Department of Energy & Climate Change

Annual Fuel Poverty Statistics Report, 2014

Contents

Executive Summary

Aim

The aim of this publication is to provide a comprehensive view of the latest statistical trends and analysis of fuel poverty in England.

Fuel poverty in England is measured by the Low Income High Costs definition, which considers a household to be fuel poor if:

- they have required fuel costs that are above average (the national median level)
- were they to spend that amount, they would be left with a residual income below the official poverty line.

Key findings

- In 2012, the number of households in fuel poverty in England was estimated at around 2.28 million, representing approximately 10.4 per cent of all English households. This is a fall from 2.39 million households in 2011 (a reduction of almost 5%). In line with this, the aggregate fuel poverty gap (in real terms) also dropped by around five per cent, from £1.06 billion in 2011 to £1.01 billion in 2012, as did the average fuel poverty gap over this period, from £445 to £443.
- Due to the relative nature of the LIHC measure, it is difficult to accurately isolate absolute reasons for changes. However, in summary, changes in income, fuel costs and energy efficiency levels amongst fuel poor households are broadly consistent with the changes seen for the population as a whole. Hence the overall change in the number of households in fuel poverty was relatively small – with the reduction happening mainly due to income increases for higher income fuel poor households.
- The reduction in the number of fuel poor households, coupled with the improvements to incomes and energy efficiency levels for households have reduced the aggregate and average fuel poverty gap.
- All fuel poor households came from the bottom four income decile groups. In 2012, 41 per cent of all households in the lowest income decile group were fuel poor, as were 36 per cent of all households in the second income decile group and 13 per cent of all households in the third and fourth combined income decile groups.
- The depth and likelihood of being fuel poor increases markedly with lower SAP scores. In 2012, 35 per cent of households living in G rated properties were fuel poor compared to only two and seven per cent living in A/B/C and D rated properties respectively.
- The West Midlands followed by the East Midlands had the highest rate of fuel poverty (with fuel poverty rates of 15% and 13% respectively). Households living in the South East and East have the lowest levels of fuel poverty (at 8% and 9% respectively).

- Unemployed households have the highest rates of fuel poverty across all economic activity groups. This pattern has been consistent since 2003, with at least 30 per cent of all unemployed households but less than 10 per cent of working households in fuel poverty over this time.
- Of the different tenure groups, households living in privately rented accommodations have continued to have the highest fuel poverty rates, whilst owner occupied households have had the lowest rates of fuel poverty. This pattern has been consistent since 2003.
- The number of households in fuel poverty is projected to increase from 2.28 million in 2012, to 2.33 million in 2014, with increases in energy costs a key factor.
- The aggregate fuel poverty gap is also projected to increase from £1 billion in 2012, to £1.1 billion in 2014; and the average gap is projected to increase from £443 in 2012 to £480 in 2014.
- In 2012 under the previous 10 per cent indicator of fuel poverty, the number of fuel poor households in the UK was estimated at around 4.50 million representing 17 per cent of all UK households.

Chapter 1: Introduction

1.1 Overview of fuel poverty

Through the Energy Act 2013, the Government has laid the ground for a new legal framework to monitor fuel poverty in England using the Low Income High Costs Indicator (LIHC). This new measure of fuel poverty was first proposed in Professor Hills' review of Fuel Poverty[1] and following consultation, the Government confirmed its intention to adopt the indicator in July 2013[2]. In the accompanying strategic framework document, 'Fuel Poverty: a framework for future action'[3], Government set out how the new indicator will inform the strategic approach to tackling fuel poverty, including setting a new fuel poverty target which will be underpinned by a new fuel poverty strategy. Further details will be published in due course

1.1.1 Definition: Low Income High Costs

Under the Low Income High Costs definition, a household is considered to be fuel poor if:

- they have required fuel costs that are above average (the national median level)
- were they to spend that amount, they would be left with a residual income below the official poverty line.

Unlike the previous indicator measuring fuel poverty (the 10% indicator), the Low Income High Costs definition is a relative measure as it compares households to the national median bill and income – thereby ensuring the contemporary trends are reflected in both these measures.

The Low Income High Costs indicator is a twin indicator consisting of:

- the **number** of households that have both low incomes and high fuel costs (shown by the shaded area in bottom left hand quadrant in Figure 1.1); and
- the **depth** of fuel poverty amongst these fuel poor households. This is measured through a fuel poverty gap (shown by the vertical arrow in Figure 1.1) which represents the difference between the required fuel costs for each household and the median required fuel costs.

The fuel poverty gap for each individual household, is then aggregated across all fuel poor households to produce an overall aggregate fuel poverty gap which gives a sense of the depth of fuel poverty on a national level. The total aggregate and

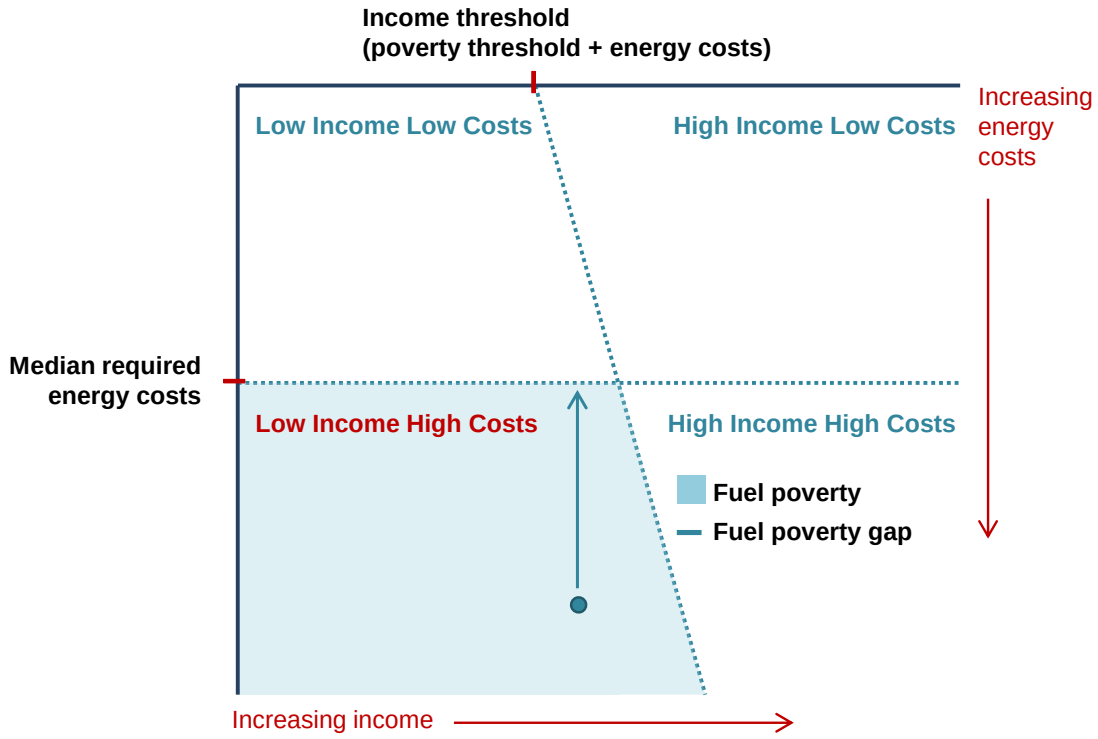
[1] See https://www.gov.uk/government/publications/final-report-of-the-fuel-poverty-review
[2] See https://www.gov.uk/government/consultations/fuel-poverty-changing-the-framework-for-measurement
[3] See https://www.gov.uk/government/publications/fuel-poverty-a-framework-for-future-action

average fuel poverty gap can be compared across different groups of households to assess the severity of the problem across different household types.

The fuel poor quadrant also includes some households who may not traditionally be considered to be poor under the previous definition, but are pushed into fuel poverty by their very high energy requirements (this is reflected in the gradient in the income threshold). While it is recognised that households in the top left hand quadrant have low incomes, they also have relatively low costs, and so are not considered to be *fuel* poor.

Those households to the right of the income threshold have relatively higher incomes, with those in the top right quadrant having high incomes and low costs, and those in the bottom right hand quadrant, having high incomes and high costs.

Figure 1.1: Fuel poverty under the Low Income High Costs indicator



1.1.2 Definition: 10% indicator

Prior to the introduction of the Low Income High Costs indicator in England, fuel poverty was measured under the 10% indicator. Under this indicator, a household is considered to be fuel poor if they were required to spend more than 10% of their income on fuel to maintain an adequate standard of warmth[4].

[4] An adequate standard of warmth is usually defined as 21ºC for the main living area, and 18ºC for other occupied rooms.

The fuel poverty ratio under this method is defined as:

$$Fuel\ Poverty\ Ratio = \frac{Modelled\ fuel\ costs\ (i.e. modelled\ consumption\ \times price)}{Income}$$

Where this ratio has a value greater than 0.1, the household is considered to be fuel poor.

This report largely covers fuel poverty under the LIHC indicator. Fuel poverty under the 10% indicator is also reported on (see Chapter 7) to provide an overall estimate for Great Britain, as the Devolved Nations continue to measure fuel poverty using the 10% indicator.

1.2 English Housing Survey (EHS)

In England, fuel poverty is modelled using data from the English Housing Survey (EHS). The English Housing Survey is an annual national survey of people's housing circumstances and the condition and energy efficiency of housing in England, It is commissioned by the Department for Communities and Local Government (DCLG), and covers all tenures (private and social) and involves a physical inspection of properties by professional surveyors.

The two key components of the EHS for fuel poverty modelling are:

- the interview survey with the householders living in the dwelling; and
- the survey of the physical features and condition of the dwelling.

In 2012, around 13,600 households took part in the interview survey which was carried out between April 2012 and March 2013. Of these households, around half were selected for the follow-up physical survey element, which involves a physical inspection of the property by qualified surveyors.

To boost the sample size of the physical survey, two years' worth of EHS data (from the physical element) are combined. For the 2012 data, this covers the period between April 2011 and March 2013, and comprises around 12,250 households. Therefore the annual fuel poverty data is a combination of two consecutive years' worth of data – 2011/12 and 2012/13. From this information, a detailed picture of household energy requirements can be modelled.

