence from the statistical model is that poverty and associated factors explain a significant part of health care utilisation and expenditure; a secondary factor is the additional 10 per cent allowance for 'unmet need'.

Acute health care

Administrative data on hospital episodes for England linked to intermediate geography and deprivation levels are in principle obtainable from the Health and Social Care Information Centre (HSCIC). However, the process of gaining agreement to access these data could not be completed within the lifetime of this project. Similar data for Scotland were ordered from the Information Services Directorate of NHS Scotland, and were delivered within a couple of months. For England, we used an earlier dataset on acute hospital in-patient activity from 2005/06 to get a first set of estimates.[2]

Table 3 show the results of the analysis, based on an analysis of utilisation (bed-days) shown in Appendix Table A1. The rows of the table represent IMD deprivation deciles, numbered in column two from best to worst, with the corresponding low income poverty score shown in the appendix tables. The analysis shows the number of acute bed-days attributable to each decile for each age group, divided by the relevant population. It can be seen that in each case these rates of utilisation rise as you read down the table, but also that utilisation is much higher for the older age group, and lowest for the child group. More detailed analysis (see appendix) shows the increase in bed-days-per-head per for each band, relative to the level in the lowest deprivation band. In general these are positive, and consistently increasing. By taking the increase to band 10 over band 1, and dividing by the corresponding increase in low income poverty score, we obtain the marginal effects of poverty on utilisation, if we assume it to be constant. Basically, a poor child will use 0.36 more bed-days per years, a poor adult of working age an extra 1.41, while a poor pensioner will use 5.36 more bed-days per year.

Table 3 shows the results of multiplying through by these factors, the poverty rates and the populations, and a unit cost (£568 per bed-day) spread across the bands, and then totalled up for England. It suggests

that in 2005/06 the extra acute health care costs for England were £ 0.33 billion for children, £3.87 billion for working age adults and £4.95 billion for retirement age population, giving a grand total of £9.16 billion. The overall share of the spending which is attributable to poverty on this basis is 36.8 per cent, which is a fairly high figure. The share is lower for children (27.3 per cent) and moderately higher than that for older people (31.3 per cent), but very high indeed for working age adults (49.4 per cent). This perhaps reflects the serious illness often associated with poverty/deprivation, which kick in during middle age and often lead to premature death.

Table 3: 'Excess' poverty-related costs and total costs for acute in-patient activity, England 2005/06, and implied costs for 2014/15*

IMD band	Excess in-patient cost of poverty by age, England 2005/06 (£m)			Total cost of acute hospital in-patients by age, England 2005/06 (£m)		
	0–14	15–59	60 plus	0–14	15–59	60 plus
1 (10% least deprived)	7.1	86.7	144.1	98.7	503.4	1336.8
2	10.3	131.5	225.8	102.1	560.0	1565.2
3	13.0	170.7	287.5	100.2	594.2	1632.0
4	15.7	209.6	343.3	106.9	654.9	1721.3
5	19.1	260.7	405.6	112.8	710.1	1769.7
6	25.0	332.8	481.5	120.9	798.1	1811.7
7	33.7	431.7	581.5	133.2	892.6	1781.5
8	47.3	583.1	694.8	152.9	1017.5	1802.4
9	68.0	748.6	839.5	181.4	1178.3	1809.3
10 (10% most deprived)	105.2	1005.0	1086.2	226.7	1439.1	1894.5
All areas (£m)	337.3	3873.6	4945.6	1236.9	7844.8	15787.5
		All ages	9156.6		All ages	24869.2
Share of total cost	27.3%	49.4%	31.3%			
		All ages	36.8%			
(£568 /bed-day is unit cost 2005/06)						
Equivalent excess cost England 2014/15 (£m)				England total acute spend 2014/15 (£m)		
	18,713.5			50,825.7		

*Note that this analysis is based on 2005/06 data, pending delivery of 2014 data by HSCIC

Applying the same average share (36.8 per cent) to the estimated acute sector spending level in 2014/15 (roughly double, in nominal terms, at around £50 billion) would give a total cost of £18.7 billion for England. However, we must caution that this estimate looks on the high side, when compared with further analyses of more recent data including modelling to allow for other influences alongside poverty, as discussed below. For example, from the Scottish analysis of comparable data we can see that the 'simple' estimate is markedly higher than the modelled estimate after controlling for other factors (Table 4, comparing rows 1 and 2).

It is possible to use data published in the census, on self-reported ill-health and disability, and model this at a relatively small geographical area, including control variables for some of the other possible influences, to get a different measure of this key variable, the share of health care attributable to poverty. Of course ill-health is not the same as receiving health care treatment, and this measure may be biased. However, it is also noteworthy that the 2015 version of the IMD in its health domain combines this information with administrative data on premature mortality, emergency hospital episodes, prescriptions and benefits data to provide quite a rich picture. We make use of this index below.

We are not able to go beyond this relatively simple method with the 2005/06 acute bed-days dataset for England. However, we are able to apply somewhat more elaborate methods involving the use of regression analysis, to allow for different measures of poverty and control for socio-demographics, when looking at other data for England as well as at comparable acute bed-days data for Scotland.

There is also the issue of the time lapse and whether the distributional pattern will have been static over this period of nine years. In general, we observe that these patterns do not change in a dramatic way from year to year. Longer term trends could push it either way – improving health generally may reduce some inequalities, as can be seen in some data such as mortality. However, the health services has become more aware of, and more tasked towards, tackling health inequalities (Marmot 2010, 2015; Morris *et al.*, 2007; Dixon *et al.*, 2011), which could be expected to lead to rather more skewing towards poverty. These two effects might be offsetting.

Acute care in Scotland

New data provided by the Information Services Division of the Scottish Government provides an analysis of total in-patient episodes and average length of stay, together with out-patient and day case episodes, for 2014–15, broken down by three age groups (children, working age, older) across 1,277 'Intermediate Zones' covering all of Scotland. It excludes mental illness/psychiatry, maternity and geriatric long stay, which we make separate estimates for. The intermediate zones are a convenient geography which enable analysis linking to background socio-demographic, physical/geographical and environmental factors while avoiding problems of extreme values or missing/suppressed data which would be associated with using the lower standard units (datazones in Scotland).

This enables us to run models for the level of acute health care activity that can control for many of the potentially confounding factors which may affect the apparent relationship between activity and poverty. As in other applications, the aim is to include variables which represent factors expected on the basis of wider literature to affect health care demand, alongside an appropriate measure of poverty. This may include variables which reflect conditions in the past, which still affect current levels of ill-health. In arriving at a preferred model we exclude variables which are not statistically significant, some variables which have an effect contrary to the expected direction (which cannot be rationalised), and variables which are very highly correlated with poverty. The resulting models do in some cases retain variables within them which are moderately correlated with poverty and may be considered to be in part representative of 'indirect effects' of poverty. However, in calculating a 'percentage attributable to poverty', we only use the main poverty variable. In this case the poverty variable is a composite based on the average of two components of the suite of indicators developed by Bramley and Watkins (2013)– low relative equivalised income after housing costs and material deprivation (lacking three or more items).

An example of the kind of regression model derived is provided in the Appendix (Table A2), this being that for in-patient bed-days for 15–59 year olds (per 1,000 population in that age group). The model is reasonable although the overall level of fit is not that high (22 per cent of variance is explained). The poverty measure is the most powerful single variable.[3] This means that that an area which has a poverty rate higher than average by the amount of the average variation in poverty will have in-patient bed-days which are higher by one third of the amount of the average variation in bed-days. The model also includes demographic factors (one person households, associated with higher utilisation, and student households associated with lower), housing factors (crowded housing shows a positive association with acute hospital utilisation, but a lack of central heating shows a negative association). It includes a measure of past industrial job structure, the proportion of construction workers in 2001, representing the cumulative health hazards of higher risk occupations. (This indicator is a rough proxy for an aspect of industrial structure affecting health)Two general urban form/environmental variables are included, the proportion of natural greenspace and the overall population density (a more general urbanisation measure), which are both associated with lower utilisation, allowing for other factors in the model.

The percentage of acute in-patient bed-days (and, by implication, spending) for this working age group attributable to poverty, based on this model, is 45.5 per cent of the overall spending analysed. This is at the high end, across the models for different age groups and types of care, as shown in Table 4. In

general, the poverty effects are greater for working age and less for both children and older people; they are also greater for in-patient days than for out-patient episodes, with day cases more similar to the in-patient case. Out-patient episodes are the least costly category, and may capture more 'screening'-type activities taken up more by middle class people.

Table 4 presents the picture as described above. Taking an overall cost-weighted average it turns out that just under 25 per cent of main acute health sector costs can be attributed to poverty, following this methodology. This is a conservative figure which excludes indirect effects through, for example, housing variables like 'crowding'. We make various estimates for the parts of acute/hospital and community–based care which are omitted in the above figures. For mental health, we use an individual survey-based modelling procedure, using the Poverty and Social Exclusion Survey, as described below. This yields an estimate of 27.5 per cent of mental health problems being directly and indirectly related to poverty. For maternity, we use the share as estimated in the Hirsch (2008) study (24.7 per cent). For geriatric long-stay we apply a figure (19 per cent) which is just marginally below our modelled share of in-patient activity for the 60+ age group. As the bottom line shows, taken together with our primary care estimate (described below) we end up with an overall poverty-related share for health services in Scotland of 25.1 per cent.

Table 4: Summary of shares of activity attributable to poverty based on simple analyses and regression models by type of care and age group with associated total costs, Scotland, 2014/15

Type of care	Children 0–15 (%)	Working age adults 16–59 (%)	Older people 60+ (%)	Weighted average (%)	Poverty cost (£m)	Total cost (£m)
In-patient – simple	43.5	72.8	48.1			
- regression model	18.5	45.5	20.0	25.7	1477	5752
Out-patient						
- regression model	15.1	15.8	5.2	7.8	18	234
Day case						
- regression model	19.4	39.6	15.5	21.0	73	347
Subtotal				24.8	1569	6334
Mental health				27.5	249	905
Maternity				24.7	86	347
Geriatric long stay				19.0	108	566
Primary care				26.4	649	2460
Total health cost in Scotland				25.1	2,660	10,612

An alternative measure for England

Although we have not been able – within the lifetime of this project – to obtain specific up-to-date information from HSCIC on hospital episodes in England, we have been able to make indirect use of such information as part of a wider composite index, namely the Indices of Deprivation for 2015 (ID2015) Health Deprivation and Disability Domain, which is published at LSOA and MSOA levels (lower and middle layer super output areas, which give statistics for small geographic areas in England and Wales). This index is composed of four components, with roughly equal weighting:

- years of potential life lost (an age and sex standardised measure of premature death);
- comparative illness and disability ratio: an age and sex standardised morbidity/disability ratio;

- acute morbidity: an age and sex standardised rate of emergency admission to hospital;

- mood and anxiety disorders: a composite based on the rate of adults suffering from mood and anxiety disorders (from prescriptions), hospital episodes data, suicide mortality data and health benefits data.

It can be seen that this index is driven by some of the same data sets which we have been using, and some others, but aims to highlight the *varying part* of ill-health and health care demand, the part that is more likely to be related to poverty and other social and environmental disadvantages. It is also a standardised index centred on zero which can take negative values. In order to turn it into a cardinal number which can act as a proxy for the total volume of health care demand, it is necessary to add a constant term and rescale it. The constant term represents the part of health care demand which is universal and primarily determined by demographics (population by age, particularly). The scaling factor is to put it into units analogous to bed-days or expenditure per head of population. The values chosen for these transformation parameters were based on the observed characteristics of the Scottish episodes data (i.e. maximum and minimum values across intermediate zones, relative to mean values) and also the census self-reported bad health and disability indicators. The former are directly comparable, albeit assuming that the degree of variation is similar between the two countries. The latter have been shown to be good proxies for health care need (Manor *et al.*, 2001).

We then run a regression model on this pseudo index, as reported in Table A3 in the Appendix. The fit of this model is remarkably good, explaining 83 per cent of the variance. Most of the explanatory variables have effects in line with expectations, including the low income score poverty measure which has a standardised beta regression coefficient of 0.59.[4] Apart from poverty, heavier health care demand is associated with older age, low value housing, past employment in construction, the presence of institutions such as nursing/care homes, mental hospitals or prisons, and urban rather than rural areas, including areas with more air and traffic pollution. The share of this volume measure attributable to poverty is 25.3 per cent, remarkably close to the composite figure derived from our more detailed analysis of Scotland.

In the light of the findings from Scotland, reported above, the analysis of a 'pseudo-health care-cost' measure based on ID2015 just discussed, and micro-analysis of the Poverty and Social Exclusion Survey (reported below), we conclude that the share of acute care in England attributable to poverty is about **25.4** per cent, giving a total annual cost in 2014/15 of **£17.75 billion** for England and **£4 billion** for the rest of the UK.

Primary care

Primary health care essentially refers to services provided in the community by GPs and allied services. Richer data are currently available on these services in Scotland, so we concentrate our analyses on this part of the UK. It is assumed that the broad pattern in terms of the relationship with poverty is similar across the rest of the UK.

For the primary care sector in Scotland we have two distinct data sources, which enable some 'triangulation' of findings. The first of these is relatively newer, and comprises analysis of the administrative data on all prescriptions issued by the Scottish NHS primary care sector over three years (financial years 2012 to 2014). The rationale for using prescription data is (a) that the cost of prescriptions is a significant part of the NHS budget, while (b) the volume of prescriptions may be taken as a reasonable indicator of demand on GP services – most GP visits generate a prescription, while people with more numerous or costly prescriptions have more serious or chronic conditions which are likely to generate more consultations. A further rationale, for future more refined studies, is the possibility of looking at groups of types of prescribed medicines, which are associated with groups of conditions, for example mental health conditions.

Three variables are supplied, broken down by deciles of the SIMD – number of dispensed items, dispensed quantity, and gross ingredient cost – we use the third of these, as it is closer to 'expenditure', but in practice the relative distributions of the three variables are similar. Table A4 in the Appendix shows the figures for three financial years up to 2014, confirming that the pattern is fairly stable. We perform a

similar analysis to that undertaken on the acute sector data above, using the difference in prescription cost per head of population, between SIMD bands 1 and 10, divided by the difference in poverty rate, to get a prescription cost per unit of poverty measure. This is then applied to the average poverty rate and the Scottish population to yield a total cost, which is £225 million in 2012 or £242 million in 2014. Expressed as a percentage of the total cost of prescriptions these are 25.5 per cent and 26.2 per cent respectively.

The other source of evidence on primary health care, again for Scotland, is the self-reported usage frequency of selected services, including in this case GP Surgeries, as recorded in the Scottish Household Survey (SHS) for 2012. We use these data to provide an independent comparator with the prescription-based estimate above, both using a similar 'simple' method of inference, and also a slightly more sophisticated regression approach.

Table A5 in the Appendix shows the result of the simple approach, essentially the same as that described above, but this time with the units of service utilisation being annual frequency of visit.[5] Taking the difference in frequency between the most and least deprived, and dividing by the difference in poverty rate, we obtain a marginal cost of poverty factor. This is then applied to the average rate of poverty to generate a value for the frequency of visits attributable to poverty. This turns out to be 1.47 visits per year, which represents 24.3 per cent of the total visits.

It is remarkable that this figure is so close to the 25.5 per cent derived from the independent data source and method described above, and gives more confidence that this is the right order of magnitude for the primary health care sector.

However, we are able to go somewhat further, by running regression models within the SHS micro-dataset. Table A6 in the appendix illustrates this approach. The observations are adults in Scotland, and the model tries to predict their frequency of usage of GP surgeries using three indicators of poverty and a number of other demographic and environmental factors. Indicators of poverty in this model include the low income score (in per cent) of their SIMD quintile, receiving benefits and having an equivalent income of less than £300/week, and reporting financial difficulties (e.g. falling behind with bills) and having similar low income (in other words, one area-based and two individual household-based measures of poverty). The demographic indicators include different age groups, being female, married, etc.), while the environmental indicators include living in a house in poor condition, having an entrance at basement level or on higher floors, or living in a rural area.[6]

The effects of poverty are summarised as the average 'effect' of each poverty indicator (product of its coefficient and its mean value) across the whole sample population (Table A6 in the Appendix). So the average effect of neighbourhood deprivation is 1.29 visits per year, while (allowing for that) the effect of being on benefits and relatively low income is another 0.35 visits, and the effect of being in financial difficulty and on relatively low income adds another 0.11 visits. The sum of all of these effects, for the average person in Scotland, is 1.75 visits, which is 29.0 per cent of the overall average number of visits. This 29 per cent share is slightly higher than the c.25 per cent found by the simpler method.

Different versions of the regression model give different percentages. A simpler model that only includes the three poverty variables gives a 27.4 per cent share. A slightly more detailed model that includes extra variables for disability, lone parent household, and being in work, has somewhat higher r-squared but shows a rather lower percentage of GP usage attributable to poverty (21.9 per cent). However, this model is not preferred, because each of those additional variables is quite strongly related to poverty (disabled, lone parent and non-working adults are all known to be much more at risk of poverty). Because we cannot easily separate the poverty effect from the demographic effect here, we omit these variables from the preferred model, but recognise that thereby we are capturing the effect of poverty and closely related factors.

Overall, the results of the modelling confirm that the simpler approaches are in the right ballpark. Our preferred regression model suggests that as much as 29 per cent of primary care may be attributable to poverty, compared with 24.3 per cent from the simple bivariate inference method, whereas the

prescriptions data for 2014 suggested 26.2 per cent. We proposed taking the average of those three figures, which is 26.4 per cent.

Total spending on primary health care in Scotland in 2014 was £2.46 billion, suggesting that that the cost of poverty within that is **£649 million**. In England, primary care spending in that year was about £22.4 billion, so if the relationship with poverty is similar to Scotland, the cost there would be **£5.91 billion**. Pro-rata allowances are made for the other UK countries.

Survey-based approach to general ill-health

In view of the importance of the health care sector for the overall cost of poverty picture, we have also explored a further approach, based on a general household survey, which contains rich detail on both the experience of health problems and on the wider range of types of social disadvantage/deprivation as well as broader socio-demographics. This survey is the UK Poverty and Social Exclusion Survey (PSE) carried out across UK in 2012 with ESRC funding. This survey enables us to develop a composite measure of ill-health and to relate this to a range of measures of factors affecting risk. Obviously, in using this to proxy health care service usage we are assuming that ill-health is strongly related to health care utilisation and cost in both acute and primary care sectors – by implication, this tends to discount the importance of the so-called 'inverse care law'.

We first construct a composite score measure of ill-health from eight components, as shown in Box 2.

Box 2: Composite score measure of ill-health

General health score based on General Health Questionnaire scale (11 items, 4-point scales, asked in self-completion section), taking values in excess of 12 and dividing by 12 (giving a range from 0 to 3).

Subjective general health 'bad' (=1) or 'very bad' (=2), based on the question 'How is your health in general? Is it Very Good…..Very Bad?' (5 point scale)

Mental health problem (=1) if report longer term (over 12 months) condition of illness ='Mental Health' or General Health Questionnaire Score>36.

Limiting long-term illness (LLTI).

Health-limited ability to participate in society 'a lot' (=1).

Number of long-term health conditions (out of 12, divided by 3).

Major health problem life event last year (=1).

Number of physical harms experienced in last year (out of 6, including injury, accidents, physical attack, medical mistakes, food poisoning).