More information on the EHS is available at:

https://www.gov.uk/government/collections/english-housing-survey

The DCLG published headline results from the 2012 survey on 26th February 2014. This is available to download at:

https://www.gov.uk/government/publications/english-housing-survey-2012-to-2013-headline-report

Full data relating to the 2012/13 EHS survey, will be made available by DCLG in summer 2014.

As the EHS data (used to model fuel poverty) includes comprehensive information on the property each household occupies and on the householders themselves, the data can provide great insight into the living conditions and energy efficiency features of different types of households.

The fuel poverty data are widely used across Government to help develop and target policies towards those households most likely to be fuel poor, or those most at risk of falling into fuel poverty.

1.3 Measuring fuel poverty

The key elements in determining whether a household is fuel poor are:

- Income
- Fuel bills
- Energy consumption (dependent on dwelling characteristics and the lifestyle of householders)

Incomes and fuel bills are calculated in slight different ways under both the LIHC indicator and the 10% indicator. (See the Annual Report on Fuel Poverty Statistics 2013 for more detail: https://www.gov.uk/government/publications/fuel-poverty-report-annual-report-on-statistics-2013).

1.3.1 Incomes

The Low Income High Cost indicator is based on incomes calculated after housing costs are taken into account. This is to reflect that money spent on housing costs cannot be spent on fuel. Therefore mortgage and rent payments are deducted from the full income of each household to give an *after housing cost* (AHC) measure of income. Once housing costs are deducted, incomes are then equivalised to reflect the fact that different household types will have different spending requirements. For example, a single person on a given income will usually have more disposable income than a family of four on the same income.

The equivalisation factors used for income calculation are the same as in the DWP Households Below Average Income (HBAI) statistics. These equivalisation factors were devised by the Organisation for Economic Co-operation and Development (OECD), and are widely used across Europe, including by Eurostat.

In comparison, under the 10 per cent indicator, incomes are calculated on a before housing costs basis, and left unequivalised.

1.3.2 Fuel bills

Both indicators use modelled fuel bills. It is necessary to model fuel bills, as this allows energy consumption to be set to ensure the household maintains an adequate standard of warmth. In reality, many households under-heat their home, relative to the recommended adequate standard of warmth.

For the low income high costs indicator, fuel bills are also equivalised. They are equivalised[5] by the number of people in the household, to reflect the fact that different sizes of households will have different required spend on fuel. For example, a single person will need to spend less on fuel than a family of four living in the same home.

1.3.3 Fuel consumption

Although the emphasis is on fuel for heating the home, fuel costs in the definition of fuel poverty also include spending on heating water, lights and appliance usage and cooking costs. In calculating fuel consumption, the fuel costs are modelled dependent on the following factors:

- The economic circumstances of householders (for example, are they unemployed or retired and at home for longer periods of the day);
- the heating system and the fuels used, and
- the dwelling characteristics.

The fuel poverty calculation of required heating takes into account long-term regional variations in climate. However, it does not reflect shorter periods of annual temperature variations. So where there is a particularly cold winter, in which households heated their homes for longer periods, this would not be reflected in the fuel poverty methodology. This is covered further in Section 2.4.

More detailed information and explanations of how consumption, prices and income are measured is included in the updated and comprehensive Methodology Handbook, published at:

https://www.gov.uk/government/collections/fuel-poverty-statistics

For a more detailed description of how to calculate fuel poverty under the Low Income High costs Indicator, see Annex B.

1.4 Understanding changes in fuel poverty

Under the 10 per cent indicator, increasing household income helps to remove households from fuel poverty as, with everything else unchanged, their fuel poverty ratio would fall, possibly to or below 0.1, making them no longer fuel poor. Reducing income has the opposite effect, by potentially increasing the fuel poverty ratio and pushing households into fuel poverty.

[5] See Annex B for further details on fuel bill equivalisation.

Decreasing fuel prices and/or improvements made to the energy efficiency of the home can also reduce the fuel poverty ratio, while rising prices will have the opposite effect. It is rare for a dwelling to become "less efficient", but an increase in consumption can occur if the householders change their routine (for example spend longer at home) or the household composition changes (for example, the householders have children), etc.

The LIHC headcount indicator is a relative measure and provides a much steadier trend in the number of fuel poor households over time compared to the 10 per cent indicator. Whereas a change in income is likely to directly affect the extent of fuel poverty under the 10 per cent indicator; under the Low Income High Cost indicator, a change in income will only have an impact on fuel poverty if households with low incomes and high fuel costs see relatively larger income changes (increases or decreases) compared to those in the overall population.

The 10 per cent indicator was very responsive to changes in fuel prices, such that these usually dominate the indicator and outweigh other factors such as income and energy efficiency. Under the LIHC indicator, the fuel poverty gap is the element that is more responsive to fuel prices, as evidenced by an increase between 2004 and 2012 when fuel prices rose substantially.

Price changes have a more limited effect on the number of households in fuel poverty under the LIHC indicator, which is largely due to the relative nature of the indicator. As households are measured by the proportion by which their bills are greater or less than the average, when prices rise equally across all households, these proportions do not change. For example, if all prices were to rise by 10 per cent for all households, then a household that previously had costs that were five per cent above the median costs will still have costs that are five per cent above the new median (in fact just over 5%) – assuming all other factors remain the same. As a result, the fuel poverty status of the household will not change.

The fuel poverty gap, on the other hand, is measured in pounds rather than proportions. Therefore in the example above, a 10 per cent rise in prices for all households will result in a greater increase, in pounds, of the fuel costs of households above the median costs threshold.

For example, if the median fuel costs are £1,000, then an increase of 10 per cent will result in a rise in the median to £1,100. A household with fuel costs above the median, say £1,500, will see an increase in their fuel costs to £1,650. Their fuel poverty gap has therefore increases from £500 to £550. This means that the fuel poverty gap indicator is even more closely linked to prices than the 10 per cent indicator. An increase in income only has a marginal impact on the gap.

Figures 1.2 and 1.3 highlight the different responses of the fuel poverty Low Income High Cost headcount and gap indicators, under a scenario where prices rise by 10 per cent. Under the headcount indicator, the bills of all households should increase by the same amount in proportional terms. Under the fuel poverty gap indicator, households with larger bills will see greater increases in their bills (and thus fuel poverty gaps for those in the LIHC quadrant) in monetary terms.

Figure 1.2: Low Income High Costs *headcount* indicator under the scenario where fuel costs increase by 10%

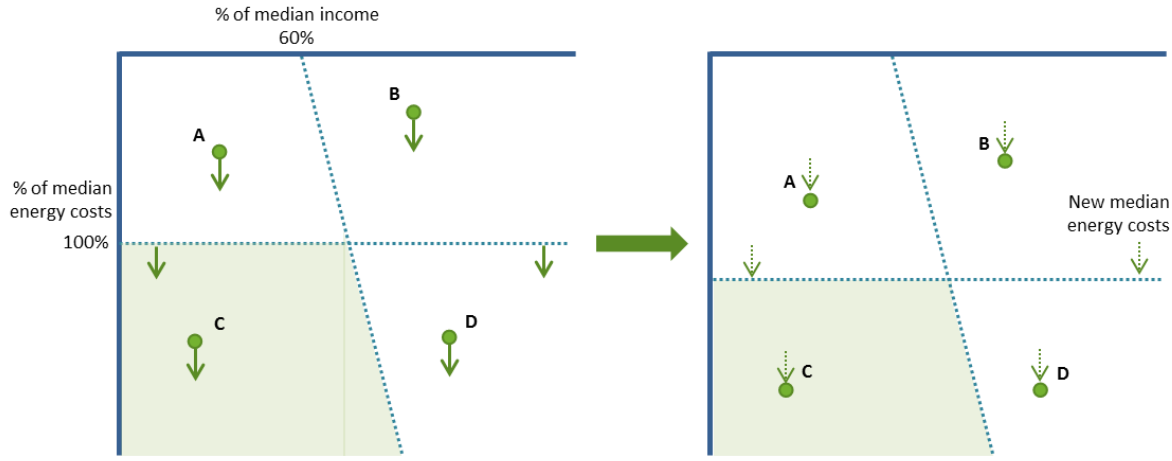
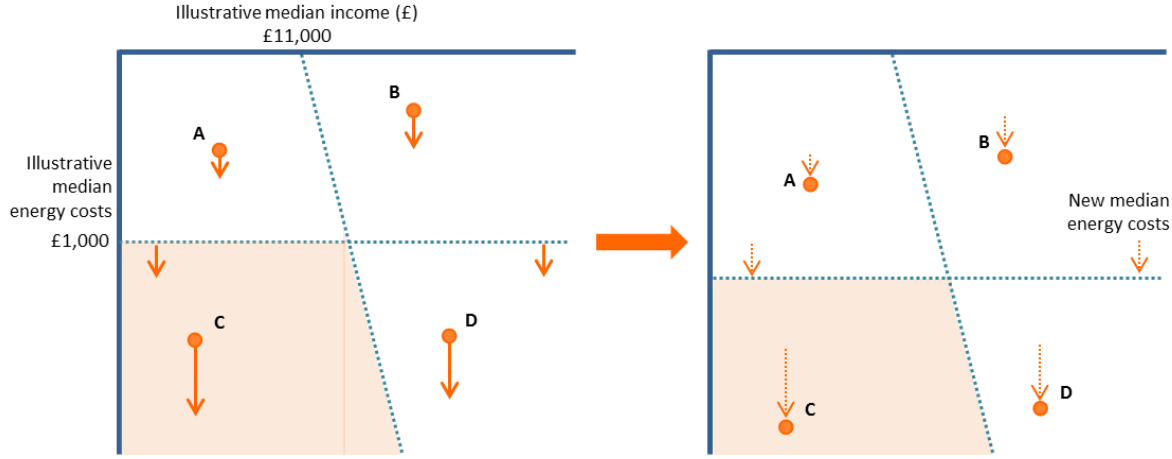


Figure 1.3: Low Income High Costs *gap* indicator under the scenario where fuel costs increase by 10%



In this example (where there is no change in energy consumption or income), households whose fuel costs are below the median (households A and B) will see their costs increase by less, in pounds, than the median. As a result, these increases will never take them over the threshold into fuel poverty, as the median fuel costs will always increase by more than the individual fuel costs. However, households with fuel costs *above* the median (households C and D) will see a larger increase in their bill, in pounds, compared to the median. These households will therefore spend increasingly more than median costs, such that the difference between their fuel costs and the median costs will widen.