This index gives a score averaging 1.44 across all UK adults, with a maximum of 13.92 and a standard deviation of 2.04. We also extract a sub-score for mental health problems, based on the first and third items only.

For explanatory variables, we have several poverty-related candidates and a range of wider socio-demographic factors, including some area-related measures. The core direct measure of individual poverty used is the PSE's own preferred poverty measure, lacking three or more consensually agreed material necessities from a well-tested set of 24, and having below average income. This is a binary indicator. Secondly, we include a continuous income measure, which is the log of net equivalent household income after housing costs, using the PSE's preferred equivalence scale. The rationale is the

arguments of Marmot (2015) and others that income inequality affects health across the income scale. Thirdly, we have a measure of 'past poverty' (binary), based on the question: 'Looking back over your life, how often have there been times when you think you have lived in poverty by the standards of that time?', counting those responding 'Often' or 'Most of the time' (=1). This question has been well-validated in PSE research and is a very strong predictor in that dataset. The rationale here is the wider research literature on health experience over time, which shows clear evidence that past experiences of poverty and hardship affect current health alongside current poverty (see for example works of Power *et al.*, 1999, based on Birth Cohort Study). Fourthly, we also have an area poverty measure, by linking PSE poverty values to the IMD low income score deciles which are attached to the PSE data. This enables us to interpret two measures of area problems, scores for number of environmental and social problems associated with local neighbourhood, in terms of their association with poverty. Finally, we have measures of employment deprivation (total number of months unemployed in last year), as well as economic status=long term unemployed and lack of qualifications.

The general socio-demographic variables tested include age (flags for 10 year bands), household types (one person, lone parent, larger adult), whether married (de facto), gender, ethnicity (four broad groups), qualifications, routine occupations, and a flag for 'higher risk' industry sectors (e.g. agriculture, fishing, mining/quarrying, construction), as well as a quite sophisticated measure of job quality — there is significant evidence that quality of working life can have significant impact on health. We also include a flag for experiencing any one of half-a-dozen standard housing deprivations (e.g. overcrowding, concealed households, affordability, suitability or condition problems), some of which are believed to impact on health. The PSE survey also enables us to include certain variables about particular past experiences which might impact on current health status, for example having a criminal record.

We then run regression models to predict the composite ill-health score, eliminating variables which are not statistically significant or too heavily inter-correlated with other variables (although this is not much of a problem in micro-data). The preferred model emerging from this process includes 19 variables significant at the five per cent level (nearly all at one per cent level) and explains 22 per cent of the variance in ill-health scores for adults across the UK (a good result for micro-data). The variables retained in this model include our key poverty/income/unemployment and area environment and social variables, as well as five age groups, single person households, married, female, 'black' ethnicity, routine occupations, housing needs, job quality score and criminal record. The only variable with unexpected direction of effect was routine occupations (negative rather than positive).

We then calculate the effect of poverty on ill-health, in three parts. The first part is the direct effect of poverty, based on the impact of being 'PSE Poor' plus the effect of income falling short of the conventional 60 per cent of median threshold. Together these account for 15.3 per cent of ill-health. The second part we term the 'indirect effect' of current poverty, comprising the effect of unemployment duration times the difference in duration between 'poor' and 'non-poor' adults, plus the effect of area environmental problems times the difference in these between poor and non-poor, plus the effect of area social problems times the difference in these between poor and non-poor. These account for another 13.6 per cent as indirect effects of poverty, giving a cumulative total of 28.9 per cent. The third part is 'past poverty', where we count the impact of past poverty itself, plus the effect of a criminal record times the difference in criminal record between those who were poor in the past and those who were not. These account for a further 10 per cent of ill-health, so one could say that the 'long-term' cost of poverty (including these past effects) is 39.2 per cent of all ill-health. For the purposes of this study we would propose using the middle estimate (28.9 per cent), counting direct and indirect but not long term. Notice that this figure is quite close to those derived from health care usage data as described above.

We have erred on the side of caution in not counting any of the housing needs effects as part of 'poverty', essentially saying these are 'housing problems', even though they are quite strongly correlated with poverty (including the part of housing effects associated with poverty would add 15 per cent points to the share of ill-health attributable to poverty). We have only counted income up to the 60 per cent of median threshold. It is intriguing to find that the job quality score is *not* worse for the poor than for the non-poor, so even though poorer job quality increases ill-health, we do not include this in the indirect effects.

On the other hand, it may be argued that what we have modelled here is ill-health (morbidity), whereas the actual usage of health services is not in practice fully proportional to this, due to barriers on access, the so-called 'inverse care law' and suchlike. From this line of argument, it may be claimed that these estimates are on the high side.

Table 5: Regression model for composite ill-health score in UK adults, showing implied effects of poverty

Variable	Coefficient	Standardised coefficient	Direct effect of poverty	Indirect effect of poverty	Long-term effect of poverty
	B	Beta			
(Constant)	1.751		0.173		
PSE poor	.828	.163			0.099
Past poverty	1.101	0.153			
Log income after housing costs	-0.183	-.077	0.047		
Age groups					
Age under 25	-.607	-.105			
Age 25 to 34	-.250	-.046			
Age 55 to 64	.261	.045			
Age 65 to 74	.382	.058			
Age 75 plus	.660	.094			
One person household	0.872	.119			
Married	-0.103	-.025			
Female	.164	.040			
Black	-.629	-.044			
Months unemployed	.009	.048		0.070	
Routine occupations	-0.622	-0.072			
Any housing need	.467	.101			
Job quality score	.068	.039			
Area environmental problems	.066	.047		0.030	
Area social problems	.151	.080		0.097	
Criminal record	.769	.076			0.049
		Total	0.220	0.197	0.148
Adjusted r-squared	.220	%	15.3%	13.6%	10.3%
Standard Error Estimate	1.859				
F-Ratio	118.7	Cumulative %	15.3%	28.9%	39.2%
Number of cases	7935				
Mean of dependent variable	1.444				
Standard dev of dependent variable	2.044				

Data source: PSE Survey, 2012

Note: All variables significant at 95 per cent level or higher.

Repeating this exercise for just the mental health component gives broadly comparable results. We find that 14.0 per cent of mental ill-health is directly related to poverty, 13.5 per cent is indirectly related (via neighbourhood and employment effects), while 7.9 per cent (a rather lower share) is attributable to past poverty. Combining the first two of these, we obtain an impact of current poverty on mental health of 27.5 per cent.

Public health

One challenge in capturing the public health costs of poverty are identifying costs that are separate to the health care costs captured in the above section. There, we saw that health care spending accounted for £134.5 billion of expenditure across the UK in 2014 (Table 1, including capital).

Public health activities are undertaken by Executive Agencies in each country – e.g. NHS Health Scotland and Public Health England (PHE) and equivalent agencies in Wales and Northern Ireland. In England, significant public health responsibilities were devolved to local authorities in 2013. Data is presented here for PHE and NHS Scotland, with some discussion of the potential overlaps with NHS funding.

In 2013–14 the Department of Health separated out funding for public health for the first time (National Audit Office, 2014). For 2014–15, the Health Department allocated £5.9 billion for public health, comprising: £3.6 billion to PHE, of which £2.8 billion was the grant to local authorities; and £2.3 billion to NHS England, of which £1.9 billion is ring-fenced. Local authorities in England budgeted to spend £3.32 billion on public health in 2015/16. The total budget is the equivalent of around 0.97 per cent of the total public expenditure in England. Factoring this estimated expenditure pro-rata up to the UK level would give an overall expenditure of **between £6.6 billion and £7.1 billion** of public health expenditure across the UK.

Since 2013, local authorities (LAs) in England have had a duty to take the steps that they believe are appropriate to improve the health of their populations. The Department of Health funds LAs for this with a grant (£2.8 billion as noted above). The Public Health Grant to LAs is ring-fenced for the following uses, to:

- improve significantly the health and well-being of local populations;
- carry out health protection and health improvement functions delegated from the Secretary of State;
- reduce health inequalities across the life course, including within hard to reach groups;
- ensure the provision of population health care advice.

The Advisory Committee on Resource Allocation determines the distribution of the local authority grant in England.

Table 6 provides a picture of PHE funding in England for 2015/16. The annual report from Public Health England (PHE, 2015) shows an operating budget of £315.2m for 2015/16 that is separate from the local authority Public Health Grant. In addition, PHE funds vaccines and counter-measures and developing cancer and non-cancer screening, which together cost over £500 million.

Table 6: Public Health England funding breakdown

Funding sources	Spending (£)
PHE net operating budget	315.2m
Local centres/regions	*78.9m*
- health protection	41.4m
- screening and immunisation	15.5m
- health improvement and population healthcare	22.0m
Protection from infectious diseases	*52.0m*
Health marketing	*48.3m*
Health and well-being	*33.9m*
Knowledge, intelligence, digital and research	*28.2m*

Protection from environmental hazards	*26.4m*
Business support	*21.6m*
Screening programmes	*14.2m*
National disease registration	*11.7m*
Other funding	
Ring-fenced local authority grant	*2.601bn*
Vaccines and counter-measures	*460.6m*
Developing cancer and non-cancer screening	*82.3m*
Externally generated income	
Commercial income (services, research, royalties, dividends)	*163m*

Source: PHE (2015)

Areas of expenditure

A Committee of Public Accounts report in 2014 suggested that Public Health funding was not being adequately targeted to local authorities. In 2013–14, a third of local authorities (51 out of 152) received more than 20 per cent above or below their target funding allocation. In 2014–15, the number was reduced to 41 out of 152, 13 of which remain more than 20 per cent below their target funding proportions.

The areas of activity funded by the Public Health Grant are varied, including a wide range of public health interventions; smoking cessation, alcohol and drug misuse services, programmes to tackle obesity, behavioural and lifestyle campaigns and many sexual health services. From April 2015, public health services for the under-fives including family nurse partnerships and health visiting will also become part of the wide range of public health activities.

A National Audit Office report in 2014 found that spending on different aspects of public health varied significantly between local authorities. Although this may reflect local needs, there was also evidence that some local authorities were not prioritising needs. There were also problems with the provisional local authority spending data on public health. For example, 81 local authorities initially reported no spending at all against one or more of the six prescribed public health functions. For several categories of public health spending such as smoking, some local authorities had relatively poor outcomes, but relatively smaller budgets devoted to tackling these problems. In response, PHE has developed a wide range of tools for local authorities and health partnerships.[7]

The types of expenditure to which the Public Health Grant is put is shown in Table A7 in the Appendix. Sexual health, drug and alcohol misuse are the largest areas of expenditure. It may be argued that some of the categories on which this money is spent are general, population-wide functions not related to poverty – health protection, child measurement, public health advice, child health programmes, miscellaneous – these total £946m, leaving £1,793 million on programmes which tend to be related to adverse health behaviours which are quite strongly related to poverty and deprivation.

The overall expenditure below could be attributed to poor people in proportion to their prevalence in recognised 'risky' health groups – from health survey data for example.

To illustrate this, Figure 1 shows the differential rates of smoking found among men and women in England in different IMD groups. Men in the most deprived areas (quintile 1) were more than twice as likely to smoke (32.9 per cent) compared with men in the least deprived areas (quintile 5) at 14.3 per cent. Smoking rates among women were lower than those for men but were still highest in the most deprived areas (26.1 per cent) than the least deprived areas (10.2 per cent).

Figure 1: Smoking rates by area deprivation, England, 2012
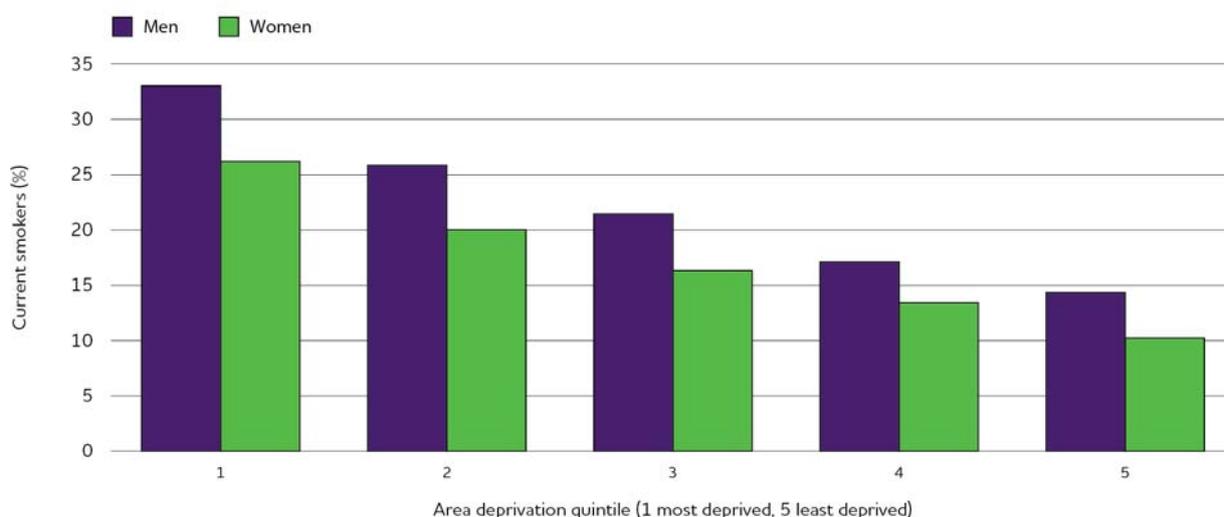
Source: 'Do smoking rates vary between more and less advantaged areas?' 2012 Integrated Household Survey, Office for National Statistics, released 12 March 2014.
Note: Data on the prevalence of current smoking, for adults aged 18 and over, from the 2012 Integrated Household Survey was linked to the 2010 Index of Multiple Deprivation (IMD 2010). Available at: http://www.ons.gov.uk/ons/rel/disability-and-health-measurement/do-smoking-rates-vary-between-more-and-less-advantaged-areas-/2012/sty-smoking-rates.html (accessed 20 June 2016).

Of course, we need to take a view on the extent to which poor people would use intervention services in proportion to their prevalence in the population. We also need to decide whether to use information on different prevalence rates for different aspects of expenditure (i.e. prevalence of STIs, pregnancy, obesity, drug misuse), although in some cases (substance misuse) we have direct data on usage of treatment services from the National Drug Treatment Monitoring System (NDTMS).

Using the prevalence rates for smoking as a proxy for differential need among poor groups, we see that smoking rates rise from 12 per cent in the least deprived quintile to 30 per cent in the most deprived. If that difference is attributed to poverty, then the additional per cent smoking per one per cent point extra poverty is 0.7 per cent points, and approximately half of all smoking is attributable to poverty. This is a simple model which does not allow for other possible socio-demographic or other background factors which might account for some of the difference correlated with poverty.

Table 7: Analysis of smoking rates across deprivation quintiles, England, 2012

SIMD quintiles	Income score 2012 %	Adult smoking frequency	Incremental frequency per 1% low income score
1 (20% most deprived)	29.4	30%	0.596
2	17.6	23%	0.639
3	11.4	19%	0.901
4	6.9	15%	0.887
5 (20% least deprived)	3.6	12%	
All	13.8	19.0%	
Difference between most and least deprived	25.8	18.0%	0.697
Share of smoking attributable to poverty			9.607
			50.6%

If this 50 per cent share is applied to the relevant Public Health expenditure figure of £1.79 billion (that spent from the Public Health Grant on LAs, excluding general population-wide services) this would mean that an extra **£0.9 billion** is needed in Public Health Expenditure due to the poorer health behaviours of poorer people. (This involves assuming that just as half of smoking is attributable to poverty, so are half of all public health expenditures, admittedly using smoking evidence as a very crude proxy for this more general relationship.) In addition, part of the NHS spend is probably distributed in a similar fashion, for example spending on drug and alcohol treatment.

One sub-sector where we have independent evidence is drug and alcohol treatment, using actual caseload data from the standard monitoring system used for all publicly-funded substance treatment programmes in England (NDTMS). The analysis in Table 8 shows that such treatments are *highly* concentrated on adults from the more deprived neighbourhoods in England – 41 per cent coming from the most deprived fifth of neighbourhoods, while less than 3 per cent come from the least deprived fifth. Using the simple standard method of calculation based on the average incremental effect of neighbourhood poverty, we find that 85.7 per cent of total service usage is attributable to poverty.

Table 8: Drug and alcohol treatment cases by IMD decile, England, 2010

IMD decile	Average low income score	Share of all substance treatment cases	Incremental impact
1 (most deprived)	34.0	21.7%	0.253
2	24.8	19.4%	0.776
3	19.5	15.3%	0.894
4	15.8	12.0%	1.024
5	12.7	8.9%	0.558
6	10.0	7.3%	0.955
7	7.9	5.3%	0.465
8	6.0	4.4%	0.622
9	4.3	3.4%	0.676
10 (least deprived)	2.8	2.4%	
Total for England	13.8	100.0%	0.622
Most deprived 20%		41.1%	8.569
Weighted number of cases (2010)		313,106	85.7%

Source: Authors' analysis of NDTMS data from PHE, as reported in Bramley *et al.,* (2015) *Hard Edges* report,

It will be noted that the concentration in deprived areas is characteristic of all the sub-categories, but that 'more complex' cases, where substance issues are combined with homelessness, offending, or both, show a stronger concentration. An analysis at local authority district level, using a regression model to control for a range of socio-demographic background factors, suggested that even allowing for those other factors the share attributable to poverty was probably still of that order (around 85 per cent).

The costs of substance treatment programmes are probably partly located within the NHS budget, in addition to the amounts which are in the LA budgets. Appendix H of the Bramley *et al.,* (2015) report noted that the average cost of a drug-alcohol treatment was £2,664, which would imply that the 313,106 cases in Table 8 cost £834 million. Based on the additional cost of substance abuse treatment (85% in Table 8) compared to the earlier estimate for smoking and more general causes of ill-health (50%), we add 35 per cent of these costs £280 million, to the £0.9 billion provisional figure for England, to allow for the more highly skewed nature of substance treatment, making **£1.2 billion**.

Analysis of public health spending across English local authorities

We can use budget data from the Chartered Institute of Public Finance and Accountancy (CIPFA) at higher tier social services local authority level to look at the relationship between spending per head and deprivation. Using 2015/16 budgets, the average spend per head was £66.65, with a range between most deprived to least deprived IMD quintiles from £93.23 to £41.76. Relating this to the difference in low income scores between these quintiles (23.9-8.1=15.8% points) suggests that each 1 per cent higher poverty adds £3.27. On this simple basis, the total cost of poverty for LA public health spend in England is £51.60, or 77.4 per cent of the total, which equates to £3.316 billion multiplied by 0.774, resulting in a figure of **2.57b**. This is a much higher figure than that derived as above. Given the uncertainties discussed above, the rather large/coarse scale of social services local authorities, and the fact that this is a 'simple' rather than modelled estimate, we suggest taking the more conservative figure of **£1.2 billion** as derived above.

In Scotland, prevention-related activities are shown in community services costs.[8] Not all community services are likely to be relevant to public health; the relevant areas are likely to be the following ones (Scotland-wide costs, 2014−2015):

- Community Psychiatric services (£207.62 million)

- Addiction services (£74.88 million)

- Health promotion (£58.47 million – part of 'Other services')

- Family planning (£33.01 million)

- Allied health professionals (AHPs) – dietetics (£14.8 million), clinical psychology (£24.4 million)

- Total in scope = £388.78 million across these services.

In Scotland, £146.83 million is spent annually in Community Services on all AHPs. Work is underway to standardise the recording of AHP data - which will lead to significant change to the costs book. AHP services include clinical psychology, physiotherapy, occupational therapy, chiropody, dietetics and speech therapy. Some of these areas (such as clinical psychology and dietetics) may be involved in health behaviour change and well-being work.

If we applied the same factor as in England (50 per cent of relevant expenditure being accounted for by the additional rates of poor people's poor health behaviour), that would be **an additional £220** spent annually in Scotland per person in poverty.

Children and families

Box 3: Overview of evidence and cost calculation for children and families

Approach: The cost of services for children and families, comprising primarily personal social services directed at children in need plus nursery, childcare and early years provision, are primarily estimated from local authority level budgetary and activity data.

Specifically, the aim has been to measure how much additional activity and spending are associated with higher rates of poverty in areas that are more deprived.

Evidence: One strand of evidence simply compares per capita spending on children's services of English local authorities with their deprivation rank in the IMD to estimate how much spending is associated with poverty and deprivation. More detailed data, including on income-related variables, are available from the Children in Need Census for England (CIN). Recent data from this survey was only broken down by local authority level, which is too large a geography to be ideal, but modelling based on recent local authority level data was considered alongside earlier results at postcode district level.

Controls and interpretation of findings: The modelling used in these calculations attempts to control for other relevant factors, but several of these (e.g. adults with complex needs, young lone parent families) are strongly related to poverty and difficult to separate. Overall, we consider the evidence of the poverty link to use of these services be strong, supported by previous research and the fact that the resource allocation system explicitly seeks to spend more in poorer areas.

Result: The strands of evidence lead to a range of estimates of the proportion of activity being attributable to poverty (48–70%), from which we take an average of 58% pending further more detailed analysis of CIN data. This leads to an estimate of poverty costing **£5.9 billion** in additional spending on social services and **1.6 billion** on childcare and early years.

Personal social services for children and families has long been recognised as a service which is very strongly related to child, family and neighbourhood poverty. In the previous study (Hirsch, 2008), we were able to model data from the CIN at an intermediate geographical level of postcode district. This analysis suggested that just over 70 per cent of the expenditure on this service was attributable to poverty across England in 2005, even after controlling for a number of other relevant socio-demographic variables.

The CIN has changed somewhat since that time, but it does operate annually and the data are linked to the National Pupil Database at individual level. An order has been placed for an extract from this dataset to enable a similar analysis to be carried out for the most recent available year. These data will not include the cost estimate previously available, but will give the number 'in need' (i.e. in contact with and receiving services during the year), and some proxies for cost, for a similar intermediate geography and for IMD bands. It should also be possible to model the data at individual as well as area level. These new data are still in the pipeline of being supplied to the researchers.

As an interim step, we are able to carry out a simpler analysis of budgeted spending data at social services local authority level across England, using CIPFA Budget Estimates data for 2014/15. In this case, we look at expenditure per capita and relate this to a quintile banding of local authorities in terms of the IMD 2010 low income score. This enables us to make a first, simple estimate of the current cost of poverty in this service.

The results of this analysis are shown in Table 9. This shows the expected strong upward gradient of expenditure with level of deprivation.

Table 9: Expenditure per capita on children and families services by IMD quintile at local authority level for England 2014/15 and estimate of expenditure attributable to poverty

IMD quintile (LAs)	Low income score (%)	Children and families expenditure per capita (£)
1 (most deprived)	23.9%	198.03
2	17.2%	160.46
3	13.6%	146.48
4	11.3%	120.08
5 (least deprived)	8.1%	114.93
All LAs	15.7%	151.85
Derived values		
Difference between most and least deprived IMD	15.8%	83.10
Marginal expenditure per capita per 1% income score		5.27
Total population (thousand)		53,854
Total expenditure on children and families (£ thousand)		7,717,186
Expenditure attributable to poverty (£ thousand)		4,459,220
Percentage of expenditure attributable to poverty		**57.8%**

Using the standard 'simple' method, we derive within the lower part of Table 9 a first estimate of the cost of poverty for children and families personal social services for England. This amounts to 4.5 billion in total, which is about 58 per cent of the total LA expenditure on the service.

A second interim step has been to conduct an analysis of CIN caseload data at the level of social services local authority in England. Following advice from Department for Education (DfE) statisticians that a limited number of local authorities had adopted radically different methods of service delivery involving third sector organisations, we excluded a limited number of authorities (10) which reported very low CIN numbers in absolute terms or relative to their general poverty level. We then explored regression models to predict CIN caseload at this broad local authority level. There is clearly an issue of strong intercorrelation of poverty with some of the variables which could be included in the model, including specific family types (e.g. female young lone parent with two or more dependent children) as well as the measure of 'severe and multiple disadvantage' (SMD) derived from the Bramley *et al.* (2015) *Hard Edges* study. Using the up-to-date child poverty measure from ID 2015 (income deprivation affecting children index) we find that including this variable on its own implies that poverty accounts for 56.3 per cent of caseload, while including it in a model with SMD and large couple families suggests that poverty accounts for 48.2 per cent of activity.

Analysis at this level remains unsatisfactory, in comparison with analysis at an intermediate geography level or mixed modelling including individual level measures, for reasons set out in our rationale and methodology. When we have been able to carry out the more sophisticated analysis using CIN-National Pupil Database data for 2014, we would expect these numbers to change, probably to a larger total and share. This expectation is based on our view that individual and small area variation is better able to pick up the true effect of deprivation on the demand for this service, and the level of intervention activity resulting, than an analysis at LA level. The LA-level analysis is in danger of understating this, because it is constrained by the resource allocation to LAs, which has been characterised since 2010 by a considerable downward squeeze on the budgets of LAs with higher levels of deprivation (as documented in Hastings *et al.*, 2013; 2015). It also reflects the findings of the earlier study, which analysed costed activity at an intermediate geography level.

In the light of these considerations, we opt in this report for an estimate in the middle of the range of figures (70 per cent from previous study (Hirsch, 2008), 58 per cent from CIPFA spending, 56 per cent from simple regression of CIN data and 48 per cent from a model including controls for family type and SMD (complex needs). The average of these values is 58 per cent, and this yields a total of £4.5 billion of LA spending in England. To this could be added a similar share of the central DfE spending on children and families services (about £0.35 billion), making an England total of **£4.9 billion.** We have carried out no further detailed analysis for other UK countries so the allowance for these is a simple pro-rata addition of £1 billion, making **£5.9 billion** in all.

Nursery and early years

There is another category of local authority expenditure which falls under the general heading of children and families, and that is the spending on nursery education and other 'early years' services. This includes the expanding sector of child care, including free entitlements where claimed, as well as children's centres which were expanded in the 2000s although now subject to retrenchment. This spend is recorded separately in the CIPFA budget data from the primary, secondary and special schools covered under 'school education'. Table 10 shows a similar analysis of this expenditure at LA level, following the same structure as used above for the personal social security children and families spending.

Table 10: Expenditure per capita on nursery education/early years by IMD quintile at local authority level for England 2014/15 and derived estimate of expenditure attributable to poverty

IMD quintile (LAs)	Low income score (%)	Nursery education/early years expenditure per capita (£)
1 (most deprived)	23.9%	69.66
2	17.2%	56.49
3	13.6%	45.68
4	11.3%	45.76
5 (least deprived)	8.1%	46.22
All Las	15.7%	54.00
Derived values		
Difference between most and least deprived IMD	15.8%	23.44
Marginal expend £pc		
Marginal expenditure £ per capita per 1% income score		1.49
Total population (thousand)		53,854
Total expenditure children and families (thousand)		2,863,314
Expenditure attributable to poverty		1,258,005
Percentage expenditure attributable to poverty		**43.9%**

This analysis suggests that there is a further amount of **£1.26 billion** in England of early years spending which is attributable to poverty, this representing 44 per cent of this expenditure category.

We have another source of evidence on nurseries, which is the UK Poverty and Social Exclusion Survey (PSE). This has a measure of usage (effectively, use/not use) for a representative sample of households with children across the UK in 2012. This provides ambiguous evidence, which is not perhaps conclusive in terms of expenditure. In simple bivariate comparisons, usage appears to be significantly higher in more deprived areas, and slightly higher for poor/deprived households. However, in multivariate regression analysis, nursery usage appears to have a negative relationship with poverty, particularly area poverty. This

is not necessarily difficult to understand, as a lot of nursery use is associated with people who are working and, very often, paying for it. The usage measure does not distinguish fully or partially paid-for nursery provision versus free or heavily subsidised provision. Because we cannot account properly for this breakdown between paid-for and subsidized service in this analysis, we do not use this source directly in estimating poverty-related costs.

Other children's services

The PSE survey asks households with children about five other services which they might use, in addition to nurseries. One of these, children's play, appears from both simple description and modelling results to be used less by the poor or in poor areas. From both PSE and other surveys we can infer evidence that children's play facilities in deprived neighbourhoods are perceived as poor quality and risky, so deterring usage. Another of the services, school meals, is strongly skewed towards the poor in terms of usage (unsurprisingly, given the availability of free meals) – this is in any case part of the schools budget.

The other three services – youth clubs, after school clubs, school transport – all appear to be, to varying degrees, 'pro-poor' in their distribution of usage. This emerges from both simple comparisons and more especially from multivariate models. After school clubs are more ambiguous on the simple comparisons, but controlling for other factors the models suggest that, in all of these cases, poverty accounts for about a third of total usage. In financial accounting terms, these services are generally included as part of 'non-school education', which is picked up later in this report.

Adult social care

Box 4: Overview of evidence and cost calculation for adult social care

Approach: The poverty-related costs of adult social care services, comprising domiciliary and residential care and support to both frail elderly and other adults with a range of disabilities, are estimated principally by looking at local authority spending data, with spending for older adults (aged over 65) separated out, and comparisons made with survey data.

Evidence: Local authority budgetary data are compared with deprivation in England, with the most detailed modelling looking separately at services for older adults. Further evidence for Scotland, based on administrative data of local authority spending, looks at the different context there where personal care is not charged for. Supplementary analysis comes from survey data including the Poverty and Social Exclusion Survey, the Scottish Housing Survey and Understanding Society.

Controls and interpretation of findings: While simpler approaches tend to generate rather modest estimates of the extra costs of poverty, some modelling used in these calculations, which attempt to control for other relevant factors, such as age, household types, health, urbanisation, housing tenure and conditions, and institutional clusters, tend to generate rather higher estimates. It is difficult to accurately model the charging and means testing regimes involved, which differ between UK countries. In view of various limitations of the different analyses, we take a mid-point in the range of estimates.

Result: Our mid-point estimate is that 26% of expenditure is linked to poverty, giving totals of **£2.4 billion** for younger adults and **£2.2 billion** for older adults.

Adult social care is one of the largest services provided by local government. It divides into two parts, of roughly similar size in terms of expenditure: services for older people, particularly domiciliary (home) care and residential care for frail older people; and services for younger adults, which have traditionally been seen as falling into three main sub-types of client group: physically or sensorally disabled; with learning disabilities, or with mental health problems. All of these services work closely with the NHS, essentially providing the 'community care' into which many acute patients move after treatment, or as an alternative to traditional long-stay institutions.

In recent years there have been extensive changes in these services, with more development of private and third sector providers in a 'mixed economy' of welfare, further moves to de-institutionalisation particularly for people with learning difficulties, greater awareness of and service provision for the informal carers who provide the majority of all personal care, and the introduction and spread of personal budgets to give more choice and control to clients. Services for older people have seen greater growth of private or non-LA provision, and a greater role for means-testing and own private funding of long-term care; privately funded care is now as large as LA-funded care in England. In Scotland, as described below, policy has diverged from that in England, with 'free personal care' for all over-65s. In all areas, the ageing population is increasing potential future demand, and there is particular concern about the growing numbers suffering dementia. In England particularly, in the period since 2010, austerity has not left these services untouched, and pressures have been particularly great in the more urban authorities which have suffered the greatest reduction in resources (Hastings *et al.*, 2013; 2015).

Expenditure patterns in England

As a first step, we looked at expenditure per capita across the 150-odd social services authorities in England, according to the general poverty level measured by the low income score measure (2010 version). As can be seen from Table 11, this showed only a weak relationship with poverty; expenditure per capita rises from £264 in the least deprived quintile to £285 in the most deprived. On this simple basis, poverty would only account for 7.8 per cent of expenditure.

Table 11: Adult social care expenditure per capita by IMD quintile in England, and implied share of expenditure associated with poverty 2014/15

IMD quintile (LAs)	Low income score (%)	Adult social care expenditure per capita (£)
1 (most deprived)	23.9%	284.86
2	17.2%	262.82
3	13.6%	267.57
4	11.3%	257.93
5 (least deprived)	8.1%	264.12
All Las	15.7%	264.84
Derived Values		
Difference between most deprive and least deprived IMD	15.8%	20.74
Marginal expenditure £ per capita per 1% income score		1.32
Total population (thousand)		53,854
Total additional expenditure on social care (£ thousand)		14,361,155
Expenditure attributable to poverty (£ thousand)		1,113,072
Percentage attributable to poverty (£ thousand)		7.8%

Source: Authors' analysis of CIPFA budget estimates data for 'all-purpose authorities'.

However, this approach really is too simple, partly by being too aggregated. It is important to treat the older age group separately from the other adult groups. When we do this, we are able to fit reasonable regression models to the budget spending data for adults of working age and for older people. The former model (shown in Table A8 in the Appendix) does not have a very good fit (explaining 19 per cent of the variance) but the effects of the explanatory variables included seem to make sense. In addition to a strong positive effect from low income poverty (ID2015 version), there is some positive effect from one person households, and from the presence of mental health institutions as well as traveller and temporary housing sites; and negative effects from larger families, private renting and less valuable housing.

This regression model suggests that 30.8 per cent of expenditure on younger adult social care is related to poverty. This is not dissimilar to estimates we reported earlier for mental ill-health, which is one of the relevant sub-sectors, and we know that in general long-term illness and disability are related to poverty. Total budgeted net spending on this service in 2014/15 in England was £7,783 million, so the poverty-related part of this would be **£2.4 billion**.

It proved more difficult to estimate a regression model for social services for older people, but in the end we have arrived at a reasonable model, shown in Table A9 in the Appendix. Expenditure per older person is related to the share of older people on low income (IDAOPI index, 2015), the proportion aged over 75, and population density, while being negatively related to owner occupation (as expected), bad/very bad health (all ages), the ID2015 living environment score and London. This model has a reasonable fit, explaining 56 per cent of the variation, and suggests that as much as 44 per cent of the net expenditure may be attributable to poverty.

This may be regarded as upper estimate of the poverty-related spend in this service, given the limitations of the analysis. The social services local authorities are relatively large, and by 2014 the effects of differential cuts in the poorer local authorities might have been distorting the results. In the poorest areas, life expectancy is much shorter and this may reduce the amount of potential demand for later life care, but this effect is probably allowed for via the bad/very bad health indicator. There is a fair amount of inter-correlation between variables with these large spatial units, and there are some grounds for concern about some of the negative coefficients in the model (although some of these can be rationalised, e.g. owner occupation proxies the ability of older people to pay for their care).

There are some other sources of evidence that show some degree of relationship between poverty and social care need. The 2014 Health Survey for England found the highest proportions receiving help with activities of daily living (ADL) and instrumental activities for daily living, (IADL) in the third of households with lowest incomes. ADLs are activities relating to personal care and mobility about the home, such as washing, dressing, using the toilet, getting around indoors and eating. IADLs are further activities important to living independently, such as doing routine housework, getting out of the house, shopping for food and paying bills.

Figure 2: Men and women aged 65 and over needing or receiving help with daily activities by equivalised household income, 2014
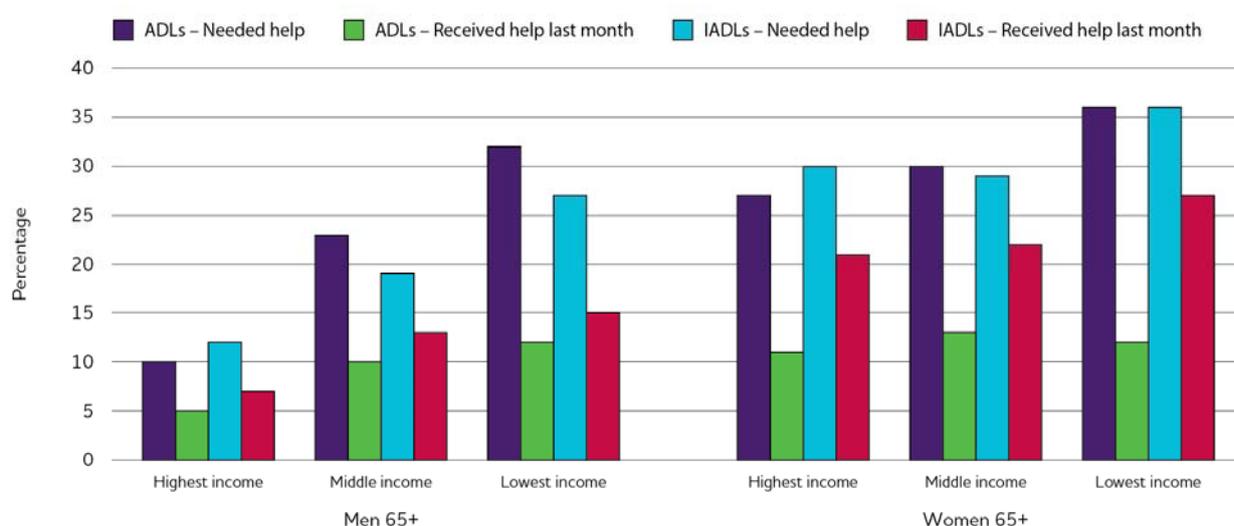
Source: Health Survey for England 2014, Health and Social Care Information Centre, December, 2015.
Notes: ADLs: Activities of daily living. IADLs: Instrumental activities of daily living. 'Needed help' includes those who said they could do an activity but with difficulty, those who could only do it with help, and those who were unable to do it. Note that those who received help in the last month may not be the same people as those that need help. IADLs excludes help because of the way household responsibilities are divided.

Using data from the Understanding Society Survey, we can show that there is a modest general tendency for measures of disability to be somewhat higher in households which are poor using standard measures. Partly for this reason, and partly because of the means test, we would expect poverty to have some positive net effect on costs. However, it should be noted that the means test is complex and is strongly related to housing assets, so that quite a lot of non-poor households would get free or subsidised care. Making rather broad assumptions and building on the Understanding Society Survey data, including allowing for the availability of informal care within the household, we would tentatively suggest that about 19 per cent of net expenditure might be attributable to the extra cost of poor households (equivalent to **£1.3 billion** in England). This share of 19 per cent is similar to the share of acute health in-patient expenditure attributable to poverty in the older age group, within the Scottish data reported in the Healthcare section.

We can also use the PSE Survey to undertake analysis of home care services. A simple comparison of utilisation of home care (typically the largest single component of adult social care) by households with elderly or disabled members in top and bottom quintiles of deprivation suggests a higher figure of 15.7 per cent or £2 billion. However, this estimate is not stable when we vary the details of the comparison (e.g. deciles vs quintiles). We can fit multivariate regression models, to control for potentially confounding socio-demographic factors, to three local authority-provided adult social care services – home care, day care and special transport. In each case, the models suggest that there is a positive relationship between area deprivation (most deprived neighbourhood) but a negative relationship with individual household poverty, with the latter more than offsetting the former, giving a net negative effect of poverty on usage. Our interpretation of this is that poverty may tend to deter usage, for a variety of reasons, even though authorities may try to offer more service in deprived areas. The reason that spending is moderately skewed towards poverty, despite this, is essentially because the charges for the service are means tested, so the revenue side of 'net expenditure' is reduced in poorer localities.