Consequently, there will be no change in the number of households in fuel poverty, but households already in fuel poverty will move further into fuel poverty. The gap, which represents the difference between household fuel costs and the median fuel costs, will therefore increase.

1.5 Developments and future work on fuel poverty statistics

1.5.1 Changes to the BREDEM model

Since the last fuel poverty statistics publication, the underlying methodology used to model household energy consumption, through the Building Research Establishment Model (BREDEM) has been updated to better reflect the latest understanding around energy consumption. The latest version of this model, BREDEM-2012[6], now supersedes the previous methodology applied through BREDEM -12.

The key methodological updates from the BREDEM-2012 model include:

- An update to the climate data
- Alterations to the calculation and effect of energy gains
- Changes to the cooking, lights and appliances algorithms
- Introduction of the provision for electric showers
- Updates to the hot water energy requirement and loss calculations

The adoption of BREDEM-2012 is estimated to produce a slight reduction in the overall energy consumption for the average household. Space heating requirements are likely to reduce slightly as outdoor temperatures are revised to show an increase of 1ºC – resulting in less heat loss through the thermal fabric of properties. Conversely, energy use for lights and appliances now show a slight increase, as each of the key elements within this category is now individually modelled.

The overall effect of the change to BREDEM-2012 is negligible for the headcount measure under LIHC as all households, and thus the overall median, will see the same proportional change. However, as the modelled energy consumption is now slightly lower than under BREDEM-12, the aggregate fuel poverty gap under LIHC and the 10 per cent indicator will correspondingly show small reductions as both these measures are more closely linked to the overall cost of energy consumption. The magnitude of such reductions in energy consumption over a combined two year fuel poverty dataset is in the vicinity of around five per cent[7].

Detailed information on the BREDEM-2012 applied algorithms and assumptions for fuel poverty modelling, can be found in the updated, and comprehensive Methodology Handbook, available at:

https://www.gov.uk/government/collections/fuel-poverty-statistics

1.5.2 The Energy Follow-Up Survey, EFUS 2011

In 2011, a sub-sample of the English Housing Survey respondents were contacted to take part in a detailed follow-up survey, with an aim to collect new information on their domestic energy use. Detailed analysis on heating patterns and domestic energy use from the EFUS can be found in a series of reports published at:

https://www.gov.uk/government/publications/energy-follow-up-survey-efus-2011

[6] Further details on the BREDEM-2012 model is available at: http://www.bre.co.uk/filelibrary/bredem/BREDEM-2012-specification.pdf

[7] It should be noted, BREDEM-2012 has been applied to only the latter half of the 2012 dataset, and so the reductions in energy consumption for this year are assumed to have around a half this effect.

Data from this survey is available via the UK Data Archive:
http://ukdataservice.ac.uk/

DECC intends to analyse the information collected from the Energy Follow-Up Survey with a view of assessing the potential implications this new data source may have on the assumptions underlying the fuel poverty methodology (see above Methodology Handbook for further details). Specifically in this analysis, we will investigate the temperatures people heat their homes to, their heating patterns and the extent to which they heat their homes. We will consult on our findings later this year.

1.5.3 Other work on fuel poverty statistics

Work to improve the sub-regional fuel poverty estimates is continuing. A multi-level model is currently being developed to help better estimate levels of fuel poverty in small areas, and provide users with confidence intervals around these estimates.

DECC are continuing to develop the work which investigates how households actually consume energy (gas and electricity). This work involves matching actual energy consumption to the Fuel Poverty and English Housing Survey datasets, and will potentially allow a greater understanding of where households might be under heating their homes, amongst other things.

Results of these works will be published either in future annual fuel poverty reports or in additional statistical releases.

1.5.4 Further information

The Fuel Poverty dataset along with the English Housing Survey datasets will be made available later this summer via the UK Data Archive (UKDA):

http://data-archive.ac.uk/

Please note, users will need to register with the UKDA website to access the data.

For further information on the statistics presented in this report, please contact:

fuelpoverty@decc.gsi.gov.uk

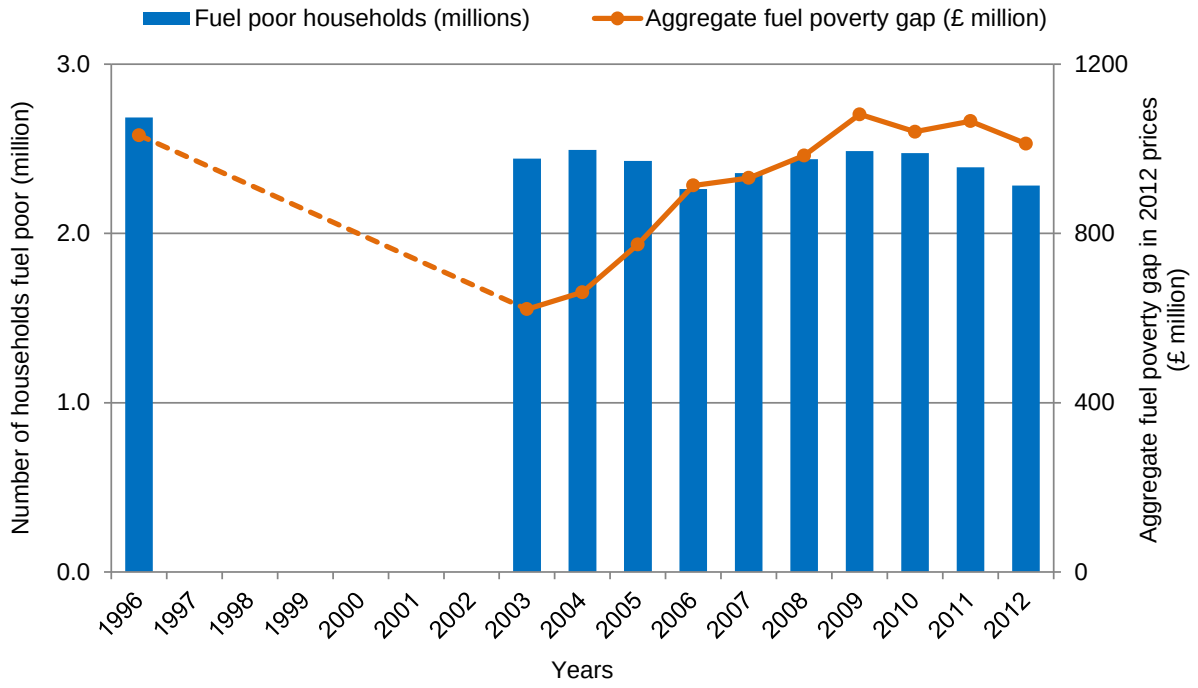
Chapter 2: Summary of fuel poverty in England, 2012

2.1 Fuel poverty in England under LIHC

In 2012, the number of households in fuel poverty in England was estimated at around 2.28 million, representing approximately 10.4 per cent of all English households. This is a fall from 2.39 million households in 2011 (a reduction of almost 5%). In line with this, the aggregate fuel poverty gap[8] also dropped by around five per cent, from £1.06 billion in 2011 to £1.01 billion in 2012.The average fuel poverty gap over this period also decreased from £445 to £443.

Chart 2.1 below shows the overall trend in fuel poverty in England under the LIHC indicator between 2003 and 2012, and Table 2.1 provides the figures behind the chart. The reasons for the changes are set out in Section 2.3.

Chart 2.1: Fuel poverty in England, 1996 – 2012



[8] Note the historic aggregate and average fuel poverty gaps are rebased to 2012 prices.

Table 2.1: Fuel poverty in England, 1996 – 2012

	1996	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fuel poor households (millions)	2.68	2.44	2.49	2.43	2.26	2.36	2.44	2.49	2.47	2.39	2.28
Aggregate fuel poverty gap: 2012 prices (£ million)	1032	621	661	774	913	931	984	1081	1040	1065	1012
Average fuel poverty gap: 2012 prices (£)	384	254	265	319	403	395	404	435	421	445	443

2.2 The drivers of fuel poverty

As explained in Chapter 1, the fuel poverty status of a household depends on the interaction between three key factors: incomes, fuel prices and energy consumption.

This section looks in detail at the change in each of these elements in recent years, with a particular focus on the change between 2011 and 2012, and examines how this has affected fuel poor households in terms of the number of households that are now fuel poor as well as the fuel poverty gap.

Due to the relative nature of the LIHC headcount indicator, it is important to assess the above drivers in terms of the likely effect on the fuel poor population currently living on low incomes with high fuel costs, and those households most at risk of becoming fuel poor. For example, if incomes rise faster (or fall more slowly) for households with low incomes than for the population as a whole, we would expect the number of households in fuel poverty to fall. One of the difficulties in explaining the changes in this indicator is that the fuel poverty dataset is not longitudinal. As a result, we cannot explore how individual households move between quadrants over time, under the LIHC metric, as their circumstances change.