Social care in Scotland

Gross expenditure by local authorities on adult (aged 18+) social care services in Scotland in 2013–14 was £2,908 million. This figure represents 74 per cent of the £3,923 million of gross expenditure on total social work. Gross expenditure on adult (aged 18+) social care services in Scotland in 2013–14 equates to £680 per capita of the population aged 18+. Charges to service users account for between 8-9 per cent of gross expenditure (8.6 per cent in 2012–13).

Table A10 in the Appendix shows the expenditure on adult social care, as a proportion of all social work expenditure in Scotland (2013–2014).

The funding of adult social care provision is quite different in Scotland, with *free personal and nursing care* **(FPNC).** FPNC was introduced in Scotland on 1 July 2002. Before then, people could be charged for personal care services provided in their own home and many residents in care homes had to fully fund their care from their own income and savings.

FPNC applies to home care and care home provision. In the case of home care, people aged 65 and over can no longer be charged for personal care services in their own home. Domestic services such as shopping or housework can be charged for and would be subject to a means test. In care homes, people aged over 65 are assessed and self-funded residents can receive a weekly payment towards personal care. A further payment can also be received for nursing care (for people of all ages).

Table A10 in the Appendix shows the role of free personal and nursing care in care homes and home care – the two largest elements of expenditure on adult social care in Scotland.

Clearly, the vast majority of home care clients (almost 95 per cent) received free personal care at home while around two-thirds of all care home residents were not self-funders. However, not being self-funded in a care home is not the same as being poor. More specific information on poverty among older people is required to derive estimates of this.

The Scottish Household Survey has data on care at home. However, this is not reported in the annual report and so needs further analysis. We know that older people have poorer self-assessed health, with 16 per cent of those aged 75+ with bad or very bad health. This is a proxy for the 'home care' client group for now. Published data are shown in the Appendix, Table A10. We also know that the self-assessed health of poorer households is less good and that people living in the most deprived areas have the poorest self-assessed health.

This data show that older people have worse health and poorer people have worse health, so it appears likely that poorer, older people would have worse health still. Work by David Bell and colleagues at Stirling University (Bell *et al.*, 2014) found a link between the level of care required by older people and deprivation, with hours of social care provision per week highest in SIMD quintile 1 (most deprived) and lowest in SIMD quintile 5 (least deprived).

Bell *et al.* (2014), identify the lack of care networks and the inability to purchase care as possible explanatory factors behind the additional social care use among more deprived groups. Of course, the generally poorer health of younger people in deprived areas also makes it likely that healthy ageing is less common.

From Bell *et al.*'s research, it appears that the 65-74 age group in the lowest SIMD quintile receive **five times more care** than those in the highest SIMD group (five hours, compared with one hour) while there is a narrowing among older groups to around twice the rate among 75-84 (13 hours in the lowest SIMD group and six hours in the highest). Among the over 85 year olds it looks like an average of 25 hours of care among the lowest SIMD compared with 17 hours among the highest SIMD group of over 85 year olds.

We have conducted some further analysis using the Scottish Household Survey data on care received by older people. Comparing levels of use across the SIMD quintiles, we find that a simple index of uses of relevant forms of care (excluding informal care) rises from 2.8 per cent to 5.4 per cent across the income quintiles. This implies that the cost of poverty is around **36** per cent.

In this section we have derived a range of estimates of the costs of poverty for adult social care targeted at older people. At the lower end we have a simple estimate of eight per cent based on the variation in per capita spending across English social services authorities, 16 per cent based on a simple analysis of PSE homecare usage data, and 19 per cent based on analysis of Understanding Society Survey. At the higher end we have 31 per cent for younger adults and 44 per cent for older people based on regression modelling of the English social services local authority level spending data, or 36 per cent from a simple analysis of Scottish Household Survey care utilisation data across small area SIMD quintiles. Given the uncertainties and limitations associated with each of these estimates, we suggest that a prudent approach would be to take a mid-point of these estimates, **26 per cent** and apply this to both components (adult and older people). This makes for estimates of **£2.0 billion and £1.7 billion** for the adult and older groups in England, or **£2.4 billion and £2.2 billion** for UK, making **£4.6 billion** in all.

School education

Box 5: Overview of evidence and cost calculation for school education

Approach: Schools are a case where there is a clear policy framework favouring enhanced resources for schools directly or indirectly tied to children from poorer backgrounds. Thus the main approach is based on comparing direct data on resource allocation to schools in areas with higher and lower poverty rates.

Evidence: School budget allocations related to the bandings of poverty measured by Free School Meals entitlements provides the primary source for estimating the extra costs of poverty in this sector. Allowance is also made for LA spending on education support activities.

Controls and interpretation of findings: Conclusions and orders of magnitude of the poverty premium are checked against other contemporary and earlier research literature. The intentional nature of providing additional resources to pupils in low income households makes the main estimates for England relatively robust, in terms of linking expenditure levels to poverty. Broader 'guesstimates' are applied to spending data for the other UK countries.

Result: Our estimate is that 18.5 per cent of schools expenditure is linked to poverty in England, with about 12 per cent in the other UK countries, giving a total of **£10.1 billion** for the whole of the UK.

The overall education budget for the UK countries is summarised in Table 12. The grand total for 2014 of around £84 billion includes higher education, but it is probably changes in funding for that sector which account for the apparent fall between 2010 and 2014.

Table 12: Education expenditure across the UK by country 2010 and 2014

Country	Education expenditure (£ million)			
	Current 2010	Current 2014	Capital 2010	Capital 2014
England	68,685	64,540	8,071	5,155
Scotland	7,082	7,090	601	611
Wales	4,001	3,863	253	245
N Ireland	2,603	2,669	224	231
UK total	82,371	78,162	9,149	6,242

Source: H M Treasury (2015) : HMR_CRA_2015_Chapter_A_Tables A13

Of the DfE's budget for 2013/14 of £56.4 billion in England, about 46.8 billion went on schools, of which £3.9 billion was for capital, and £0.87 billion for centrally-managed curriculum, training, accountability and standards work, leaving about £42 billion going to schools themselves, of which £1.9 billion was the 'Pupil Premium' (a payment explicitly targeted on poor pupils, as proxied by current or past eligibility for free school meals, or FSM for short). The remainder of DfE's budget went mainly on support for 16–19 year old education and training (£7.7 billion), together with some central work on children and families (£0.6 billion)[9] and some central spending on admin, analytics, IT, and capital (e.g. private finance initiatives), totalling £1.26 billion. It would appear that the balance of the £64.5 billion shown for England in Table 12 (£8.1 billion) must be accounted for by higher and further education, included within the Business, Innovation and Skills budget.

Education generally provides a clear case where the extra cost of poverty, or 'deprivation', is formally recognised within the policy framework and the funding mechanisms. It has been increasingly recognised, and underpinned by evidence on attainment patterns and determinants,[10] that poverty and deprivation in the home background hamper attainment throughout childhood and the educational system, but that

appropriate provision and support can counter this and lead to more desirable and acceptable outcomes for most pupils. While this is clearly the rationale for the Pupil Premium introduced by the Coalition government, in fact elements of additional funding were included in existing funding formulae, both (a) the former Revenue Support Grant/Formula Spending Share system for distribution between local authorities, and (b) the school funding formulae operated by individual local authorities. Sibieta (2015) notes that these systems had been giving additional weight to deprivation during the 2000s, even before the introduction of the Pupil Premium.

The present Government are proposing to introduce a common funding formula for schools, to overcome the apparent inconsistencies arising from having separate historic formulae for inter-LA allocation, school funding within LAs, and add-ons like the Pupil Premium. It is unclear what the implications of this would be for the extent of redistribution towards poorer schools and pupils, but we have been advised that there is no intention to reduce this. However, in this study we look at the system in operation in 2014/15.

The calculation of the 'cost of poverty' in this case would seem to be a relatively uncontroversial task, simply that of measuring the degree of additional funding per pupil associated with poverty (as measured by FSM) in the different types of school. Table A14 in the Appendix presents this analysis for schools in England, using data mainly derived from the DfE's published tables of school funding for 2014 (which show figures for every individual school). The main part of the table refers to 'mainstream' schools still provided and managed by LAs. A supplementary analysis below adds equivalent amounts for academies, which are funded and managed separately, although it should be noted that their main funding source is the same 'dedicated schools grant' that goes to mainstream schools, governed by the same formulae.

The logic of the calculation can be followed from this table (A14). Schools are divided into three bands, according to their level of FSM, with the average levels by band shown in the first block. The number of pupils in each type of school[11] by FSM band is shown in the second block. The average amount of grant funding (i.e. public expenditure) per pupil in each of these school type-FSM band categories is shown in the next block. We then calculate the difference in funding per pupil between high FSM and low FSM schools, and divide this by the percentage point difference between high and low band schools in their average FSM scores; this yields the marginal cost of poverty per one per cent point per pupil. We then simply multiply this number by the average overall FSM percentage for that sector and the number of pupils to generate the total cost of poverty. It should be noted that this procedure, consistent with the approach in other services, assumes that even schools in the low FSM band have some costs of poverty because they have some pupils who are poor (e.g. 9.3 per cent of primary pupils in low band schools have FSM).

As a check on this calculation, we make a rough estimate from a recent published study of school funding in England (Sibieta, 2015), of the differential in funding between high and low deprivation quintiles. Once we make a rough allowance for the 'baseload' level of poverty (nearly all schools have some poor pupils), then we arrive at a rather similar figure.

For academies, we make an approximate equivalent calculation, by utilising published information on the number of pupils in both mainstream and academy schools by type and whether eligible for Pupil Premium. The additional amounts involved, which are particularly significant in the secondary sector, are provided in the Appendix (Table A14).

The resulting estimate of the cost of poverty for school education in England is £3.0 billion for primary, £4.9 billion for secondary and £0.5 billion for special schools, making a grand total of £8.5 billion, which is 18.5 per cent of school funding.

We have also undertaken a quick analysis of the budgeted spend of LAs on 'non-school' education activities, which mainly comprise administrative support , specialist and advisory services, and support activities geared to special needs and disadvantaged pupils. This budget has been diminishing over time because of 'academisation' and the devolution of more spending to schools, but it still comprised a total of £3.24 billion in 2014/15. Using the standard method of comparison across LAs grouped by deprivation banding, we infer that the proportion of expenditure attributable to poverty is 18.2 per cent,

remarkably similar to the share found for the main schools budget. This amount (£0.59 billion) should be added to the English total.

So far as other UK countries are concerned, it is a matter of judgement to determine the extent to which they make similar additional provision to reflect poverty and deprivation. In the previous study, (Hirsch 2008, and drawing on research reported in Bramley *et al.*, 2011), we looked at detailed data for Wales and concluded from an essentially similar methodology that the overall cost in 2005/06 was about 6 per cent of the aggregate school budget. Subsequently, it is understood that the Welsh Assembly Government have implemented some supplementary funding relating to deprivation. That would suggest that an appropriate share of spending might lie somewhere between the figures of 6 per cent and 18.5 per cent.

Analysis of older data for a limited number of English and Scottish authorities in 2001/02 suggested a range of shares of expenditure lying between 6.7 per cent and 12.5 per cent (primary) and 7 and 21.3 per cent (secondary).

In the light of these various pieces of evidence, we suggest that an appropriate assumption would be that in the other UK countries, the share of school expenditure attributable to poverty is midway between the historic low proportions of 6-7 per cent and the current English figure of 18.5 per cent, namely 12 per cent. If schools current spending represented the same share of education in the rest of the UK as in England (64 per cent), that would give a total of £8.7 billion; applying 12 per cent to that gives £1.0 billion attributable to poverty, making an overall UK total of **£10.1 billion.**

Further and higher education

Box 6: Overview of evidence and cost calculation for further and higher education

Approach: We take from national agency budgets the totals of funds specifically allocated to assist students from deprived backgrounds or to encourage their participation.

Evidence: 16-19 education is broadly funded by a capitation approach linked to levels of qualification targeted, but some specific additional funding is allocated in respect of 'disadvantage'. We take relevant parts of this additional funding as the measure of the cost of poverty. Similarly, in higher education the main funding is via student loans, but specific provision for 'student opportunity' is identified as being related to disadvantage.

Controls and interpretation of findings: We refer to background research on the basic distributional character of higher and further education, and to current policy and budgetary documents.

Result: Our estimate is that only a small part of the budgets for these sectors are related to poverty, **£1.1 billion** in relation to 16−19 education and **£0.4 billion** in relation to higher education.

16 to 19 education and training

A further block of expenditure covers most school sixth form provision, sixth form colleges, tertiary and further education colleges, and also apprenticeships. This sector shares some characteristics with the school system and some with the higher education (HE) sector. Funding is primarily allocated on a capitation basis related to students enrolled. However, supplementary amounts are allocated in relation to 'disadvantage', which is mainly based on economic deprivation measured through the IMD, 'high needs' which includes aspects of learning difficulty, discretionary bursaries which essentially relate to financial need, and free meals (likewise). We take the sum of the first, third and fourth items, plus half of the second item, as our measure of funding related to poverty. As can be seen from Table 13, this amounts to **£0.9 billion** for England, which is 14.8 per cent of total funding for the sector.

Table 13: Students and funding for 16 to 19 education in England 2014/15

Students	Number
Total students	1,294,926
High needs students (included above)	39,604
Proportion high needs	3.1%

Funding category	Cost (£)
Total programme funding	5,676,760,737
Disadvantage (including programme funding)	572,656,907
High needs	293,860,000
Discretionary bursary funding	155,047,676
Free meals	39,988,395
Total funding allocation	6,165,651,808
Poverty and disadvantage-related funding	914,622,978
Percent share	14.8%

Source: Education Funding Agency, 16 to 19 Allocations for the 2014 to 2015 academic year.

Rather similar arrangements apply in Scotland. It should be noted that there are both bursaries and educational maintenance allowances in Scotland, and also discretionary funds and child care support. It should also be noted that colleges have funding targets for the percentage of students by 10 per cent most deprived SIMD, disability and ethnic minorities.

Higher education

There are very significant differences in the funding mechanisms for higher education (HE) between the constituent countries of the UK, with England having gone much further down the road of moving University study onto a 'full fee' basis, with students relying largely on loans (with income-contingent repayment) to fund both fees and living costs. This has quite big implications for the way we account for public spending on the sector, for it tends to be become the student loans, or the government's support to the Student Loans Company, which is the main form of public expenditure, although grant is still paid in respect of 'high cost' subjects. Part of the thinking behind this kind of funding shift is a recognition that studying in higher education is one of the most 'pro-rich'/pro-middle class services, which traditionally has systematically been used by and benefitted from disproportionately by people from relatively favoured backgrounds (Le Grand, 1982; Goodin and Le Grand, 1987; Barr, 1998; Bramley, 1996; Bramley *et al.*, 2005). Nevertheless, policymakers have shown some concern about this phenomenon, and various schemes have been developed to assist access and defray some of the costs for people from economically deprived backgrounds.

It is rather difficult to deduce what the total spend on HE is for 2014/15, from the way this is presented in the Business Innovation and Skills Annual Report and from other sources such as the funding council (HEFCE) allocations, and there are large fluctuations in some items from year to year, probably due to successive changes in the funding structure. For example, there has been the progressive implementation of full fees together with unexpected changes in student support costs through the Student Loan system. HEFCE allocations to institutions totalled £3.8 billion, with a corresponding Departmental Expenditure Limit figure of £3.2 billion, but various different figures for Annually Managed Expenditure (AME) range from -£1.1 billion to +£8.5 billion, and a figure for 'student support' in the Programme table of £2.0 billion, which may include FE as well as HE.

However, given the nature of HE as outlined above, the main focus in relation to the cost of poverty must be on the specific support targeted on poor or disadvantaged students. The allocation for 'student opportunity' amounted to **£318 million**, and this appears to cover extra costs associated with recruiting and retaining students from disadvantaged backgrounds. Equivalent funding in Scotland appears to be about £12 million.

Housing

Box 7: Overview of evidence and cost calculation for housing

Approach: We look at investment in social housing in terms of the proportions of new or existing tenants who are poor, while looking at other current local spending in terms of its variation between more and less poor local authorities.

Evidence: We include the net public cost of new social housing investment, other investment in existing social housing, and utilise administrative data on new tenant characteristics and large scale survey data on existing tenants. Other current expenditure by local authorities relating to housing is analysed in terms of variations in budgeted spending across deprivation levels of local authority districts. Similar proportions are applied to detailed expenditure data for the other UK countries.

Controls and interpretation of findings: The broad sweep of academic research on housing would concur that social housing in the UK, as well as services relating to homelessness and supporting people, is strongly targeted on the poor.

Result: Our estimate is that **£2.7 billion** of social housing investment and **£1.4 billion** of local current expenditure on housing related services are attributable to poverty.

Capital investment in England

In the previous study (Hirsch, 2008) we identified between 0.75 billion and 3.4 billion of spending attributed to child poverty in the programmes for new social housing and decent homes investment. In the former case the share attributed to poverty was 72 per cent. In general we would expect the share to be fairly high.

However, since the mid-2000s there have been major changes in the funding and financing of social housing investment. The previous Affordable Housing Programme administered by the HCA has been replaced by the 'Affordable Rent' programme which seeks to achieve reasonably high levels of new affordable homes at much lower grant rates, typically around £20,000 per unit or less. In our target year of 2014/15, this programme was in the later stages of its four year run with output building up to around 30,000 units and capital grant expenditure at around £0.58 billion (approximate estimates, as detailed annual numbers not available from published sources). About 79 per cent of the output was on housing for rent, as opposed to Low Cost Home Ownership (LCHO) – we would regard only the housing for rent as significantly targeted on the poor.

The previous Affordable Housing Programme ran on beyond 2011 in terms of spend and completions but this would have largely run out by 2014/15. Local authorities were also building some new council housing in this period, but it appears that in 2014/15 completions only totalled 1,210, which might account for investment of £170 million. Thus in total we have public capital /grant investment in new social /affordable rented housing of only about £0.63 billion (0.79 multiplied by 0.58 plus 0.17) in England.

We can look at investment in (new and refurbished) social housing, the largest item, in terms of who the direct users are, i.e. the tenants. In particular, we should focus on new social tenants, as they are the direct beneficiaries of investment to generate new social lettings. We have a major source of data on new tenants in the form of CORE, the Continuous Recording System, which now covers both registered providers (housing associations) and local authorities in a comprehensive manner. Using data for 2013/14 from the UK Data Service, we can make a reasonable if approximate estimate of the proportion who are 'poor' using the standard criterion of having less than 60 per cent of median net income, adjusted for household composition using the standard 'Modified OECD' equivalence scale. This can be done because CORE records household type and numbers of adults and children, as well as net income (albeit banded).

It appears from this analysis that 62.8 per cent of new social rented tenants are poor in terms of having less than 60 per cent of median net equivalised income before housing costs. The total relevant public capital spending in England on new social/affordable rented housing was about £0.63 billion, as explained above. Thus the part which can be attributed to poverty is **£0.39 billion**. This can be argued to be a 'cost of poverty' because the principal rationale for social housing is to provide subsidised housing of a decent standard to households who would not be able to afford it in the market. In practice about 63 per cent of new social lettings are targeted on those who are 'poor' on the standard measure, with the balance going to households who are not poor but still have relatively limited purchasing power in the market, and/or other social needs which make social housing an appropriate solution for them.

A further (and, in our target period, larger) part of social housing investment is directed towards improving the quality of the existing council housing stock, including measures to improve energy efficiency and counter 'fuel poverty', and more generally measures to ensure that all social housing is of a 'decent' standard. For this part of the investment, the relevant proportion might be the proportion of existing tenants who are 'poor'. Using Understanding Society Survey data for 2011 embodied in the author's simulation model for looking at the impacts of different scenarios on poverty, we find that in fact only 32 per cent of social tenants are poor in terms of low income before housing costs, although this rises to 44 per cent in terms of after housing costs poverty, 48 per cent against the JRF minimum income standard, or 55 per cent in terms of material deprivation. We suggest taking the middle figure (44 per cent) based on after housing costs poverty in this case.

Local authority housing capital investment in England was £4,310 million in 2012/13 (Wilcox and Perry *UK Housing Review*, 2014, Table 62a). Adjusting this for capital receipts and estimated new build costs gives a net figure of £3,766. It is not clear what the equivalent figure for 2014/15 may be. If we apply the 44 per cent share of poor tenants to this we get a total attributable to poverty of **£1.66 billion**.

Housing investment in the rest of UK

In Scotland, the 'housing and regeneration' budget for 2014/15 was £543 million of which £327 million was 'DEL Capital' (mainly grants to housing associations and local authorities for new build), £180 million was 'financial transactions' and £36m was current resource expenditure by central government. (Scottish Budget 2015, Table 12.10). Local authority gross investment forecast for 2014/15 was £888 million of which £449 million was housing revenue account (HRA) borrowing and £166 million was 'Non-HRA Investment'. However, HM Treasury figures (HM Treasury, 2015, HMR_CRA_2105_Table A10) give a total capital figure of £1,609 million for 2014, which seems rather higher than the total of the above items, as well as £195 million current expenditure (which would include LA current).

We estimate that the total grant and borrowing for new social housing amounted to £250 million for housing association social rent and about £100 million for LA new build, making £350 million in all. If we apply the same factor for the share of poverty among new tenants (62.8 per cent) we get a figure of **£220 million**. Other HRA investment funded from borrowing, excluding new build, would be £349 million, to which we might add the £166 million for non-HRA investment, making £515m., to which we apply the 44 per cent poverty rate for existing tenants, giving **£227 million.**

In Wales, we estimate new build capital grant at £90 million, mainly through housing associations, of which the part attributable to poverty given the same share of 62.8 per cent would be **£57 million**. HRA renovation totals £178 million (including major repairs allowance to transfer landlords), and there is an additional £73 million on improvement grants and enveloping. If the 44 per cent share for poverty applies to these two elements we have an additional **£110 million**. (These estimates are based on data in Wilcox and Perry 2014, Tables 75 and 76).

In Northern Ireland, the Housing Executive is no longer building new housing but there is out-turn for housing associations of £85 million in 2012/13. Applying the 62.8 per cent share of poverty to this gives **£53 million.** There is also an amount for improvement grants and enveloping of £44 million; applying 44 per cent to this gives **£19 million.** (Wilcox and Perry, 2014, Table 88).

The total of housing investment attributable to poverty for the other UK countries is therefore **£686 million**. This gives a UK-wide total for housing investment of **£2.74 billion**.

Local authority current expenditure

Another element of general public expenditure on housing is the expenditure which local authorities incur on their general fund in providing various kinds of support to the general population (as opposed to council tenants, funded through the ring-fenced, self-funding housing revenue account). These expenditures include homelessness administration, relief and prevention, Housing Benefit administration, 'Supporting People' services and certain other support activities including repair and disabled facilities grants. We are able to analyse the level and variation in these expenditures using data on local authority budgets from the CIPFA Financial and General Statistics Estimates for 2014/15 for England. It is most convenient to analyse these for the all-purpose unitary authorities, given the split of these functions (particularly Supporting People) in the two-tier shire county areas.

Table 14 shows the analysis of per capita spending on three component services and the whole of general fund housing by IMD quintile for all-purpose authorities in England. It can be seen from the table that in each part of the service expenditure per capita rises with the level of poverty across the quintiles. We use the standard simple method to estimate the proportion of expenditure attributable to poverty, by taking the difference between the per capita spend in the most deprived and least deprived quintiles and dividing by the difference in poverty (low income score), and multiplying this factor by the average level of poverty.

Table 14: Expenditure per capita on general fund housing support services for all-purpose LAs in England, 2014/15, and implied shares of expenditure on poverty

IMD quintile	Low income score	Homeless-ness (£ per capita)	Housing Benefit administrative costs (£ per capita)	Supporting People (£ per capita)	All housing (£ per capita)
1 (most deprived)	0.239	9.17	11.87	20.32	52.62
2	0.172	6.90	9.49	21.00	45.12
3	0.139	6.81	9.16	14.78	38.58
4	0.115	5.26	7.67	10.63	29.94
5 (least deprived)	0.078	4.96	6.83	14.03	31.40
All	0.171	7.17	9.66	17.99	43.22
Difference between most deprived and least deprived	0.161	4.21	5.04	6.29	21.22
Marginal expenditure per 1% poverty		0.26	0.31	0.39	1.32
Poverty expenditure		4.46	5.33	6.66	22.46
Poverty percentage of expenditure		62.2%	55.2%	37.0%	52.0%
Amount £m all LAs		199.7	248.8	274.6	994.3

This shows that the proportion of spending attributable to poverty ranges from 37 per cent in the case of Supporting People to 62.2 per cent in the case of Homelessness, with an overall share of 52 per cent. Applying these proportions to the total expenditure by English local authorities (including those in the shire areas) gives the total amounts of expenditure attributable to poverty in England in the last line. The total is **£994 million**, with £200 million or more on each of the sub-services shown. The finding that these services are quite strongly related to poverty is unsurprising in the light of evidence about the incidence and drivers of homelessness (Fitzpatrick *et al.*, 2015), complex support needs (Bramley et al., 2015), poor housing generally and, of course, Housing Benefit eligibility.

For Scotland, we know that non-HRA expenditure in 2012/13 was £316 million (Scottish Government, 2014, Table 1.3). A share of 52 per cent of this would be £164 million. In Wales the equivalent budget spend amounts to £241 million, and 52 per cent of this would be £125 million (StatsWales, 2015). In Northern Ireland, there is a spend of £66 million on Supporting People (Wilcox and Perry, 2014, Table 87). It is unclear how much is spent on the other items but it might be about £130 million, giving a total of about £200 million, and a poverty-related share of £100 million. This would give a total for the other UK countries of **£389 million** and thus a UK total of **£1.38 billion.**

Police and criminal justice

Box 8: Overview of evidence and cost calculation for police and criminal justice

Approach: We look at the incidence of crime by local area and build up a unit cost model to compare it with components of criminal justice expenditures.

Evidence: Modelling of the cost of crime at intermediate geography scale in England and Scotland provides the primary basis for our cost estimates. We also look at data on the geographical distribution of offenders and crime rates at the coarser local authority scale, and at past evidence on activity costing analysis within these services.

Controls and interpretation of findings: Modelling of cost-weighted reported crime rates takes account of a wide range of other determinant factors alongside poverty, including age, household type, ethnicity, housing quality, institutional clusters, urbanisation and land use patterns. Models are compared between England and Scotland and with LA-level models of offender numbers. The commentary underlines that the 'poverty' component of crime may reflect effects of past poverty and complex linked issues of poverty, addiction, and criminal behaviour.

Result: Our estimates are that **£5.0 billion** of policing and **£3.9 billion** of criminal justice expenditure are attributable to poverty.

A broad picture of UK-wide spending on 'public order and safety' is presented in Table 15, showing a total of £28.5 billion in 2014. The largest elements within this will be police, criminal justice and fire and rescue.

Table 15: Expenditure on broad public order and safety sector by UK country, 2010 and 2014

	Public order and safety expenditure (£ million)			
Country	Current 2010	Current 2014	Capital 2010	Capital 2014
England	24,322	22,286	1,381	879
Scotland	2,450	2,574	241	112
Wales	1,342	1,288	85	68
N Ireland	1,375	1,218	73	68
UK total	29,489	27,366	1,781	1,127

Source: H M Treasury (2015) HMR_CRA_2015_Chapter_A_Tables A7

It is difficult to get a clear breakdown of these figures for England, where responsibility is divided between Home Office and Ministry of Justice, local government /police and crime commissioners, and several executive agencies (e.g. National Offender Management System), whose websites and corporate reports do not present their public spending numbers in a straightforward manner. Expenditure in Scotland can be more clearly identified. Although the Home Office total for 'police' is £8.6 billion in 2014, CIPFA Budget Estimates for local authorities (including police commissioners) adds up to £11.1 billion – it is presumed that the difference is 'locally financed expenditure' raised from Council Tax precepts. The

Scottish equivalent would be £1,068 million for the single Scottish police force and another £446m for central government police-related expenditure, pensions and other overheads. We have a single total for the Ministry of Justice of £7.4 billion, which presumably includes its executive agencies, and bears an appropriate relationship to the equivalent Scottish total of £768 million.

In the previous study (Hirsch, 2008) it was argued, from various earlier evidence, that between 60 per cent and 80 per cent of police activity and expenditure could be attributable to crime and disorder, so in this study as a working assumption we take a mid-point of 70 per cent.[12] It is presumed that the share of Justice expenditure attributable to crime is slightly higher than this, so we take 80 per cent. This gives an initial working total expenditure of £13,736 million for England and £1,373 million for Scotland.

'Crime' itself, and the way that it is measured, can be somewhat tricky and ambiguous, and this extends to how it is located geographically, which is important given the emphasis on geographical location in our methodology. There are large differences (more for some types of offences than others) between 'reported' crime recorded by police forces and experience of crime by victims as reported in surveys, both of which differ markedly from the 'fear of crime' which may affect people's behaviour, lifestyle and well-being. While these wider issues are undoubtedly important in policy terms, and certainly for the wider 'social costs' (shadow costs) of crime, for the more direct public service costs which are the focus of this study, reported crime may actually be a closer proxy for the time and resource input of police and the justice and correctional systems.

The geographical location issue is that crime may be located in at least three ways, according to the place where the crime happens, the place of residence of the victim, or the place of residence of the perpetrator. The former place might not be a residential area – it could be a shopping centre or a trading estate or a piece of waste ground. This tends to be the basis of recorded crime based on incidents data. The place of residence of the victim is recorded by crime or general household surveys, and this is clearly relevant to analyses in terms of wider social costs and benefits. The place of residence of the perpetrator would be recorded by the criminal justice and offender management systems and should be recorded on the Police National Computer system, and this may be of most relevance to analyses concerned with the background causality and generation of crime.

The main sources available enable us to measure the number of crimes by type by small neighbourhood area, and to apply cost weightings to those types of crime to assemble a cost estimate. The disaggregation of types of crime is more detailed in England than in Scotland. These costs are average unit costs built up from a number of elements, only some of which are 'public service' costs – therefore the totals we derive will be scaled down to be consistent with the control totals quoted above. We can then look at these figures by IMD deciles, and apply a simple bivariate approach to the identification of a first figure for the proportion of crime costs attributable to poverty. This will tend to yield a very high figure, given the strong correlation of crime with poverty. A somewhat more subtle approach would use regression modelling at some intermediate spatial scale to 'control for' the effects of certain other socio-demographic variables, so yielding a modified (but still quite high) figure for the proportion of crime costs attributable to poverty.

An alternative source we have available is based on the NOMS 'Offender Assessment System' as analysed as part of the Bramley *et al.* (2015) *Hard Edges* report, which enables us to estimate the location of offenders in the prison or supervision system in terms of their place of residence/origin, and to analyse this either at LA district level or across bandings of IMD low income neighbourhoods. There is no cost weighting but there is implicitly a seriousness of offence weighting (and certainly a cost of service weighting) insofar as the numbers are grossed to represent the stock of offenders in the system in a year. Analysis at LA district level is a reasonable option here as it is not obviously distorted by budgetary cuts affecting local authorities since 2010. The data are actually pooled for a run of years 2006–13, and include England and Wales.

The general association of this 'offenders rate' with poverty is strikingly strong. This is illustrated by Figure 3, which shows the relationship across quintiles of poverty at the LA district level, for England and Wales. The relationship is near to a straight line, and it goes more or less through the origin. As a

consequence, if we apply our standard simple bivariate approach, we find that poverty accounts for 103 per cent of crime!

Figure 3: Offenders per 100 working age population by low income poverty, LA districts in England and Wales, 2006−13 average

A somewhat more sophisticated approach is to use a multiple regression model to establish the association with poverty when controlling for a number of other socio-demographic factors. A reasonable model containing the IMD low income score and nine other variables can explain 79 per cent of the variance across 316 local authorities, compared with 43 per cent explained by the single variable of low income alone. The additional variables included are: aged 16−24 (+); no qualifications (+); Asian (-); one person household of working age (+); migrant inflow household (+); share of flats (-); geographical barriers (i.e. rurality) (-); institutional population prison/bail hostel etc. (+); institutional population hotel and boarding house (+). The coefficient on the low income variable in this model is lower than in the simple bivariate model, but it still means that poverty accounts for 56.3 per cent of total offending.

Therefore, our first estimate of the cost of poverty in terms of police and criminal justice services is £7.7 billion (56.3 per cent multiplied by £13.736 billion). Using a simple global mark-up of 23 per cent from Table 15, we obtain a UK figure of £9.5 billion, of which £5.4 billion is policing and £4.1 billion is criminal justice, including offender management, accommodation and rehabilitation.

This estimate can be triangulated by further analyses using small area-based reported crime data linked to unit costs (and also by separate estimates for Scotland). As a first step, we tabulate the total number of reported crimes by type by IMD decile of the small neighbourhood area (LSOA). Secondly, we produce the total product of reported crimes by type and the unit cost estimated for that type of crime (this entails some approximate matching of categories between the two datasets), again by low income decile. We then aggregate these costs, rescale them to get to the already-identified total for police and criminal justice spending related to crime, then tabulate alongside the average low income score for LSOAs in that decile (based on the new IMD 2015 for England). These figures are shown in Table 16.

Using the standard simple method to quantify the bivariate relationship, we estimate that 70.8 per cent of relevant costs (£9.73 billion) are attributable to poverty. This seems more reasonable (less extreme) than the simple estimate from the offender data, while being higher than the figure derived from the regression model on the offender data. We can, however, run an equivalent regression model for this new crime cost data, again at LA district level. Using a similar model, but excluding a couple of variables

which were not significant or were unduly correlated with deprivation, now based on 2015 IMD, we find that the cost of crime attributable to poverty is about 48 per cent of the total.

If we take the average of the results from the two models, we have 52.3 per cent of costs attributable to poverty.

Table 16: Estimated cost of crime by IMD 2015 low income deciles for England, 2014/15

Income decile 2015	Low income score (%)	Total cost (£m)	Public service cost (£m)	Crime cost per capita
1 (most deprived)	36.9	6,411	2,734	507
2	26.3	5,481	2,338	434
3	20.3	4,661	1,988	369
4	16.0	3,712	1,583	294
5	12.8	3,026	1,291	240
6	10.2	2,505	1,068	198
7	8.2	2,055	877	163
8	6.5	1,771	755	140
9	5.0	1,478	631	117
10 (least deprived)	3.1	1,105	471	87
All	14.5	32,204	13,736	255
			13736	
			0.427	
Difference between most deprived and least deprived	33.8%			420
Increment per 1% low income score				12.43
Product of increment and average low income score				181
Total and percentage of average crime cost attributable to poverty			9,728	70.8%

Modelling crime at smaller area level

We are able to construct a dataset for relatively small areas (MSOAs/intermediate zones) in both England and Scotland and use this to model levels of the estimated cost[13] of a selection of more common types of crime, for 2007 in Scotland (more recent data has not been published) and for 2014 in England. Five types of crime are included in the Scottish analysis: assault, drug-related, vandalism, housebreaking, and violence. The cost weights are derived from Home Office analysis of unit costs, approximately matched to this set of crime types.

A regression model to predict these cost levels (per head) is shown in Table A15 in the Appendix. In this model it is found that a squared term for poverty works better. It was also decided to omit the crowding variable as this has a rather high correlation with poverty (0.576). The model, which explains 61 per cent of the variance, also includes a couple of socio-demographic variables (especially single person households), some ethnic and migrancy variables, two kinds of institutional populations (prisons and hostels), and several urban form variables, including population density and sparsity and the amount of commercial and retail floorspace per household. These represent varying opportunities for crime.

Poverty remains the most important variable, with a non-linear increasing effect, suggesting concentrations of poverty may exacerbate crime levels. Overall this model suggests 56 per cent of crime is attributable to poverty (when crowding is included in the model, this drops to 48 per cent).

We have been able to compile relatively similar data for the equivalent 'middle' sized geographical unit in England, but this time the crime cost is much more up-to-date and based on a larger number of reported crimes (nine types). We are also able to use measures from the recently published ID2015 (DCLG, 2015), including the low income score poverty measures and a measure of population sparsity ('GeogBar15) and poor housing conditions ('IndoorScr15'). Appendix Table A16 shows the resulting model. Generally this model is satisfactory, with most variables having effects in the expected direction and generally consistent with the findings in Scotland. In addition to a strong effect from poverty, more crime costs are associated with younger (non-student) adults, one person households, more immigrant (non-UK) population, but not mixed or Asian ethnicity, poorer housing conditions, but not cheaper houses, presence of mental health or hostel institutions, urban areas with lower density, and areas of non-residential urban land uses.

The share of crime costs attributable to poverty in this model is 54.2 per cent, remarkably close to the figures derived from a similar model for Scotland (56 per cent), and the average of two simpler/earlier approaches (52.3 per cent).

These approaches to modelling the costs of crime, focusing essentially on reported crime (or offenders in the justice system), drawing on spatial variation at different geographical levels, and controlling for a pretty good range of other expected influences, insofar as these are measurable at this level, seem to be converging on a fairly consistent figure of around 54 per cent. This yields a total for England of **£7.44 billion** (of which £4.2 billion is for police and £3.2 billion for criminal justice) and a total for UK of **£8.94 billion.**

While the evidence consistently shows quite strong relationships in terms of correlations between poverty and crime, there may be considerable complexity underlying these relationships when considering causality, as discussed in our 'rationale and methodology'. Current perpetrators of crime may be influenced in their behaviour by past circumstances and experiences as well as by current circumstances. The propensity to offend may reflect genetic, psychological and cultural factors which create a predisposition to act in this way, or a lack of inhibition. Causation may act in reverse, or in a two-way fashion, between crime and poverty – offenders find it very difficult to gain or maintain employment for example. Evidence highlighted in the *Hard Edges* study (Bramley *et al.*, 2015) showed strong associations between current complex needs (combinations of chronic offending, substance misuse and homelessness) and adverse childhood experiences, including conduct problems and school exclusion, learning difficulties as well as severe poverty and disruption and conflict in the home. This suggests that simply reducing poverty through financial means may not quickly and easily reduce chronic offending behaviour by some groups, and that the full beneficial effects would not be attained until a considerable time lag had elapsed, and considerable resources put into support, rehabilitation, substance treatment programmes, education/training and so on to break the two-way links between poverty and offending.

Fire and rescue

Box 9: Overview of evidence and cost calculation for fire and rescue

Approach: As with crime, an analysis across smaller area geographies provides the primary evidence for the relationship with poverty.