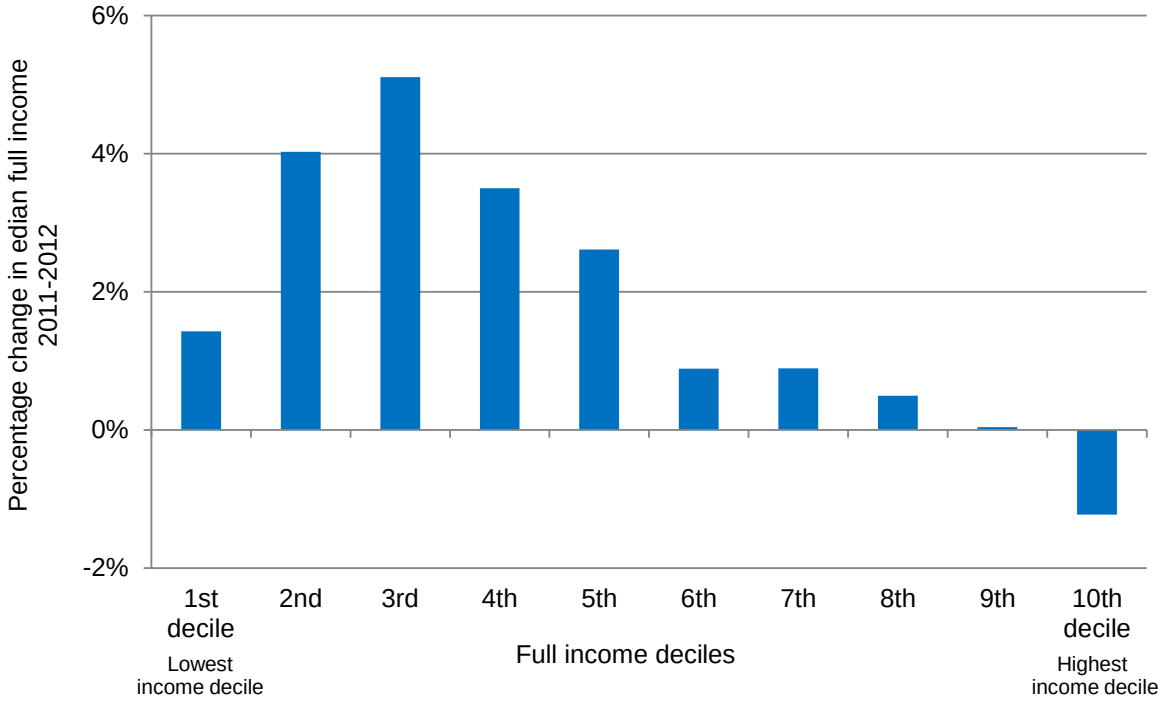
2.2.1 Income

Income data are taken from the EHS which, although is not designed as a dedicated survey of incomes, does provide a suitable source of data. The EHS income data is compared to external data sources such as the Annual Survey of Hours and Earnings (ASHE) and Family Resources Survey (FRS) to ensure overall consistency.

In 2012, average median full incomes (before housing costs) continued to increase, rising to £23,950 from £23,420 in 2011. However, as Chart 2.2 shows, incomes did not rise equally across all household income decile groups: the poorest 50 per cent of households saw the largest rises in income while the higher income groups saw more modest increases and decreases for those in the highest decile.

Households in the lower income deciles are predominantly in receipt of state benefit, tax credits and housing related income. In contrast, incomes of households in the higher deciles are dominated by earnings. Increases in state benefits and housing related income are a major factor behind income rises in the lower deciles, whilst in general, earnings saw much smaller increases or falls, affecting the incomes of households in the higher income deciles. This is shown in the change in median full incomes from 2011 to 2012 in Chart 2.2 below.

Chart 2.2: Annual percentage change in median full income by income deciles, 2011 – 2012



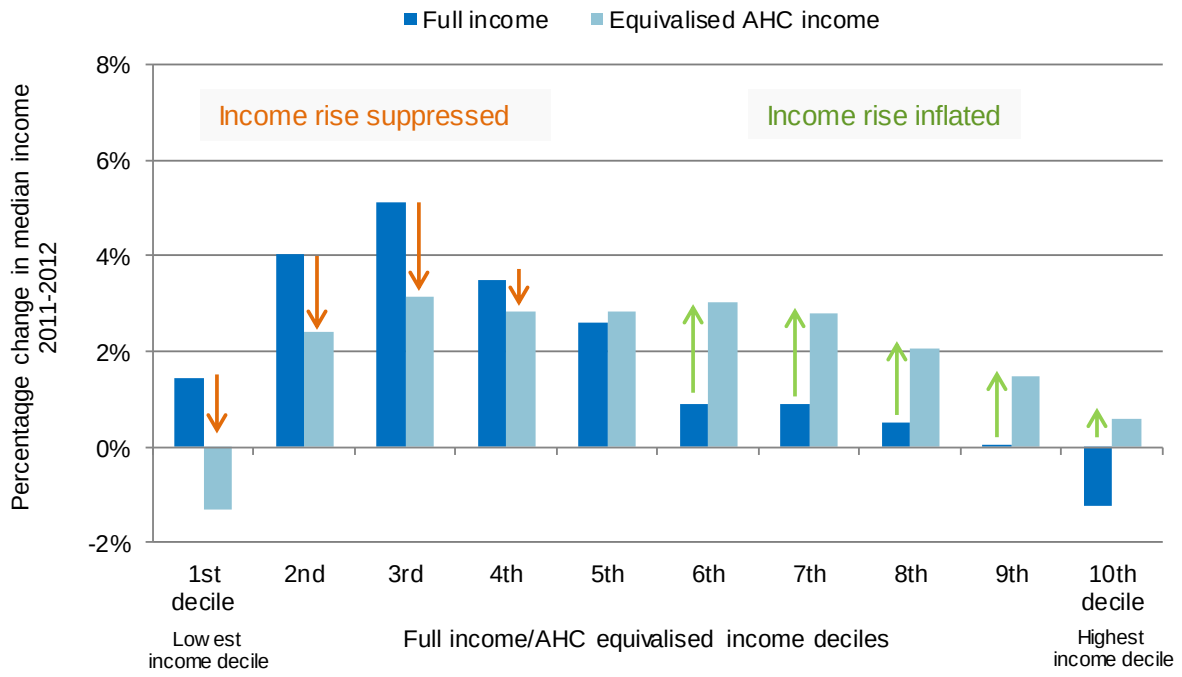
Under the LIHC indicator, housing costs are taken off the income of each household. This will make households who own their own homes outright (and so have no housing costs) relatively better off to those with rent or mortgage payments. Between 2011 and 2012, reported average housing costs increased considerably for households in the social housing sector (by around 6.5%), and more modestly for those in the private rental sector (almost 2%). In contrast, housing costs for all owner-occupiers remained fairly static – although, those with mortgages did see a small increase in costs.

Households in the lower half of the equivalised AHC income[9] deciles (the poorest 50% of households) live in around 81% of all social sector housing, 68% of privately rented accommodation and 37% of all owner occupied households. Therefore despite the rises seen in the full incomes of these households, increases in their housing costs act to supress the income rise, and thus produce lower AHC income increases. Conversely, the lower housing costs in the higher income decile groups work to inflate the income rises, when measured after housing costs.

The equivalised AHC income changes therefore differ to the before housing costs full income changes, in that it shows a fairly consistent income rise across the income distribution, due to the non-uniformity of the housing costs increases across the distribution, as shown in Chart 2.3 below.

[9] See Section 1.3.1 for further details on equivalised AHC incomes.

Chart 2.3: Annual percentage change in median income by income deciles, 2011 – 2012



The reduction in equivalised AHC income for households in the very bottom decile is unlikely to have a large impact under the LIHC metric, as these households are likely to already be classed as having 'low incomes'. As such, low income households that are not classed as having low incomes *and* high costs will be those with relatively *low* fuel costs - and so will be in the low income low costs (LILC) quadrant. A relative reduction in incomes alone for the LILC group is unlikely to push many more households into fuel poverty.

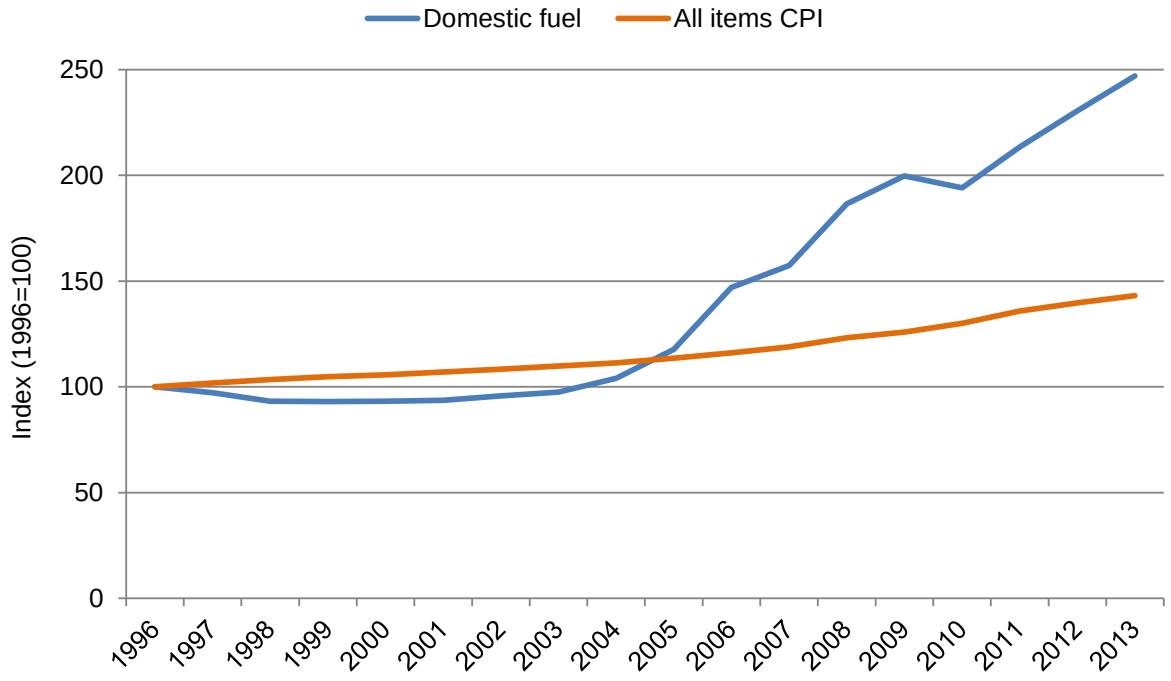
2.2.2 Prices

Chart 2.4 shows the retail prices of domestic energy[10] since 1996, and compares these against the prices of a 'typical' basket of goods and services that make up the Consumer Prices Index (CPI).

As the chart shows, 2010 marked the first calendar year in over a decade that domestic energy prices decreased from the previous year - despite a general rise in inflation over this period. However, from 2011 onwards fuel prices have continued to rise in line with recent trends.

[10] Domestic fuel prices are an aggregate of solid fuel, gas, electricity and liquid fuel prices. Figures on domestic fuel prices are sourced from the fuel price component of the Consumer Prices Index (CPI).