Evidence: Modelling of the response cost of fire service incidents at the intermediate geography scale in England provides the primary basis for our cost estimates.

Controls and interpretation of findings: Modelling of fire service incidents weighted by response cost rates takes account of a wide range of other determinant factors alongside poverty, including age, household type, ethnicity, housing quality, institutional clusters, urbanisation and land use patterns. The overall share of costs which are responsive in this way are comparable with previous studies.

Result: Our estimates are that **£0.8 billion** of fire and rescue costs are attributable to poverty.

There are similarities between the fire and rescue service and policing, in terms of the nature of the service and the ways in which it might be analysed. Fire service expenditure can be partly attributed to providing cover to different types of area which represent different risk levels − e.g. petrochemical refineries and certain other industries, which have the highest risk in terms of adverse consequences of a serious fire event, but very low probability of it taking place; suburban residential areas − fairly low risk and low adverse consequences; dense flatted residential − higher risk and more adverse consequences; rural areas − low risk, small population, not viable to provide rapid response. Part of it can be attributed directly to responding to callouts, genuine and bogus, and data are available on the number, type and small area location of callouts. Other parts represent general public good services in terms of fire safety briefing and inspection, while there are also overheads like pensions.

After examining the basis for pre-existing resource allocation formulae in England, it was concluded in the previous study that around half of fire expenditure was clearly risk-related. Analysis of data from one authority suggested that 84 per cent of incidents (callouts) could be attributed to poverty. Combining these led to the conclusion that about 42 per cent of fire service expenditure was poverty-related.

More recent data for England are summarised in Table 17. As with crime, estimates have been made of the average cost of fire incidents, and these can be seen as falling into the categories of (a) cost of response to incidents by fire and rescue service, together with costs of dealing with and investigating suspected arson; (b) costs to the police or the criminal justice services; (c) broader social costs, such as damage to property, lost business, fatalities and injuries. The costs to police and criminal justice appear to be only about one-tenth of the cost to the fire service itself, which were £3,464 per fire. However, this figure is dwarfed by the wider social costs, which averaged £5,184. In this case, we are focused on the response cost, the total of which is £787 million, which is rather below half of the total budget (half would be £1,061). It is not clear whether there are other indirectly incident-related costs in the fire and rescue budget to account for this difference.

Table 17: Number of fires and associated costs, England 2010/11

	Total	
Number of fires (thousand)	227.2	
	Unit Cost (£ /incident)	*Total cost (£ thousand)*
Costs − fire and rescue response and arson	3464	787,021
Costs − police and criminal justice	330	74,976
Total public expenditure costs	3794	861,997
Social costs	5184	1,177,805
Total all costs	8978	2,039,802

Sources: DCLG (2011)

It is noted that one category of recorded crime is 'criminal damage and arson', formerly 'criminal damage (commercial)', so it may be worth analysing this separately. It appears that available fire incidents are available by LSOA for England, but only up to 2006, whereas comparable Scottish data are available for 2009−12. We aimed to explore modelled relationships at MSOA level, including variables about non-domestic land uses (from the Generalised Land Use Database) as well as census socio-demographics.

Data are available on the costs of fire incidents in England down to Local Authority District level in 2006. We analysed these using a simple model involving only low income poverty and a fuller regression model including a range of socio-demographic and urban form variables. A model with nine variables can explain 52 per cent of the variance. Among the other factors influencing fire incidents, this includes housing vacancies, low occupational class, single person households, children (negative effect), young adults, density of population (positive effect), distance from major centres (negative effect) and greenspace (negative effect). Whereas the simple low income only model attributes 50.3 per cent of costs to low income poverty, this drops to 34.4 per cent in the fuller model.

Subsequently we were able to use the same dataset developed to analyse crime costs in England to fit a model at the intermediate geography scale (MSOA), as shown in Appendix Table A16. While the model has some similarity to the models for crime cost, there are some noticeable differences. Areas with more lower value housing have more fires, while areas with poorer housing conditions have less; areas with a lot of students have more fires (or callouts, anyway); rural areas (which have poorer access to services, or more greenspace) have higher fire response costs per head, which may reflect agricultural and forest fires.

This model suggests that 57.8 per cent of costs are attributable to poverty. We would regard this MSOA level model as more robust than the LA-level model reported above, for reasons explained in our rationale and methodology.

We can also use 2013–15 data on one particular category of crime as a proxy for a range of fires – 'Criminal damage and arson'. We assume that this is a somewhat narrower and slightly indirect measure of fire callout activity. We can basically run the same model for this more up-to-date measure (averaged over three years) and compare it. This model shows a better fit to the data, explaining 66 per cent of the variance (perhaps because it is better matched in time), and indicates that the proportion of response spending attributable to poverty is marginally higher at 58.9 per cent. The similarity of this figure is reassuring and suggests a convergence of results here. Nevertheless, it is worth noting that some of the other relationships in the 2014 model for this police-based indicator are slightly different from those reported above – for example, fires are more related to poor housing conditions and less to low value homes; and less to rural or student areas than in the earlier reported model.

On the basis of these analyses we take the average (58.3 per cent) proportion attributable to poverty and apply to the half share of expenditure believed to be risk-related, giving an estimate of the extra poverty-related fire service response costs in England of **£619 million** (implying a UK figure of around **£0.8 billion**.)

Transport

Box 10: Overview of evidence and cost calculation for transport

Approach: The focus in transport is on those specific areas of transport spending which are more oriented towards poorer groups' travel needs, namely bus subsidies and concessionary fares, with household survey data used to identify the differential usage of these services by poorer people.

Evidence: Two household surveys (Poverty and Social Exclusion Survey and Scottish Household Survey) are used to identify relationships with poverty.

Controls and interpretation of findings: Simple comparisons across IMD deciles provide initial estimates, with some modification in the light of limited modelling within the survey datasets.

Result: Our estimate is that **£0.45 billion** of transport expenditures are attributable to poverty.

Transport is a medium-sized public spending programme with a strong and increasing emphasis on capital investment in infrastructure, as illustrated by Table 18 below. A general characteristic of this programme is that most of it is geared to meeting demand, both for personal mobility and for freight movement. In both cases it is generally the case that demand on the network is a positive function of income – better-off people travel more by most modes of transport and place greater demands on the infrastructure network, while they also consume more and thereby create more derived demand for freight movement. Therefore, we would not expect most of this expenditure to be positively related to poverty. Our focus is therefore on relatively smaller parts of the total spend which may be found to be related to poverty, particularly subsidies to bus travel and concessionary travel schemes. Other elements which might be

related could include aspects of safety, provision for 'active travel', and measures to improve access for some groups (e.g. disabled) to transport services.

Table 18: Transport expenditure by UK country, 2010 and 2014

Country	Transport current expenditure (£ million)			
	Current 2010	Current 2014	Capital 2010	Capital 2014
England	6,306	4,635	10,404	11,408
Scotland	1,560	1,319	1,182	1,428
Wales	518	420	592	570
N Ireland	293	257	406	260
UK total	**8,677**	**6,630**	**12,584**	**13,666**

We have several sources of evidence on patterns of usage of bus services, including concessionary fare usage. Official data by income band may be derived from the National Travel Survey (see Titheridge *et. al.*, 2014). The PSE Survey for UK in 2012 has an indicator of usage of bus services (binary, not frequency), which may be analysed across IMD deciles or quintiles and across various measures of household level poverty. The SHS for 2012 has a measure of frequency of use of concessionary travel, which may also be analysed in a similar way. The PSE suggests that on a simple analysis across IMD quintiles 25.9 per cent of bus usage is attributable to poverty, while the differential usage by poor households appears to account for a lower share of between nine per cent and 15 per cent. A regression model with socio-demographic controls suggests that area and household level poverty together account for 17.1 per cent. This value is applied to general bus subsidies. The SHS suggests that a surprisingly high share of concessionary trips are differentially associated with neighbourhood poverty, based on a simple analysis across SIMD quintiles. However, a similar analysis of bus usage (binary) by elderly and disabled households within PSE yields a much lower figure of 12.1 per cent. It is possible that the SHS picks up a genuine difference based on frequency, but this may be partly a distinct Scottish effect. We therefore take the average of these two figures for concessionary travel. It appears that car ownership is a key factor accounting for greater use of concessionary and general bus travel by poorer groups.

The results of applying these proportions to the relevant budgets for England and Scotland are shown in Table 19. The English budget totals combine the amounts shown in the central departmental budget and in LA budget estimates, while the Scottish totals are as shown in the Scottish Government Budget. Making a similar allowance for Wales and Northern Ireland, we get a UK total of about **£450 million**.

Table 19: Spending on concessionary travel and bus subsidies attributable to poverty in England and Scotland, 2014

	Budget (£ thousand)	Percent spent on poor	Amount spent on poverty (£ thousand)
England			
Total concessionary fares	829,645	29.8%	247,267
Total bus subsidies	491,942	17.1%	84,122
Total			331,390
Scotland			
Concessionary fares	197,000	29.8%	58,714
Bus support	53,800	17.1%	9,200
Total			**67,914**

Local environmental services

Box 11: Overview of evidence and cost calculation for local environmental services

Approach: The focus in relation to local environmental services is on that subset which we have reason to believe show some significant relationship with poverty.

Evidence: A simple descriptive analysis of budgeted spending on the relevant sub-services (trading standards, street cleansing, waste collection, community development and economic development (within planning)) across all-purpose LAs in England provides the basis for identifying the share of spending attributable to poverty. This share is then applied to budgets for all local authorities.

Controls and interpretation of findings: Relevant research is referenced to justify the contention that some of these services are responsive to poverty.

Result: Our estimate is that **£0.9 billion** of local environmental expenditures are attributable to poverty.

Local environmental services are a relatively modest part of the traditional functions of local government. Some of these services would be characterised as classic 'public goods' (environmental health regulation, public parks and open spaces), while others are more similar to public utilities (e.g. waste collection). In either case we would not expect a strong skewing of expenditure towards particular population groups, poor or other. Table 20 shows national totals of identifiable expenditure on environmental protection, which includes activities of central departments and national agencies as well as the local authorities.

Table 20: Environmental protection expenditure by UK country, 2010 and 2014

Country	Environmental protection expenditure (£ million)			
	Current 2010	**Current 2014**	**Capital 2010**	**Capital 2014**
England	6,366	6,539	2,093	2,520
Scotland	1,011	1,021	312	434
Wales	503	535	118	146
N Ireland	239	244	10	24
UK total	**8,119**	**8,338**	**2,533**	**3,123**

Source: HMR_CRA_2015_Chapter_A_Tables A9

Although the local environmental services are not expected to have a strong relationship with poverty, there are some aspects of these services which may have some such relationship. Hastings *et al.*'s (2007; 2009a; 2009b) studies of street cleansing and related services showed how and why there might be a higher workload for such services in more deprived areas (see also Bramley *et al.*, 2012). The same could apply to related services such as waste collection and public space maintenance.

With this in mind we tested whether there was a relationship between spending on selected local environmental services and poverty, across all the unitary/all-purpose local authorities in England. Table 21 shows the results of this simple descriptive analysis.

Table 21: Selected local environmental services spending attributable to poverty for all-purpose local authorities in England, 2014

Low income score (%)	All-purpose LAs environmental expenditure per capita (£)
1 (most deprived)	57.89
2	47.23
3	42.47
4	42.51
5 (least deprived)	36.68
All Las	47.74
Difference between worst and best IMD	21.21
Marginal expenditure £ per capita per 1% inc score	1.35
Total population (thousand)	32,295
Total expenditure on environmental (£ thousand)	1,531,366
Expenditure attributable to poverty (£ thousand)	682,518
Percentage attributable to poverty	44.6%

Note: Services include trading standards, street cleansing, waste collection, community development and economic development (within planning). Total spending for all classes of LA is £1,677,812k.

It should be noted that we included within this analysis spending on those sub-programmes which we expected might have some relationship with poverty (as listed in the note to the table). For this subset of services, the 'slope' of spending per capita across the deprivation bands implies that the cost of poverty is 44.6 per cent of the spending on this group of services. However, it should be noted that this is only a small part of the total spend on environmental protection shown in Table 20 It would amount to **£0.7 billion** for England or **£0.9 billion** for the UK.

Cultural services

Studies such as Bramley (1996), Bramley *et al.*, (2005), Hastings *et al.*, (2015) broadly find that cultural services tend to be used more by the better off, or by more middle class people. This may be changing in some instances – for example there is some evidence that public libraries are becoming a bit less pro-rich/middle class, although they are still relatively neutral. However, overall we have not attempted to provide measures for services in this category as we would not expect to find significant costs of poverty here.

Public service costs: the overall picture

The overall picture of the public service costs of poverty are summarised in Table 22. We estimate that the total cost of poverty in terms of extra costs of public services is about £69.2 billion for the UK as a whole, with £57.2 billion for England and £12.2 billion for the other UK countries.

To put this in perspective, this total is about 20 per cent of the relevant total of public expenditure ('identifiable' spending, excluding social protection/benefits, foreign affairs/aid/defence etc.). It is near four per cent of GDP.

The largest components of this are health (£31 billion), schools (£10 billion), police/criminal justice (£9 billion), and children and families (£8 billion). We have deliberately invested more effort in the analysis of these services than some of the others, conscious of their importance. This has included triangulation between different sources and methods. We would argue that this has, in key instances of health and criminal justice, led to a convergence of estimates.

These public service costs are much higher than those noted in an earlier calculation of the cost of child poverty (Hirsch, 2008). Several factors lie behind this difference:

Most obviously, the extent of poverty overall is much greater than child poverty, and so is its impact. About three times as many adults as children live in households with below 60 per cent median income.

Spending on the adult population is noticeably more skewed, overall, towards poverty than it is in the case of children. This is true both within the largest service area, health care and when comparing health care with the second largest service, school education. Within health care, much of the demand comes from older adults, and the accumulated effect of a life in poverty creates far more additional spending on this group than it does on low income children. When considering schools, a substantial part of the overall budget gets spent on providing a standard amount of teaching to all children regardless of their background and situation, in contrast to health care, where most spending is on people who have fallen ill.

Nevertheless, school expenditure has, in the period since the earlier calculation, become geared more towards children in poverty, as a matter of explicit policy, particularly in England as a result of both the Pupil Premium and the actions of the previous government.

Spending has increased substantially since the previous study, with about 30 per cent more, in cash terms, being spent on public services.

These results represent our best estimate of the extra costs associated with poverty, based on observed relationships in recent data, while controlling for known and measurable other factors. There are limits to our ability to control for some factors, given the data available. In particular, for those socio-demographic factors which are very highly correlated with poverty, it is difficult to separate their effects. We would say that our estimates measure the effects of poverty together with other intimately related factors.

While some of our datasets and analyses enable a breaking down of the effects of poverty into different elements, e.g. current individual poverty, past poverty, neighbourhood poverty effects or other indirect effects, for the majority of our analyses this is not possible. Therefore, it would be fair to say that our analyses provide a measure of the cost impacts of poverty, including some effects from past poverty, some effects from behaviours (e.g. unhealthy lifestyles), and some effects from clusters of more complex problems which are very closely connected (in both directions) to poverty (e.g. chronic offending). It follows that, in order to 'save' these costs in future, it would be necessary *both* to reduce or eliminate poverty in the conventional (financial) sense but *also* to do this over a sustained period of time *and* tackle some of the behavioural issues and complex needs that link poverty and certain damaging behaviours, e.g. offending.

The group of poor people who have these more complex needs is a relatively small one, as part of the overall poor population, but they impose relatively high costs on society including in terms of public service spending (Fitzpatrick *et al.*, 2010; Bramley *et al.*, 2015). A fully successful anti-poverty strategy would need to address some of these damaging behaviours, through interventions which would go beyond simply increasing their income, and which could have a significant cost, although this could still represent a net fiscal saving for government in the medium term. Without such a strategy, of course, it would not be possible to fully eliminate poverty.

Table 22: Breakdown of all public service costs (£ billion)

Expenditure heading	England (£bn)	Rest of UK (£bn)	UK total (£bn)	UK to England expenditure ratio
Acute hospital	17.8	4.0	21.8	1.23
Primary health care	5.9	1.2	7.1	1.20
Public health	1.2	0.4	1.6	1.33
Children and families personal social services	4.9	1.0	5.9	1.20
Children and families nursery/early years	1.3	0.3	1.6	1.20
Adult social care – younger	2.0	0.4	2.4	1.20
Adult social care – older	1.7	0.7	2.2	1.29
Schools	9.1	1.0	10.1	1.11
16-19 education	0.9	0.2	1.1	1.21
Higher education	0.3	0.1	0.4	1.21
Housing investment	2.1	0.7	2.7	1.34
Housing current	1.0	0.4	1.4	1.39
Police	4.2	0.8	5.0	1.19
Criminal justice	3.2	0.7	3.9	1.22
Fire and rescue	0.62	0.18	0.80	1.29
Transport – concessions and bus subsidies	0.33	0.12	0.45	1.43
Local environmental services	0.7	0.2	0.9	1.28
Totals	57.2	12.2	69.2	1.21

3 The knock-on costs of poverty for public finances and GDP

Research shows that poverty damages people's lives and prospects. Having too few resources to meet one's needs can ultimately prevent full participation in social and economic life, and it is not surprising that this has serious knock-on effects. Those affected are poorly positioned to acquire the human and social capital that allow them to thrive. Moreover, evidence shows that the very fact of living on a low income weakens people's life chances. The knock-on impact of poverty in childhood is particularly strong and clear-cut, given that people's economic potential as adults is so strongly dependent on gaining skills, competencies and qualifications that are often acquired early in life. For adults on low incomes, it is intrinsically harder to determine to what extent future disadvantage is determined by the experience of poverty in adulthood or by the associated disadvantages that may have preceded it.

It is well beyond the scope of this report to review all impacts of poverty, but various meta-studies have sought to round up the damaging effects of living on low income. For example:

- Griggs and Walker (2008) reviewed evidence on the cost of child poverty for society, contributing to an earlier estimate of costs (Hirsch, 2008). They concluded that the consequences of child poverty are far-reaching and multi-faceted, exacerbated by the interaction between low income, material deprivation, poor housing, disadvantaged neighbourhoods and schools, parental stress and social exclusion. Consequences include losses to the economy through reduced productivity, lower educational attainment, poor health and low skills.

- Cooper and Stewart (2013) reviewed a wide range of longitudinal studies considering causal relationships between family income and consequences for children. They identified evidence of a range of effects due to low income alone. In particular, they found that family income accounts for a significant proportion of inequalities in cognitive and behavioural outcomes, and that these differences are more marked at the lower end of the income distribution. Importantly, the evidence suggests that these effects can be attributed both to the stresses arising from lack of income and to more direct effects of lacking material resources.

- Cooper and Stewart (2015) also considered evidence for the effects of household income in adult life on a similar basis. They found that lower income is strongly associated with worse well-being and mental health, especially lower down the income distribution. But while cross-sectional studies (e.g. Diener and Diswas-Biener, 2002) have established such relationships, there is a more limited range of conclusive evidence of the causal effects of low income in adulthood. The most pronounced effects identified by Cooper and Stewart's review was on life satisfaction and subjective well-being, again with the effect strongest lower down the income distribution.

Measuring knock-on costs of childhood poverty

The 2008 estimate of the cost of child poverty (Hirsch, 2008) included a calculation of economic and fiscal costs based on the lower earnings and employment prospects of adults who had grown up in poverty. This used powerful cohort study evidence, combined with economic modelling (Blanden *et al.*, 2008).