Chart 2.4: Domestic energy prices and the Consumer Price Index, 1996 – 2013

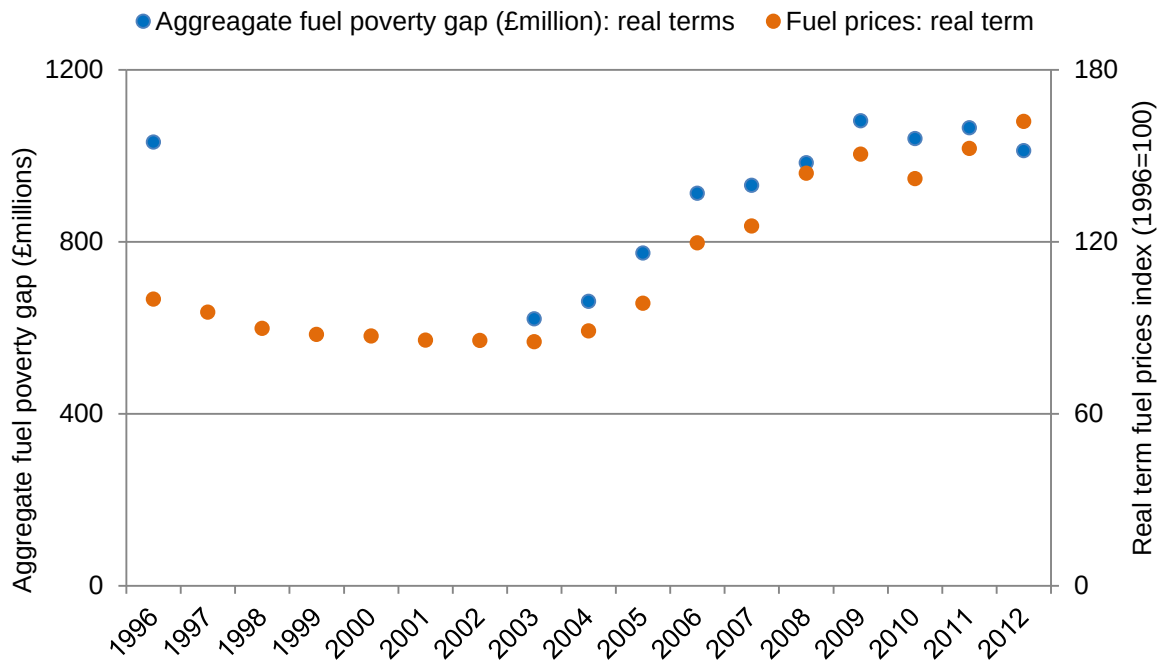


As explained in Section 1.4, there is a strong correlation between fuel prices in real terms and the depth of fuel poverty as shown by the aggregate fuel poverty gap (Chart 2.5). As prices increased steadily between 2003 and 2009, the fuel poverty gap also increased; and when prices fell sharply in 2010, the aggregate fuel poverty gap showed a corresponding reduction.

In 2012, despite a rise in real term fuel prices, the aggregate fuel poverty gap shows a reduction. This is mostly due to fewer households being classed as fuel poor in 2012 (see Section 2.1), and part due to the change to the new BREDEM-12 model (see Section 1.5.1). The average fuel poverty gap also shows a corresponding reduction.

It should be noted however, that the correlation between prices and fuel poverty is weakened by the fact that each fuel poverty dataset is actually a combination of two consecutive years' worth of data (i.e. the 2012 data is a combination of 2011/12 and 2012/13 data). This means that the effects of price changes are staggered over a two year period. Therefore when considering changes in fuel poverty from one year to the next, it is useful to consider price changes in each of the last two years (and likewise for income and energy efficiency changes).

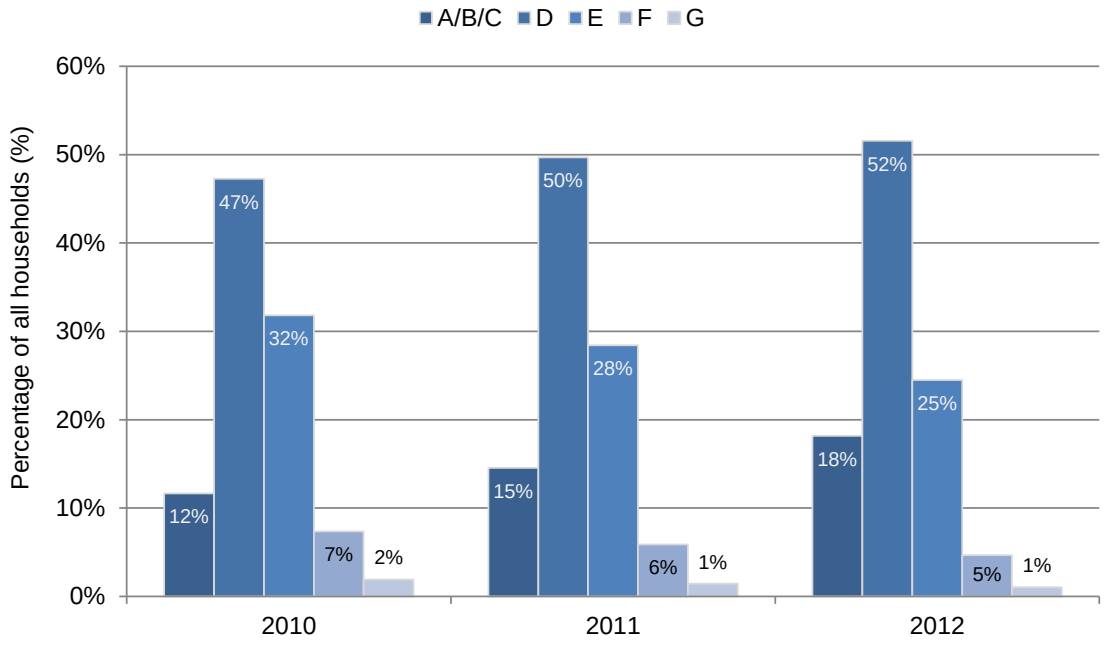
Chart 2.5: Aggregate fuel poverty gap and real term fuel prices, 1996 – 2012



2.2.3 Energy efficiency

The average energy efficiency of households, as indicated by the Standard Assessment Procedure (SAP 09) continued to increase in 2012, rising to 58.6 from 56.8 in 2011[11]. In line with this, a greater proportion of dwellings are now classed SAP band D or above (70% of dwellings in 2012 compared to 64% in 2011 and 59% in 2010) as shown in Chart 2.6.

Chart 2.6: Proportion of dwellings by SAP 09 bands, 2010 – 2012



[11] Note, this figure excludes vacant homes, and therefore differs from the SAP changes recorded in the EHS report. For more information on SAP ratings, see http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf

Table 2.2 examines the average SAP rating by tenure, comparing owner occupied housing with private and social rented housing. This indicates that social housing is generally the most energy efficient, with SAP ratings around seven points higher than the other two groups. Nonetheless, improvements have been made across all tenures in the last year, which appears to be part of a longer term trend.

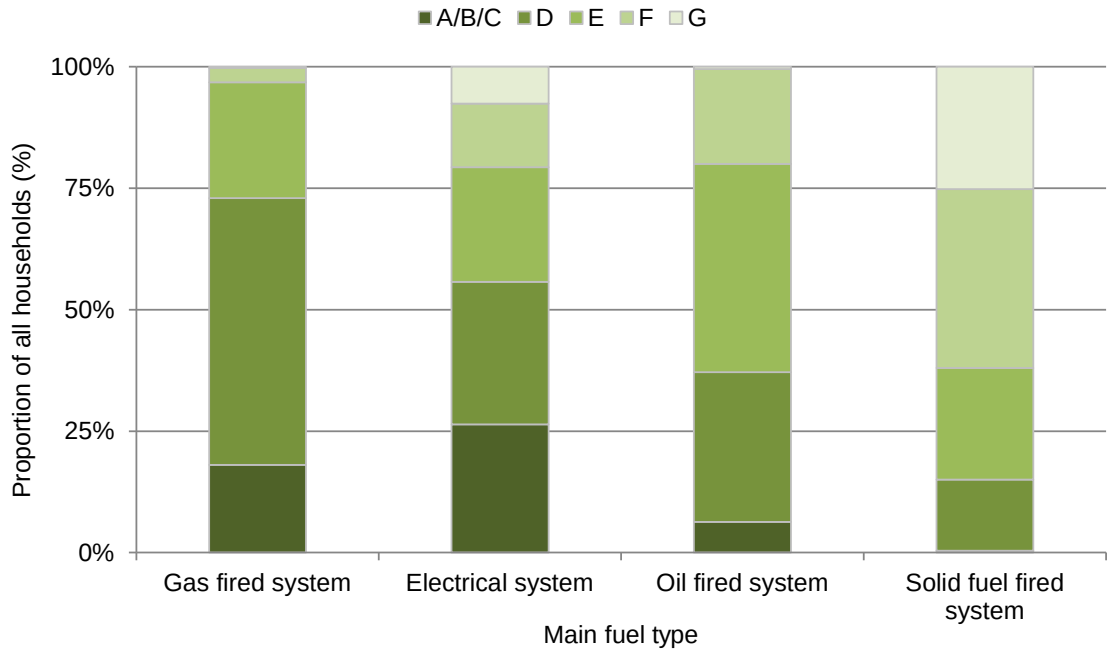
Table 2.2: Average SAP 09 ratings by tenure, 2010 – 2012

Tenure	2010	2011	2012
Social	61.4	63.0	64.6
Private rented	54.1	55.8	57.7
Owner occupied	53.8	55.4	57.4

SAP ratings are strongly influenced by the main fuel type used in a household, as these determine the costs of heating a fixed floor area. It follows that households with the more expensive heating systems will have lower SAP ratings; while those with inexpensive systems will have a higher SAP score.

Chart 2.7 demonstrates this more clearly. Almost three quarters (73%) of households with a gas fired system have a SAP rating of D or above, while households with a solid or oil powered system, have far fewer households with SAP ratings this high.

Chart 2.7: Distribution of SAP bands by the main fuel type, 2012



2.3 Changes in fuel poverty since 2011

Between 2011 and 2012, fuel poverty in England fell by around 110,000 households under the LIHC indicator. Chart 2.8 shows how the number of households under each quadrant of the LIHC metric changed over this period.

While the number of fuel poor households with low incomes and high costs has decreased, there has been a notable increase in the number of households with low incomes and low costs and the number of households with high incomes and high costs. This suggests that between 2011 and 2012, some households who would previously have been classed as having low incomes and high costs, might have either seen increases in their incomes, or decreases in their energy consumption levels and so their associated fuel costs.

Chart 2.8: Percentage change in the number of households in each quadrant of the LIHC metric, 2011 – 2012

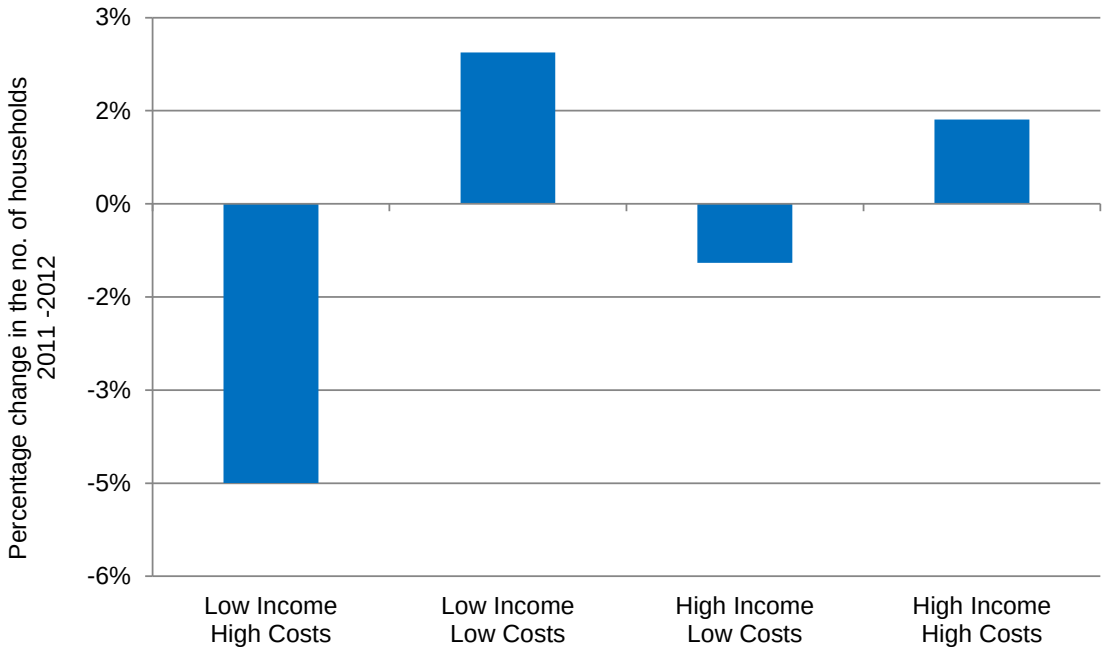


Table 2.3 below shows how average incomes have increased for each quadrant of the LIHC metric and support the earlier findings from Chart 2.3.

Table 2.3: Median AHC income by each quadrant of the LIHC metric, 2011-2012

	Median equivalised after housing costs income (£)			% change in income at the:	
	2011	2012	% change	10th decile	90th decile
Low Income High Costs	£9,205	£9,330	1.4%	-20.0%	2.1%
Low Income Low Costs	£9,235	£9,340	1.1%	-5.4%	4.8%
High Income Low Costs	£21,350	£21,735	1.8%	1.7%	0.6%
High Income High Costs	£25,815	£26,245	1.7%	1.8%	0.2%
Overall population	£19,255	£19,705	2.3%	0.5%	0.9%

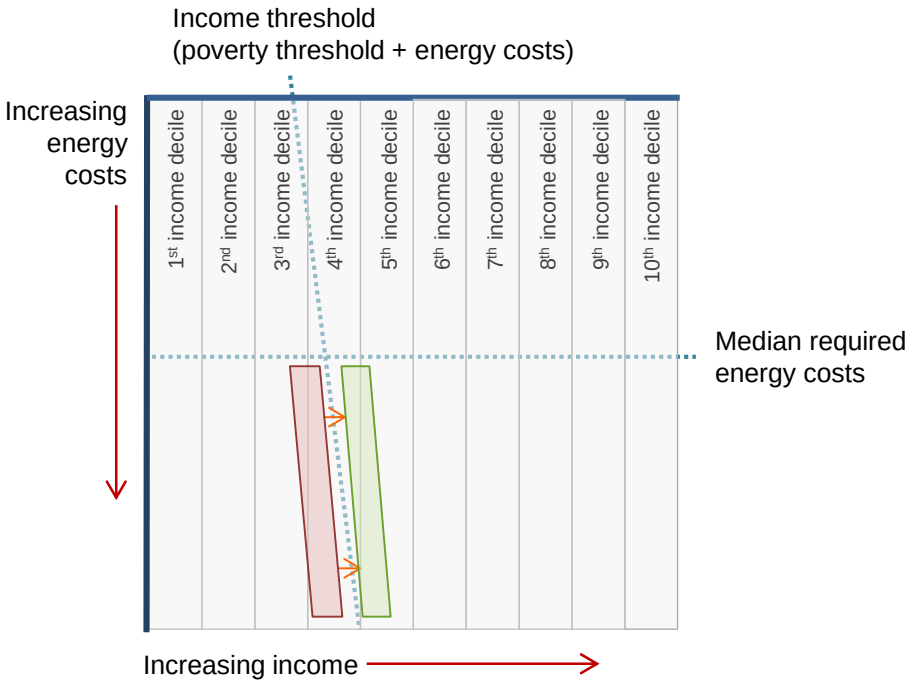
Note, median incomes are rounded to the nearest £5 but the percentage change is calculated on the unrounded incomes

The slightly lower rate of increase in incomes in the fuel poor group (1.4% vs. 2.3% for the overall population) is due to the effect of increased housing costs seen for the lowest income households in this group (as discussed in Section 2.2.1). However, any increase in incomes across the LIHC group can move some households out of fuel poverty if their income is close to the threshold and they receive an above average increase in income.

The illustrative figure below shows how fuel poor households close to the income threshold (in the red shaded area) can move across to the high income high costs group (in the green shaded area) due to an increase in their incomes, whilst the majority of the LIHC group will not see a change.

The larger average income rises across the population, and in particular the high income high costs (HIHC) group, also works to prevent additional households from this group falling into fuel poverty. These factors are likely to contribute to the reduction in the number of fuel poor households seen in 2012.

Figure 2.1: Movement across the income threshold due to increases in income for fuel poor households close to the income threshold



Fuel costs also rose for each quadrant under the LIHC metric, although more so for those with lower than average fuel costs (i.e. in the low income low costs (LILC) and high income low costs (HILC) quadrants).

The increases in fuel costs for the LILC quadrant can push households above the costs threshold and into fuel poverty. However, the distribution of households in LILC (see Chart 2.9) shows that a large proportion of this group have energy bills much lower than the costs threshold and comparatively few households are actually close to the threshold. The modal equivalised fuel bill for households in LILC is £240 lower than the costs threshold; therefore the increase in fuel costs seen here was experienced more by households with low fuel costs to begin with. As such, the fuel costs increase has not resulted in a significant number of households moving over the threshold and into fuel poverty.

The increase in fuel costs for the fuel poor population is also in line with the overall population, thus limiting the effect on the fuel poverty gap, as household fuel costs moved in line with the overall costs threshold.

Table 2.4: Median fuel costs by each quadrant of the LIHC metric, 2011-2012

	Median equivalised fuel costs (£)		
	2011	2012	% change
Low Income High Costs	£1,460	£1,515	3.5%
Low Income Low Costs	£960	£1,010	5.2%
High Income Low Costs	£990	£1,040	5.0%
High Income High Costs	£1,500	£1,535	2.5%
Overall population	£1,205	£1,240	3.3%

Note, median costs are rounded to the nearest £5 but the percentage change is calculated on the unrounded incomes

Chart 2.9: Distribution of fuel costs for the households in the LILC and LIHC quadrants

The increases in the fuel costs seen above show the impact of energy costs and energy efficiency. Table 2.5 below shows that households who already have low costs have seen smaller improvements in SAP (so fewer energy efficiency improvements) and as such their larger energy cost increases are driven by high

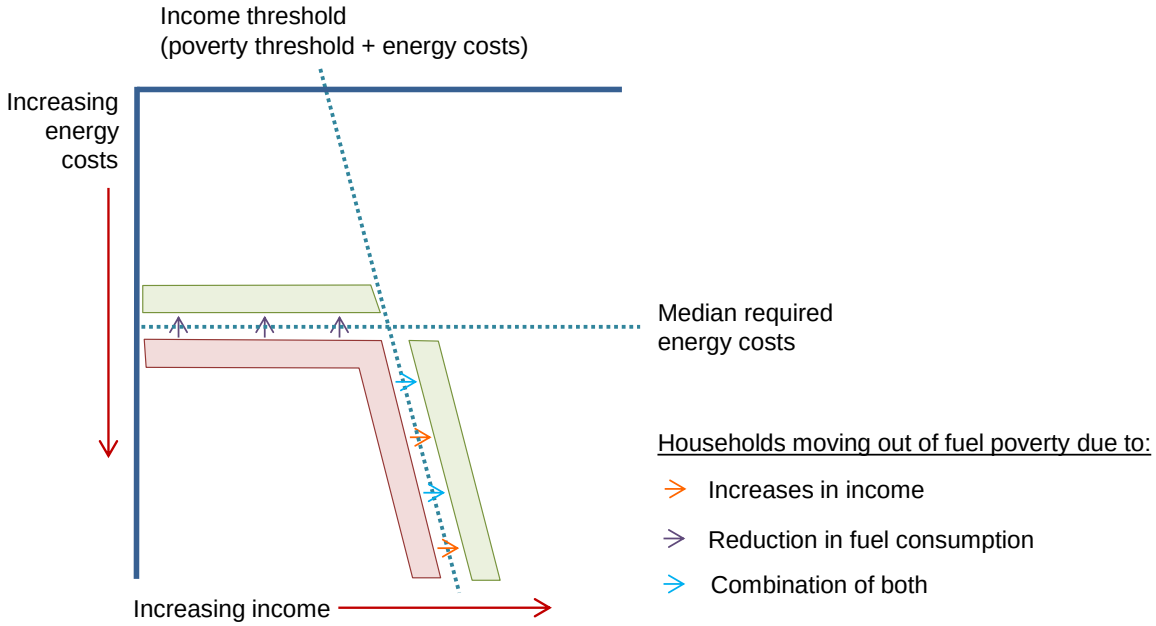
energy prices. Whereas high costs households, which are likely to be more energy inefficient and thus have more scope for such improvements, have seen a larger increase in SAP and thus a comparatively smaller increase in energy costs.