The modelling used cohort studies to measure the association between being in poverty at age 16 and earnings and employment chances early in adult life – up to age 34. In doing so it controlled for parental characteristics to get as close as possible to an effect caused by poverty itself rather than other aspects of an individual's background. The authors built on previous work using cohort studies to show that the impact of growing up on a low income continues well into adult life, and is partly but not wholly mediated by educational outcomes (Blanden and Gibbons, 2006).

The 2008 modelling considered how much would be gained in extra earnings and reduced benefit payments if all adults who grew up in poverty were instead to avoid poverty and thereby improve their employment and earning prospects. However, given that they may still face disadvantages due to socio-economic background, the estimate made the conservative assumption that their prospects would rise not to the average, but to the average for people who had grown up in families between the poverty line and twice the poverty line (60-120 per cent median income). In estimating the effect of additional employment prospects, it assumed that not having been in poverty would give someone the average chance of getting a job, but that the 'extra' people employed as a result would earn at the 25th percentile of earnings. This last assumption was an arbitrary way of acknowledging that people escaping poverty would on average come from less advantaged socio-economic backgrounds, and would be likely to be in lower-paying jobs.

These assumptions provided a first estimate of how much employment and earnings might grow in the absence of poverty, but this was further modified, to reflect the fact that labour demand might not expand fully to accommodate a greater supply of more 'employable' individuals, so aggregate earnings and employment may expand by less. The experience of immigration suggests that when more well-qualified labour comes onto the market, the long-term supply of labour is likely to expand by something above half of that increase, so Blanden *et al.* (2008), suggested a cautious approach of halving the initial estimate of aggregate employment and earnings effects to provide a lower bound of what would happen in practice.

The resulting estimates were updated in 2013, and are now further updated, assuming that the relationship has remained the same, and the total costs are therefore a function of average earnings and benefit rates. In practice, specific fiscal changes are likely to have produced some relatively minor changes in the distribution of the economic costs between private individuals and the state: in particular, increases in the personal tax allowance mean that the additional people who it is assumed could have been in work, but on relatively low earnings, had they not grown up in poverty, would be paying less of their earnings in tax. However, this adjustment, which could only be calculated by repeating the earlier calculations from scratch, would be very minor compared to the overall estimates, and would not change the total cost of poverty being estimated here, only the detail of its distribution.

The following are updates of the 2008 calculations. In adding up these costs for 2015, we are no longer including the private loss from earnings foregone, because the present report focuses on the cost to the Treasury.

Table 23: The knock-on cost of child poverty

Category of cost	Estimated cost 2008 (£ billion)	Change 2008–15	Basis	Estimated cost 2015 (£ billion)
Gross earnings lost by people who experienced childhood poverty	11.3		Increase in average earnings	12.6
Amount of these earnings that would have been paid in taxes	3.3	11.8%		3.7
(Retained earnings by individuals not counted as part of the total here)	8			8.9
Benefits associated with employment effects of having grown up in poverty	2	18.5%	Increase in Income Support rate	2.4
Total knock-on effect of child poverty – loss to Treasury	**5.3**			**6.1**

Thus the knock-on cost of child poverty to the Treasury has risen to £6 billion, while an additional £9 billion is now lost to individuals, which can also be seen as a reduction in GDP.

Measuring knock-on costs of adult poverty

The scarring effect of poverty does not end when someone turns 18. Living in poverty as an adult brings stresses, hardship and exclusion, just as it does for children. Having insufficient resources to meet your needs can affect your chances throughout life, whether making it harder to train or travel to get a job, keeping healthy enough to work, limiting the ability to save for retirement, or creating stresses and strains as a parent that make it harder to give one's children life chances. All these examples are bound to create impacts that go beyond the direct deprivation suffered by individuals as a result of low income. They will affect the future levels of poverty, economic capacity and demands on the state.

Measuring these effects, however, is intrinsically harder when considering the results of adult poverty than when looking at child poverty. The fact that teenagers on low family income are more likely to be low earning or out of work in their 30s strongly suggests a transmission mechanism between the income and associated family circumstances that they grow up with and their future ability to earn. The fact that someone on low income in their 30s is likely to be on low income in their 50s is unsurprising and a different matter. Earnings capacity linked to qualifications and other characteristics is likely to be a primary cause of low income in the first of these periods, and the same characteristics may apply in later years. Distinguishing any additional effect on future earnings and employment caused by the *experience* of poverty in adulthood would be extremely difficult.

Making inferences about such scarring effects depends, like the childhood-to-adulthood cost of poverty, on longitudinal evidence of future outcomes of those who have been on low income. Searches for this study have been unable to identify any research that attempts to measure directly the independent effect of the experience of low income on future earnings or employment prospects, comparable to the research by Blanden and colleagues (2008) referred to in the previous section. Cohort studies that address these issues focus on the influence of childhood experiences for future life chances. This is not surprising, given that even these studies have been able to attribute only a part of these prospects specifically to income, and much of the effect has been 'mediated' by educational attainment. Distinguishing any effect on future earnings of the actual experience of low income in adulthood from prior influences including educational attainment or simultaneous influences such as unstable work patterns is likely to be a fruitless task.

On the other hand, there is clear-cut evidence of an association between low income in adulthood and future outcomes in terms of physical and mental health, even controlling for prior health status. This provides an indirect indicator of knock-on costs for society of the existence of adult poverty. Health is a strong influence both on rates of participation in work for adults in later working age and on the timing of their exit from the labour market (Hirsch, 2003). Mental and physical health also interact with labour market factors in determining the claiming of various benefits.

The strongest UK evidence that adult poverty can damage long-term health comes from Benzeval and Judge's (2001) study using the British Household Panel Survey, which found that 'long-run income and persistent poverty are key determinants of health'. Studies from Sweden (Fors *et al.*, 2012) and Finland (Lahelma *et al.*, 2004) show a clear relationship between the experience of low income and mortality rates, but emphasise the important role of the mediation of this influence through other socio-economic influences including education and social class. Evidence from the United States (Dow *et al.*, 2011) suggests that the relationship between low income and mortality is growing, and is concentrated at the bottom end of the distribution, although differences between the US and UK health care systems and their influence on low income groups' access to health care suggests that this finding may not be transferable. These studies and others all suggest that the relationship between income and health, although applying across the income distribution, is largest in the lower part of the distribution and in particular in the bottom two quintiles.

While this evidence certainly helps explain why the prevalence of certain health conditions is greater in poorer communities, this issue is already covered in the service-cost side of this report in relation to health care service costs. A different question is whether there are discernible knock-on costs related to economic capacity and fiscal transfers. It can be helpful in this regard to consider characteristics of those who are in need of additional help from the state as a result of health-related conditions or low lifetime

income. For example, Sissons *et al.,* (2011) found that people coming onto Employment and Support Allowance (ESA) are substantially more disadvantaged than average in terms of work history and occupational status, while not distinguishing an independent effect of income. About half of claims for this benefit are now for mental rather than physical conditions (compared to a third in the case of Incapacity Benefit claims 15 years ago – DWP tabulation tool results for May 2000 and May 2015: mental and behavioural disorders as proportion of total claims). The well documented stresses of poverty are likely to increase this risk.

A consideration of this evidence suggests that some cautious and selective estimates of the knock-on costs of adult poverty can be made. Table 24 sets out some potential ways in which this cost could be measured, considerations of how this could be done and conclusions about whether to include each measure in the cost of poverty being estimated in this report.

Table 24: The knock-on costs of adult poverty, potential elements

Measure	Case for including	Drawbacks	Basis for inclusion/non-inclusion
Higher out-of-work benefits associated with being in deprived areas where poverty has held people back	People living in deprived areas with limited opportunities face cumulative disadvantage linked to the experience of poverty.	Impossible to distinguish the economic disadvantage deriving from the experience of poverty and the conditions that created this poverty in the first place.	Not included: no valid evidence to draw on.
Lower earnings of people living in these areas, and associated lower tax revenues	As above.	As above.	As above.
Higher claims for ESA in areas where most people are on Income Support	Evidence has shown that low income leads to poor physical and mental health, which in turn can make people unable to work.	High ESA claim rates are likely in part to relate to labour market conditions, not just to health outcomes. Poor health can be a cause not just a consequence of low income.	Included. A cautious estimate can capture the partial contribution of poverty to conditions that produce ESA claims.
Early exit from labour force caused by poverty and consequent loss of economic activity	Bardasi and Jenkins (2002) show that people's experiences in working life can trigger early exit from the labour force.	Clearest linkages are with occupational status not poverty itself; determinants of early exit complex; potentially better lifetime income makes it easier to retire earlier.	Not included, even though early exit is likely to be a significant cost of adult poverty: insufficient evidence to base an estimate on.
Higher Pension Credit claims in relatively poorer areas	A long-term effect of not having enough money in working life is inability to make contributions and save towards pension; state picks up part of this cost through means-tested Pension Credit.	It is possible to be eligible for Pension Credit even if you were not in poverty in working life, e.g. women with an insufficient contribution record, and those with full contributions basic state pension entitlement only.	Included. Since low income in working life can lead directly to poor pension entitlements, means-tested help can be seen as a direct consequence of working age poverty.
Outcomes of poverty in pregnancy and early	Intergenerational consequences of poverty, transmitted	Identifying economic effects would be extremely indirect. Risk of double	Not included: even though effects are important,

| parenthood | e.g. through health outcomes including low birth weight (Hirsch and Spencer, 2008) show long-term social and economic damage. | counting with respect to cost of child poverty. | measurement of an economic cost not feasible. |

On this basis, the spatial distribution of ESA and Pension Credit claims are used here as two indicators of knock-on costs of adult poverty.

In the case of ESA, Figure 4 considers the extent to which claims for benefits due to being unable to work (rather than due to the lack of jobs) are higher in parliamentary constituencies that are income-deprived, using Income Support claims as an indicator of the greater risk of having faced poverty in these areas. (Income Support is just one of the components of the income domain of the IMD used earlier in this report, but one that gives a strong indication of whether adults in the area have spent time living on low incomes, and for which a comparison with ESA is readily available.) This shows that in the most deprived areas, about three times as much is claimed per head of adult population than in the least deprived areas. It is noticeable that the relationship between area income deprivation and ESA claims is greatest when comparing the most deprived 30 per cent of areas to the rest. On this basis, an estimate of the cost to the Treasury of people on low incomes in deprived areas having an additional risk of claiming ESA can be calculated by imagining that the bottom three deciles have the same ESA per head as those in the fourth decile. Of course, were poverty not to exist, some of the extra claims in the bottom three deciles would still take place due to disadvantages other than poverty that cause people in those areas to have higher claim rates, but equally, some individuals in better-off areas who escape poverty would be less likely to claim. The estimate should therefore be regarded as illustrative.

Figure 4: Average employment and support allowance payment per working age adult by parliamentary constituency, ranked by decile group of Income Support claims
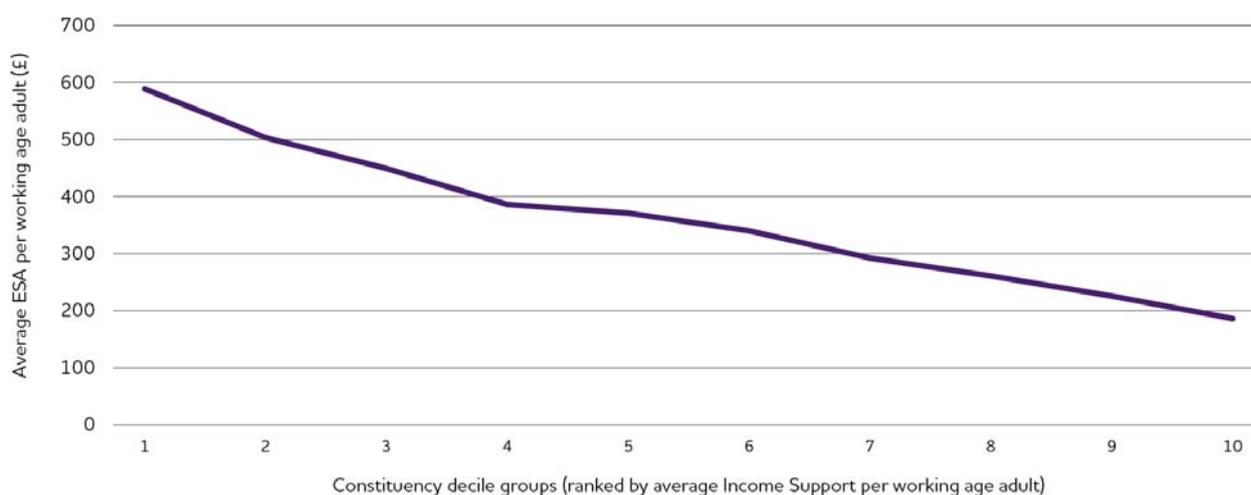
Table 25 thus calculates the cost of additional ESA payments caused by higher claim rates in the most income-deprived 30 per cent of constituencies. This comes to a total of £1.4 billion, equivalent to just over 10 per cent of all ESA payments. Given the importance of the overlap between the experience of low income and the conditions that create ESA claims, this is a modest estimate of the cost.

Table 25: Distribution of ESA average claims by constituency, ranked by income deprivation, and cost of additional claims by most deprived 30 per cent, 2015

Decile group: constituencies ranked by income deprivation	1	2	3	4	5	6	7	8	9	10
Actual average payment (£)	590	505	450	387	372	341	293	261	226	187
Saving per adult if bottom three deciles improved to fourth decile average (£)	203.3	117.5	63.17							
Population per decile (thousand)	3,642	3,642	3,642							
Total saving by decile group (£ million)	740	£428	£230							
Total saving (£ million)	1,398									

Source: DWP Tabulation tool (February 2015), matched with ONS population data for constituencies

Figure 5 and Table 26 carry out the same exercise for claimants of Pension Credit. All of these claimants are on definition on low income, but their clustering in certain areas where Pension Credit claims are higher relative to the number of pensioners is taken as an indication of the extent to which poverty during working life has contributed to the need for this means-tested support in retirement. In this case, the graph shows that payments per pensioner in the highest 10 per cent of constituencies are over five times as high as in the lowest. However, there is even more of a skew to the bottom end of the distribution, with by far the greatest differences being in the bottom two decile groups compared to the rest. On this basis, the estimate imagines that in the absence of working age poverty, average pension credit claims in the 20 per cent of constituencies where they are the highest fall to the level of the third decile group. This produces a figure of £1.3 billion, representing the extra public cost of people who have been in poverty in working life requiring means-tested support in retirement. This is about one sixth of all spending on Pension Credit.

Figure 5: Average pension credit per pensioner by parliamentary constituency, ranked by decile group, 2015
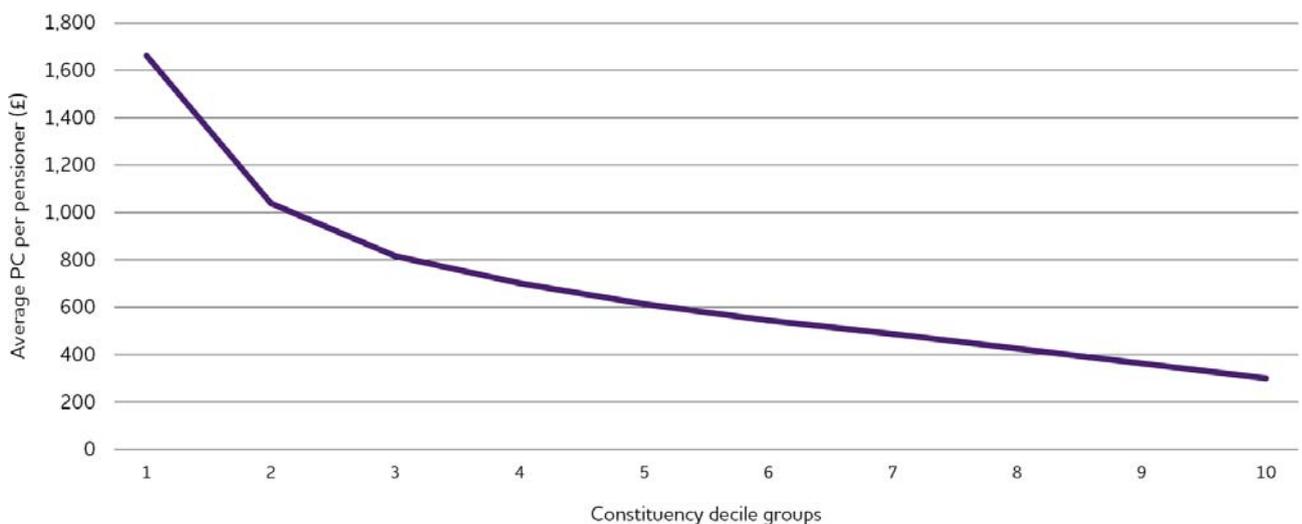
Table 26: Distribution of Pension Credit average claims by constituency, and cost of additional claims by most deprived 20 per cent, 2015

Decile group: constituencies ranked by average pension credit claims	1	2	3	4	5	6	7	8	9	10
Actual average payment per pensioner (£)	1,669	1,043	819	704	616	546	489	427	364	301
Saving per pensioner if bottom two deciles improved to third decile average (£)	850	224								
Population per decile (thousand)	1,200	1,200								
Total saving by decile group (£ million)	1,020	268								
Total saving (£ million)	1,288									

Source: DWP Tabulation tool (February 2015), matched with ONS population data for constituencies

The total of these two categories of public spending costs resulting from the knock-on effects of adult poverty comes to **£2.7 billion**. As emphasised throughout this section, this is likely to represent only the tip of a hard-to-view iceberg of the cost of adult poverty.

4 Conclusion

The total costs of poverty in the UK estimated in this report comprise:

- Public service costs: £69.2 billion.

- Knock-on effects of child poverty: £6 billion lost to Treasury – in addition to the £9 billion lost to individuals who grew up in poverty in terms of lower retained income.

- Knock-on effects of adult poverty: cost to Treasury of £2.7 billion.

This gives a total cost to the Treasury of about £78 billion. This equates to over four per cent of GDP. This is slightly more than the amount that the UK Government borrowed in 2015–16: £72 billion (HM Treasury, 2016, p. 24).

This is a broad brush estimate which cannot be taken as a precise calculation of the savings and additional revenues that would accrue in a world without poverty. However, these calculations give a powerful indication of just how strongly the existence of poverty is impacting everyone in the UK, and not just those living below the poverty line. In particular, a large proportion of what we spend publicly (about £1 in every £5 spent on public services) is associated with the ways that poverty damages people's lives. A coherent strategy to combat poverty would therefore not only improve the lives of those whom it helps, but also bring huge public savings.

Notes

1. 'Identifiable expenditure' is that which can be meaningfully allocated across the UK countries and regions.

2. Because of the focus of the previous study (Hirsch, 2008) on children, no use was made at the time of the data on 15−59 year olds and 60-plus populations, even though this was provided; therefore this is the first time these have been analysed and presented in this way.

3. A standardised beta coefficient of 0.31 means that bed-days increase by 0.31 of a standard deviation for one standard deviation increase in poverty.

4. A standardised beta coefficient of 0.59 means that the healthcare index increase by 0.59 of a standard deviation for one standard deviation increase in poverty.

5. SHS records frequency in bands, such as 'about once a week' or '2−3 times a year'; these have been recoded to suitable numbers per year, in this case 50 and 2.5 respectively.