Table 2.5: Median SAP ratings by each quadrant of the LIHC metric, 2011-2012

	Median SAP score		
	2011	2012	Change
Low Income High Costs	50.4	52.2	1.8
Low Income Low Costs	64.3	65.8	1.5
High Income Low Costs	64.1	65.6	1.5
High Income High Costs	51.9	53.9	2.0
Overall population	58.7	60.6	2.0

The illustrative figure below shows how fuel poor households may move out of fuel poverty either due to a reduction in energy consumption, or an increase in incomes or a combination of both.

Figure 2.2: Movement across the income and fuel costs threshold due to either increases in income, reductions in energy consumption or a combination of both



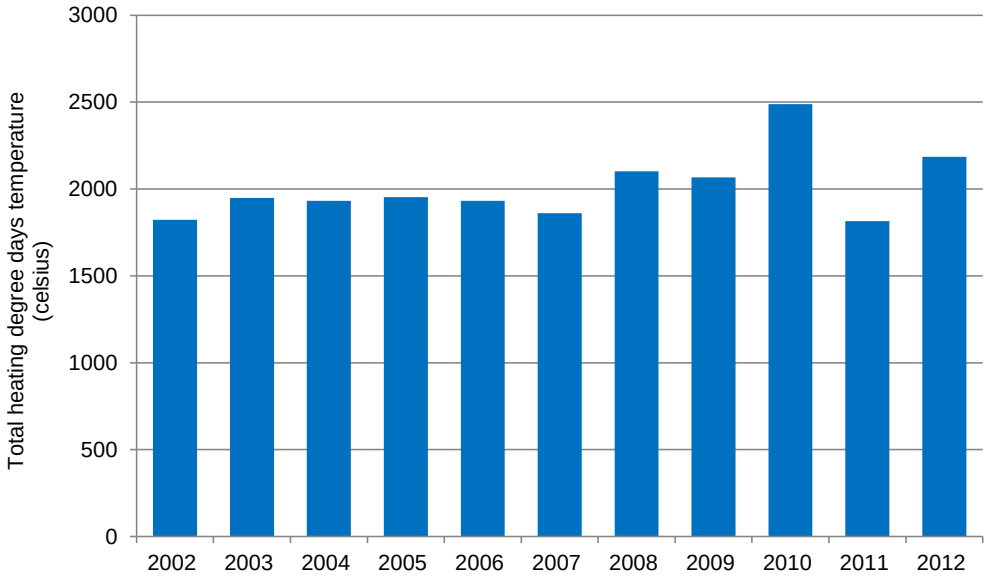
Due to the relative nature of the LIHC measure, it is difficult to accurately isolate absolute reasons for changes. However, in summary, changes in income, fuel costs and energy efficiency levels amongst fuel poor households are broadly consistent with the changes seen for the population as a whole. Hence the overall change in the number of households in fuel poverty was relatively small – with the reduction happening mainly due to income increases around higher income fuel poor households.

This reduction in the number of fuel poor households, coupled with the improvements to incomes and energy efficiency levels for households have reduced the aggregate and average fuel poverty gap.

2.4 The impact of weather on fuel poverty, 2012

Chart 2.10 shows the winter months falling in 2012 (that is the end of the 2011/12 winter and the start of the 2012/13 one), were cooler than the previous year, thereby resulting in an increase in overall higher heating degree days[12] of around 20 per cent.

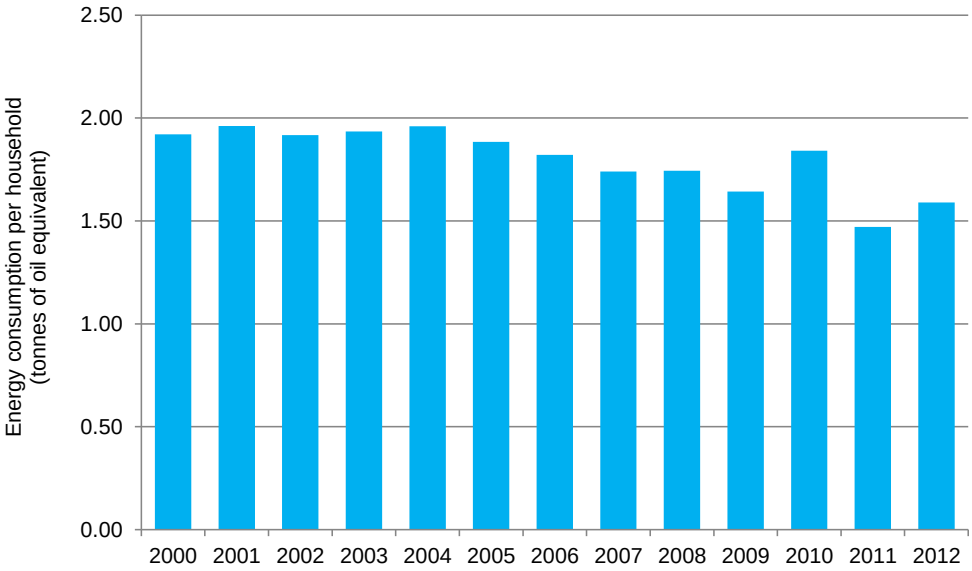
Chart 2.10: Total annual number of degree days in the UK, 2002 – 2012



Source: Energy Trends, Table 7.1

As a result of the cooler winter, average annual household energy consumption was also higher than in 2011. This is shown in the Chart 2.11 below.

Chart 2.11: Average annual domestic energy consumption, 2002 – 2012



Source: Energy Consumption in the UK, Table 3.35

[12] Heating degree days (HDD) are defined relative to a temperature base – the outside temperature above which a building requires no heating. The chart uses 15.5ºC. If the outside air temperature on a day is above this base temperature, no heat is required; if it is below, then the heating requirement that day will be equal to the temperature deficit in degrees. For example, a day with an average temperature of 10ºC would score a HDD of 5.5. The HDDs are summer across the year and displayed in Chart 2.9.

The required fuel costs used to calculate fuel poverty are based on the assumption that a household will heat their home to an adequate standard of warmth defined as 21ºC in the main living area and 18ºC in other occupied rooms. However, although these modelled costs reflect regional differences in temperatures, they do not reflect annual variations in temperatures. As a result, the effects of particularly cold or mild winters on domestic energy consumption are not reflected in the required fuel costs of households. It is assumed that the same amount of energy will be required to heat identical dwellings in the same location in consecutive years. In reality, as Chart 2.11 highlights, this is not the case.

The modelling of energy bills for fuel poverty calculations uses fixed long run temperatures as a baseline for each region, therefore short weather fluctuations, such as the mild year in 2011 and the cooler year in 2012, do not affect the fuel poverty data. While actual domestic consumption broadly reflects extreme weather patterns, modelled consumption in the fuel poverty dataset shows steady falls year on year (mainly reflecting improvements in the energy efficiency of homes).

2.5 Supplementary indicators

To accompany the LIHC indicator, a range of supplementary indicators have been developed which focus on 'real world' outcomes, such as energy efficiency in low income households. This section looks at fuel poverty in this wider context.

2.5.1 Measuring fuel poverty before housing costs (BHC)

Incomes under the LIHC indicator are based on incomes after housing costs (AHC) are taken into account and so deducts rent or mortgage payments from the overall income. The rationale behind this is that money spent on housing costs do not constitute disposable income and so cannot be put towards payment of fuel bills. However, deducting housing costs from incomes reduces the incomes of households with rent or mortgage payments, and can result in some households moving into fuel poverty. Meanwhile, households that own their home outright are less likely to be fuel poor, as their final incomes will be relatively higher than those with higher housing costs.

The first supplementary measure therefore is based on full incomes, before housing costs (BHC) are taken into account. Table 2.6 below shows that the number of households in fuel poverty and the aggregate fuel poverty gap are both lower under this indicator. This implies that in many cases, housing costs have the effect of pulling a subset of households just below the income threshold and into fuel poverty. When housing costs are not deducted from income, these households are on the other side of the income threshold (that is, not classed as low income).

Table 2.6: Fuel poverty under the LIHC indicator, excluding and including housing costs from income, 2012

	After housing costs (main LIHC) indicator	LIHC calculated using income before housing costs	% Difference
Fuel poor households (millions)	2.28	1.89	-17%
Aggregate fuel poverty gap (£million)	1012	864	-15%
Average fuel poverty gap (£)	443	457	3%

2.5.2 Measuring fuel poverty without disability benefits

It has been suggested that disability benefits should also be treated as part of the non-disposable income of households with disabled occupants in, as the extra income is needed to achieve the same standard of living as other non-disabled households.

Disability benefits are included in the headline measure of fuel poverty as to remove them would be inconsistent with other measures of poverty, as standard measures of income poverty do not take account of the additional costs associated with disability. Research also shows that level and nature of disability benefits vary greatly between recipients; as a result, there is no general agreement on how to measure these. Nevertheless, Table 2.7 below shows the fuel poverty levels with these benefits excluded from income to give an indication of the effect of their inclusion.

The benefits excluded are Disability Living Allowance and Attendance Allowance. The number of households and the aggregate fuel poverty gap, both increase slightly as the disability benefit is removed from income, whilst the average gap remains broadly similar.