6. As is typical of micro models, the 'fit' in terms of proportion of variance explained is quite low (r-squared=0.037), but most individual variables are significant and the overall model F-ratio is satisfactory.

7. See PHE data and analysis tools, available at: https://www.gov.uk/guidance/phe-data-and-analysis-tools (accessed 20 June 2016)

8. See the Costs Book detailed tables. Available at: http://www.isdscotland.org/Health-Topics/Finance/Costs/Detailed-Tables/#Community-Health (accessed 20 June 2016).

9. The bulk of funding for Children and Families sits in the local government block.

10. See for example Barr, 1998; West *et al.*, 2001; Hobcraft, 2002; Lupton, 2004; Levacic *et al.*, 2005; Steele *et al.*, 2007; Sibieta, 2010 and Bramley *et al.*, 2011.

11. Type of school includes a small category for 'secondary without KS4' − it is presumed that this is a residual group of Middle-deemed-Secondary schools.

12. We are not aware of more recent studies of police activity analysis across different functions having been updated and published.

13. These cost estimates include both public service costs and wider costs to victims and society. In using them in this way we are assuming that public service costs correlate reasonably with overall costs. Our estimates are scaled to the control totals for police and criminal justice spending.

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Appendix: More detailed analyses of public service costs

Health care

Table A1: Acute hospital in-patient activity rates by IMD poverty deciles in England, 2005/06*

IMD						Observed	Excess	
Low Inc	**IMD**	**Bed-days/**				**Bed-days/**		
Score '07	**Band**	**Popn**				**Popn**		
incscr07		0-14	15-59	60 plus		0-14	15-59	60 plus
.0360	1.00 (best)	0.18	0.30	1.79		0.00	0.00	0.00
.0549	2.00	0.20	0.33	2.04		0.02	0.04	0.25
.0699	3.00	0.19	0.34	2.12		0.01	0.05	0.34
.0853	4.00	0.21	0.38	2.29		0.03	0.08	0.50
.1051	5.00	0.22	0.41	2.46		0.04	0.11	0.67
.1313	6.00	0.23	0.45	2.65		0.05	0.15	0.86
.1681	7.00	0.24	0.49	2.76		0.06	0.20	0.97
.2213	8.00	0.26	0.55	3.07		0.08	0.25	1.29
.2891	9.00	0.28	0.64	3.34		0.10	0.35	1.55
.4001	10.00 (worst)	0.31	0.81	3.74		0.13	0.51	1.95
						Marginal bed-days/pop/margincscr		
.1561	Total	0.24	0.47	2.55		0.358	1.414	5.357

*Note that is analysis is based on 2005/06 data

Table A2: Example of regression model for Scottish acute health service activity: in-patient bed-days for 15-59 age group per 1000 population, 2013/14 (Intermediate Zone level)

Variable	Coeff B	Beta	Signif
(Constant)	113.250		.000
Compos Poverty	9.122	.311	.000
1-person hhd	3.179	.159	.000
Crowded	6.610	.209	.000
No cent heating	-9.624	-.109	.003
Student	-4.920	-.224	.000
Construction wkr	7.714	.097	.001
Greenspace %	-1.173	-.184	.000
Population density	-1.210	-.179	.000
Model summary			
Adj r-squared	0.218	*Percent attrib to poverty*	
Std Err Est	25.9		45.5%
F-Ratio	40.5		
No of cases	1,277		
Mean of dep var	348.2		
Std Dev of d v	179.2		

Table A3: Regression model for pseudo health care workload index based on ID2015 health domain, MSOAs in England

Varname	Variable desription	Coeff B	StdCoeff	Signif
Const	Constant	432.458		.000
IncScr15	Low Income Score ID15	2771.799	.585	0.000
pc16_39	Aged 16 - 39 %	10.712	.249	.000
pc60plus	Aged 60+ %	12.090	.219	.000
Pcmixed	Mixed ethnicity %	-16.356	-.072	.000
Pcpakbang	Pakistani, Bangladeshi %	-1.164	-.022	.000
Pctbab	Cncl Tax Bands A&B %	4.877	.355	.000
pcstud1624	% Students/% 16-24	-54.193	-.025	.001
Pcrowd	Crowded households %	-3.605	-.074	.000
pigfish	Agricetc workers 2001 %	-6.157	-.031	.000
Pconstr	Construction wkr 2001 %	2.845	.014	.042
Nurscarehomept	Nursing/care home resid %	2.239	.043	.000
Psychhosppt	Mental hospital resid %	5.493	.025	.000
Prisonpt	Prison popn %	1.161	.022	.000
GeogBar15	Geographical barriers' ID15	-35.814	-.056	.000
Resdens	Density net dwellings/ha	.312	.040	.000
OutdoorScr15	Air Pollution, Traffic	39.786	.080	.000
	Adj r-squared	.833		
	Std Err Est	175.1		
	F-Ratio	2107.9		
	No of cases	6777		
	Mean of dep var	1598.8		
	Std Dev of d v	412.0		

Table A4: Cost of prescriptions in primary care sector in Scotland by SIMD deprivation deciles, 2012–14

SIMD2012 Low Inc (%)	Decile SIMD 2012	Cost/head 2012	Cost/hea 2013	Cost/head 2014	Incremental Cost per 1%pt
34.0	1	219.5	227.6	238.5	1.072
24.8	2	209.7	217.9	226.0	1.661
19.5	3	200.8	208.8	216.3	4.770
15.8	4	183.4	190.3	196.8	5.609
12.7	5	166.2	172.2	179.3	4.324
10.0	6	154.4	158.9	165.8	4.343
7.9	7	145.2	149.2	156.2	3.956
6.0	8	137.7	142.1	148.8	5.504
4.3	9	128.4	132.1	138.0	3.134
2.8	10	123.7	127.0	132.1	
13.8	Overall	166.2	171.7	178.9	3.076
					Total Cost Pov
					225,232,641
					25.5%

Source: Authors' analysis of data provided by Information Services Division, Scotland;
Note: units are 'gross cost of ingredients'

Table A5: Frequency of usage of GP surgeries by adults in Scotland by quintiles of deprivation

SIMD Quintiles	Income Score 2012 %	Frequency pa	Increm-entalfreq/1% lowinc
1 - 20% most depr	29.4	7.64	0.113
2	17.6	6.32	0.036
3	11.4	6.09	0.186
4	6.9	5.27	0.112
5 - 20% least depr	3.6	4.89	0.112
All	13.8	6.04	0.106
Poverty-related (Ave product)			1.467
Share of Total			24.3%

Source: Authors' analysis of Scottish Household Survey 2012.

Note: Frequency of use by random adult, weighted to represent whole adult population.

Table A6: Regression model to predict frequency of usage of GP surgeries by adults in Scotland, 2012

	Coeffic	t-stat		Effect
	B			Coeff x Mean
(Constant)	2.653	9.67		
quinincscr %	.094	8.60	*quinincscr*	1.29
Benefit	1.503	6.16	*benefitp*	0.35
Findiffp	1.666	4.03	*findiffp*	0.11
ager1624	-.667	-2.21	Total Pov	1.75
ager3544	-.271	-0.99		29.0%
ager6074	1.649	6.35		
ager75p	1.886	5.35		
Female	1.439	7.70		
Married	.795	3.86		
Poorcond	1.737	2.02		
Hiflrbase	1.452	3.16		
Rural	.394	1.57		
dep var	gpfreq			
adj r-square	0.037			
SEE	9.420			
F-ratio	32.5			
N of cases	9891			

Source: Authors' analysis of Scottish Household Survey 2012.
Note: Frequency of use by random adult, weighted to represent whole adult population.

Table A7: Breakdown of local authority public health spending in England, 2014/15

Public health area	Net current expenditure (£000s)
Sexual health services - STI testing and treatment (prescribed functions)	379,055
Sexual health services - Contraception (prescribed functions)	190,613
Sexual health services - Advice, prevention and promotion (non-prescribed functions)	86,083
NHS health check programme (prescribed functions)	62,827
Health protection - Local authority role in health protection (prescribed functions)	38,314
National child measurement programme (prescribed functions)	26,633
Public health advice (prescribed functions)	62,074
Obesity – adults	62,880
Obesity – children	36,642
Physical activity - adults	62,810
Physical activity - children	32,241
Substance misuse - Drug misuse – adults	540,933
Substance misuse - Alcohol misuse – adults	200,702
Substance misuse - (drugs and alcohol) - youth services	66,720
Smoking and tobacco - Stop smoking services and interventions	119,383
Smoking and tobacco - Wider tobacco control	14,669
Children 5–19 public health programmes	267,052
Miscellaneous public health services	489,484
Total public health	2,739,118

Source: DCLG Revenue Out-turn R03; Social Care and Public Health

Adult social care

Table A8: Regression model for adult social care expenditure (aged under 65), English social services authorities

Varname	Variable description	Coeff B	Std. Error	Beta	t	Sig.
(Constant)	(Constant)	230.220	21.367		10.774	.000
incscr15ss	Low income score	460.904	82.780	.569	5.568	.000
p1phhness	One person hshlds	1.675	1.120	.166	1.496	.136
Pclrgfamss	Large families	-12.266	4.546	-.168	-2.698	.007
Pcprivrentss	Private rent	-2.290	.643	-.336	-3.564	.000
Pctbabss	Cncl Tax Bands A&B	-1.105	.141	-.621	-7.856	.000
Ppmhinstss	Mental heath instits	10.269	7.097	.074	1.447	.149
Pptravtempss	Traveller & temporary homes	2.786	.770	.252	3.616	.000
Dependent Variable: YngAdSCExppc	YngAdSCExppc	Mean	218.1	std ddev	39.3	
Weighted Regression - Weighted by hhdwgt	No. of households					
	Adj r-squared	0.188				
	Std error Estimate	36.700				
	F-ratio	11.600				
	Number of cases	150				

Table A9: Regression model for older people's social care expenditure (aged over 65), English social services authorities

Varname	Variable description	Coeff B	Std. Error	Beta	t stat	signif
(Constant)	(Constant)	1901.196	286.918		6.626	.000
IDAOPI15ss	Older people low income	1893.823	519.334	.423	3.647	.000
Pownss	Owner occupiers	-16.429	3.328	-.546	-4.936	.000
pc75plss	Aged over 75	27.026	16.305	.150	1.658	.098
pcbvbhlthss	Bad/ very bad health (all age)	-83.106	17.240	-.322	-4.820	.000
LivEnvScr15ss	Living Environ Score	-6.958	1.867	-.207	-3.726	.000
nurscarehomeptss	Nursing/care homes	-9.247	8.340	-.074	-1.109	.268
Popdensss	Population density	2.466	1.277	.216	1.931	.054
London	London	-146.189	57.014	-.160	-2.564	.011
Dependent Variable: YngAdSCExppc	YngAdSCExppc	Mean	799.3	std ddev	326	
Weighted Regression - Weighted by hhdwgt	No. of households					
	Adj r-squared	0.558				
	Std error Estimate	224.800				
	F-ratio	51.800				
	Number of cases	150				

Table A10: Numbers of clients and expenditure on personal care in Scotland 2013–14

Type of care	Number of clients aged 65+ (Scotland)	Estimated expenditure (thousand)
Home care	50,450	£468,190
Free personal care at home	47,810	£363,570
Care home residents	30,400	£632,760
Self-funded care home residents receiving FPNC or FPC	10,240	£130,110

Source : http://www.gov.scot/Topics/Statistics/Browse/Health/Data/FPNCInfo

Table A11: Self-perception of health by gender and age in Scotland, 2014

Adults	Male	Female	16 to 24	25 to 34	35 to 44	45 to 59	60 to 74	75 plus	All
Very good/good (%)	75	74	86	86	82	73	66	48	74
Fair (%)	19	19	12	11	14	20	25	36	19
Bad/very bad (%)	6	7	1	3	5	7	9	16	7
Total	100	100	100	100	100	100	100	100	100
Base	*4,440*	*5,350*	*790*	*1,350*	*1,430*	*2,530*	*2,380*	*1,310*	*9,790*

Source: Scottish Household Survey 2014

Table A12: Self-perception of health by net household annual income* in Scotland, 2014

Adults	£0–£6,000	£6,001–£10,000	£10,001–£15,000	£15,001–£20,000	£20,001–£25,000	£25,001–£30,000	£30,001–£40,000	£40,001+	All
Very good/good (%)	72	61	59	66	73	80	83	89	75
Fair (%)	21	27	28	24	21	15	14	10	19
Bad/very bad (%)	7	12	13	10	6	5	4	1	6
Total	100	100	100	100	100	100	100	100	100
Base	*300*	*1,010*	*1,780*	*1,550*	*1,160*	*920*	*1,190*	*1,610*	*9,520*

Source: Scottish Household Survey 2014

*Note: Due to missing income information, 'All' figures may not match between tables. Excludes refusals/don't know responses.

Table A13: Self-assessed health by Scottish Index of Multiple Deprivation (SIMD), 2014

Adults	10% most deprived									10% least deprived	Scotland
	1	2	3	4	5	6	7	8	9	10	
Very good/good (%)	63	67	64	74	73	77	79	79	82	87	74
Fair (%)	25	23	25	19	20	18	17	17	15	10	19
Bad/very bad (%)	13	10	11	7	6	6	4	4	3	2	7
Total	100	100	100	100	100	100	100	100	100	100	100
Base	*1,000*	*920*	*920*	*1,080*	*1,070*	*1,040*	*1,090*	*880*	*780*	*9,790*	*9,790*

Adults	20% most deprived	Rest of Scotland	Scotland
Very good/good (%)	65	77	74
Fair (%)	24	18	19
Bad/very bad (%)	11	5	7
Total	100	100	100
Base	*1,920*	*7,870*	*9,790*

School education

Table A14: Analysis of school funding and pupils in England by free school meals banding and school type, 2014/15

FSMBAND	Average of FSM Primary	Secondary with KS4	Secondary without KS4	Special	Grand Total
HIGH	43.9	43.9	37.2	49.0	45.0
LOW	9.3	11.0	9.2	16.0	9.5
MEDIUM	26.9	26.4	25.2	28.3	26.9
Grand Total	17.0	17.6	11.5	40.0	18.2
	Sum of PUPILS				
HIGH	475,910	88,682	1,294	48,186	614,072
LOW	2,401,203	860,992	35,863	3,718	3,301,776
MEDIUM	856,193	304,426	3,528	31,136	1,195,283
Grand Total	3,733,306	1,254,100	40,685	83,040	5,111,131
	Average of GRANTFUNDING				
HIGH	5,609	8,415	5,553	25,222	10,018
LOW	4,290	5,479	4,631	27,343	4,485
MEDIUM	4,966	6,906	7,301	22,500	6,591
Grand Total	4,572	6,079	4,944	24,399	5,661
				High-Medium	
High-Low grant/pupil	1318.8	2935.5	922.5	2722.0	5533.0
High-Low FSM	34.6	33.0	28.0	20.7	0.0
Extra grant per 1% FSM pupil	38.1	89.1	33.0	131.4	0.0
Total expattrib to FSM	2,420,142,234	1,963,718,867	15,476,710	435,891,471	4,835,229,283
Total Exp (Grant)	17,069,027,847	7,623,787,211	201,159,825	2,026,069,503	26,920,044,385
	14.2%	25.8%	7.7%	21.5%	18.0%
Estim diff from Sibieta (2015)	7.9%	14.5%			
Base level funding for poor	5.8%	13.2%			
Academy expattrib to FSM	612,180,674	2,967,819,379		79,021,230	3,659,021,283
Total expattrib to poverty	3,032,322,908	4,931,538,246		514,912,701	8,478,773,855
Total Schools current funding					46,000,000,000
					18.4%

Police and criminal justice

Table A15: Regression model for cost of crime, Scottish intermediate zones 2007 (total social cost per head)

Variable	Coeff B	StdCoeff	Signif
(Constant)	4958.230		.000
comppov08sq	2.131	.382	.000
1-person hhd	38.479	.262	.000
No central heating	-63.493	-.098	.000
ethnic - mixed	-540.880	-.126	.000
ethnic – Black	-55.734	-.056	.023
born UK	-60.384	-.299	.000
Prisonpt	5.477	.030	.082
Hostpt	116.758	.234	.000
Popdens	.412	.008	.741
Popspars	-17.100	-.071	.000
commercmphh	18.104	.165	.000
Retailmphh	11.531	.123	.000
Adj r-squared	0.614		
Std Eff Est	817.1		
F-Ratio	170.4		
No of cases	1277		
Mean of dep var	1285		
Std Dev of d v	1316		

Table A16: Regression model for cost of crime, English middle super output areas, 2014 (total social cost per head)

Varname	Variable description	Coeff B	StdCoeff	Signif
(Constant)		1221.307		.000
IncScr15	Low Income Score ID15	2169.890	.400	.000
pc16_24	Aged 16 - 24 %	3.243	.040	.001
pc60plus	Aged 60+ %	-3.935	-.062	.000
p1phh	One person hhd %	13.526	.183	.000
Pcmixed	Mixed ethnicity %	-18.498	-.071	.000
Pcpakbang	Pakistani, Bangladeshi %	-4.891	-.081	.000
born UK	Born in UK %	-10.481	-.306	.000
IndoorScr15	Poor housing cond %	74.062	.112	.000
Pctbab	Cncl Tax Bands A&B %	-3.037	-.193	.000
pcstud1624	% Students/% 16-24	-399.073	-.162	.000
Psychhosppt	Mental hospital resid %	7.216	.029	.001
Hostpt	Hostel resident %	26.064	.123	.000
Popdens	Density persons per ha	-3.096	-.235	.000
GeogBar15	Geographical barriers' ID15	-66.272	-.090	.000
Resdens	Density net dwellings/ha	-.509	-.057	.000
Pnonresa	Non resid urban % area	9.470	.294	.000
	Adj r-squared	0.523		
	Std Err Est	338.7		
	F-Ratio	465.5		
	No of cases	6777		
	Mean of dep var	584.5		
	Std Dev of d v	472.2		

Fire and rescue

Table A17: Regression model for the response costs of fires in England in 2006 (cost per head, MSOA level)

Varname	Variable description	Coeff B	StdCoeff	Signif
	(Constant)	-3.728		.000
IncScr15	Low Income Score ID15	28.530	.474	.000
pc16_24	Aged 16 - 24 %	.051	.057	.000
pc60plus	Aged 60+ %	-.079	-.112	.000
pc1phh	One person hhd %	.170	.207	.000
Pcmixed	Mixed ethnicity %	-.283	-.097	.000
Pcpakbang	Pakistani, Bangladeshi %	-.035	-.052	.000
pcgypsytraveller	Gypsy traveller %	.716	.026	.005
IndoorScr15	Poor housing cond %	-.197	-.027	.012
Pctbab	Cncl Tax Bands A&B %	.008	.045	.007
pcstud1624	% Students/% 16-24	.958	.035	.016
Hostpt	Hostel resident %	.111	.048	.000
Popdens	Density persons per ha	-.038	-.262	.000
GeogBar15	Geographical barriers' ID15	.906	.111	.000
Resdens	Density net dwellings/ha	-.006	-.057	.000
Pgreenspace	Green space/land % area	.044	.237	.000
Pnonresa	Non resid urban % area	.143	.400	.000
Pconstr	Construction workers %	-.157	-.060	.000
	Adj r-squared	.453		
	Std Err Est	4.02		
	F-Ratio	330.9		
	No of cases	6777		
	Mean of dep var	7.2		
	Std Dev of d v	5.2		

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About the authors

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