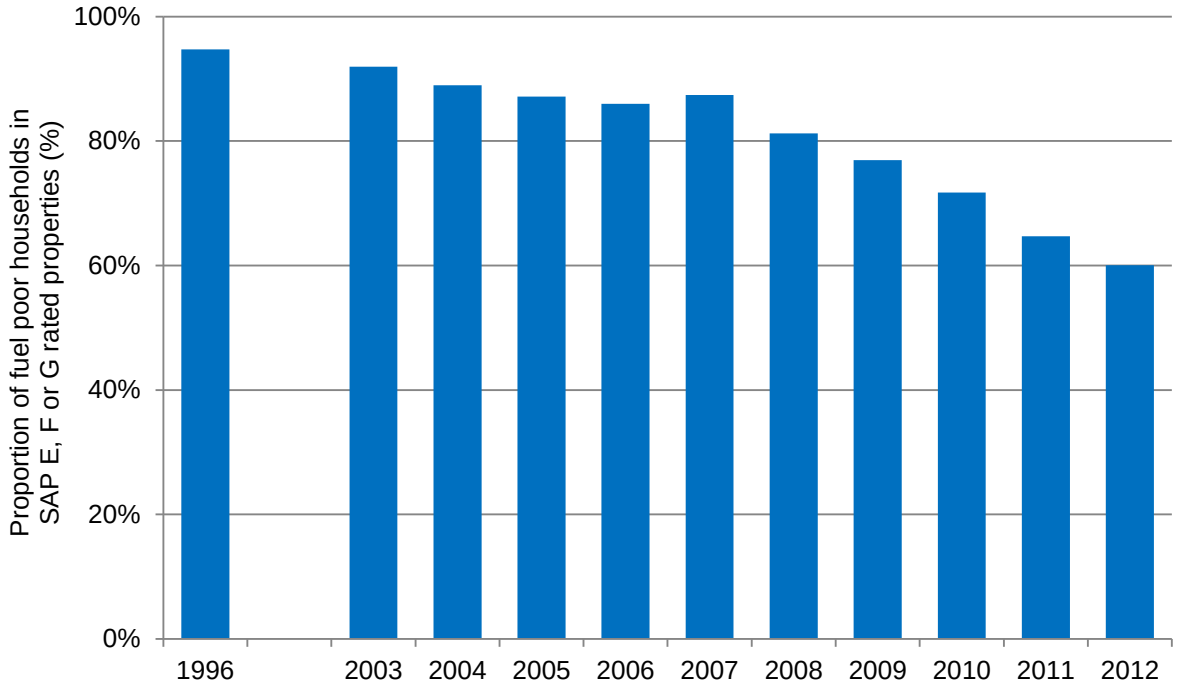
Table 2.7: Fuel poverty under the LIHC indicator, including and excluding disability benefits from income, 2012

	Disability benefits included (main LIHC) indicator	LIHC calculated with disability benefits excluded	% Difference
Fuel poor households (millions)	2.28	2.32	2%
Aggregate fuel poverty gap (£million)	1012	1031	2%
Average fuel poverty gap (£)	443	444	0%

2.5.3 Energy efficiency and fuel poverty

The energy efficiency supplementary indicator focuses on the proportion of fuel poor households living in properties with SAP (09) ratings of E, F or G. These are the lowest SAP ratings, and tend to reflect the least energy efficient properties or those with the most expensive heating systems. Chart 2.12 below shows there has been a notable reduction in the number of fuel poor households living in properties with these low SAP ratings. Since 2003, the proportion of fuel poor households living in properties with SAP ratings E, F or G has dropped by around 32 percentage points – with around 60% of all fuel poor households living in such properties in 2012.

Chart 2.12: Proportion of fuel poor households in SAP E, F or G rated properties, 2003 – 2012



While there has been a clear improvement in the SAP ratings of fuel poor households, these still remain notably lower than the ratings of non-fuel poor households.

Table 2.8 shows that the average SAP rating in 2012 for fuel poor households was 50.4, while the average rating for non-fuel poor households was 59.6. A SAP score of 50 equates to a SAP band of E (ratings between 39 and 54 fall within band E of SAP 09).

Table 2.8: Average SAP ratings of fuel poor and non-fuel poor households, 1996 – 2012

Year	Fuel poor households	Non-fuel poor hoseholds	All households
1996	35.0	46.3	44.7
2003	39.2	48.9	47.8
2004	40.6	49.6	48.5
2005	41.3	50.0	49.0
2006	41.7	50.6	49.6
2007	42.0	51.7	50.6
2008	43.6	52.9	51.8
2009	45.0	54.5	53.4
2010	46.5	56.3	55.2
2011	48.4	57.8	56.8
2012	50.4	59.6	58.6

Chapter 3: Analysis of Fuel Poverty in England

This chapter explores the prevalence of fuel poverty by different household and dwelling characteristics in 2012. Whilst the analysis looks at individual characteristics, users should be aware of the inherent inter-correlations likely to exist between these characteristics.

The figures behind the analysis in this chapter are available online in the *fuel poverty detailed tables* at:

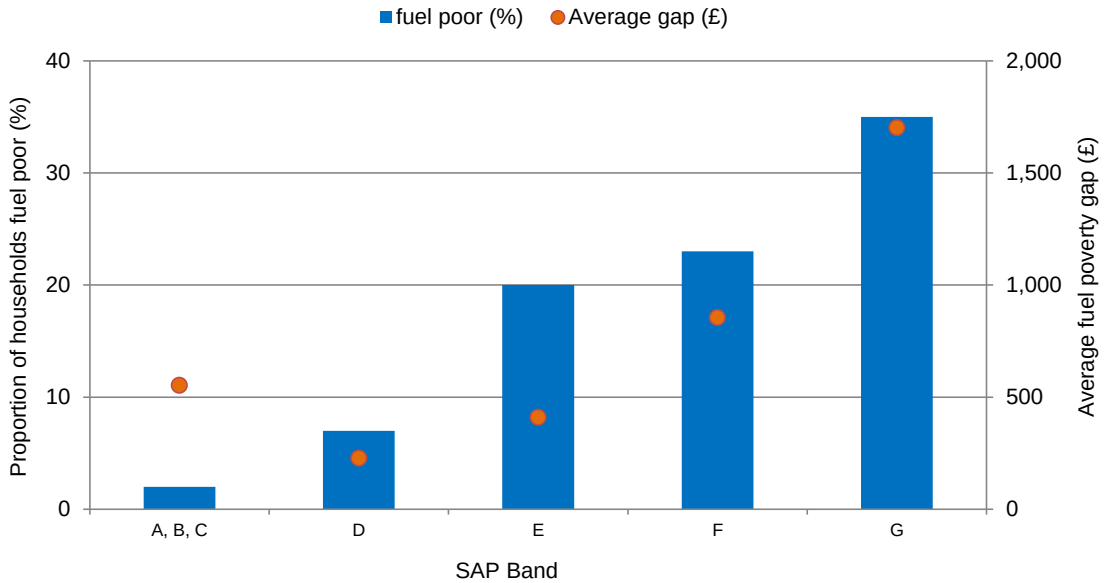
https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/fuel-poverty-statistics

3.1 Energy efficiency and dwelling characteristics

3.1.1 SAP

The energy efficiency of dwellings is a key driver of the likelihood of a household being fuel poor, as it is strongly linked to the fuel costs incurred by the household. Chart 3.1 shows the fuel poverty rates by different SAP rating bands (based on SAP09 methodology) under the low income high cost indicator.

Chart 3.1: Fuel poverty and average fuel poverty gap by SAP rating bands, 2012



The above chart shows that the depth and likelihood of fuel poverty increases markedly with lower SAP scores. In 2012, 35 per cent of households living in G rated properties were fuel poor compared to only two and seven per cent of households living in A/B/C and D rated properties respectively. The corresponding average fuel poverty gap is also three times higher in G rated properties compared to A-C rated properties and seven times higher than in D rated properties (with an average fuel

poverty gap of around £1,702 in G rated properties compared to £552 in A-C rated properties and £228 in D rated properties in 2012). The average fuel poverty gap is higher for households living in properties in bands A/B/C than households living in properties banded D or E as incomes for fuel poor households in this group are generally lower by comparison. The median equivalised AHC income for fuel poor households in bands A/B/C was less than £6,000 pounds in 2012 compared to approximately £9,000 for fuel poor households in bands D or E. Caution should be taken when looking at the fuel poor in bands A/B/C as the number of households in this group are quite small, although the same pattern was observed in 2011.

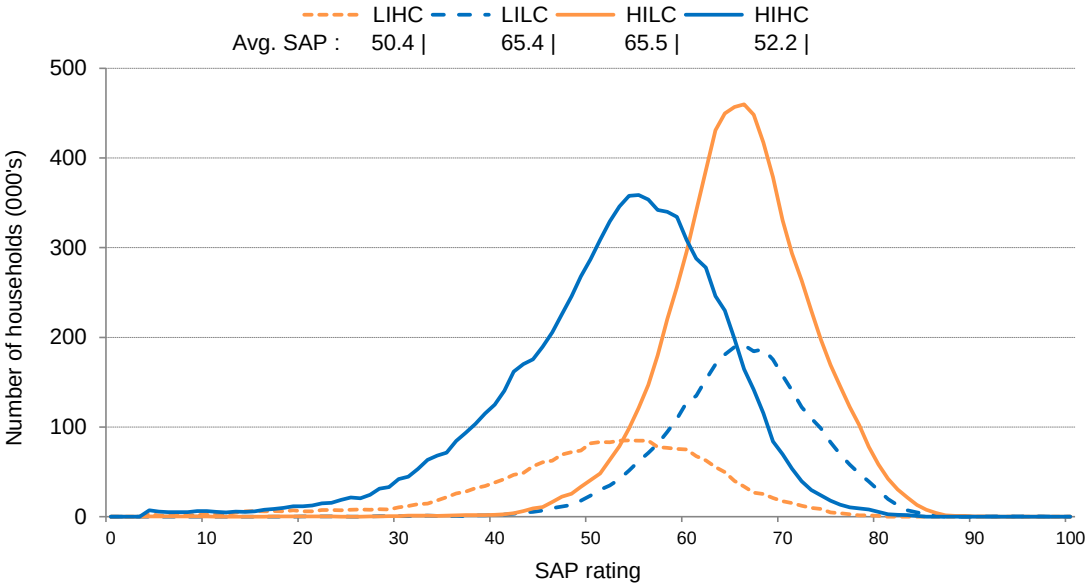
Table 3.1 shows the 2012 median equivalised fuel bill for fuel poor and all households by SAP band. The median equivalised fuel bill increases with each successive SAP band, showing that less energy efficient properties have higher fuel bills. The fuel bill of fuel poor households is noticeably higher than that for all households in SAP bands A/B/C and D. This is likely due to the fact that compared to the overall population, more fuel poor households in these higher SAP bands are living in privately rented accommodations and generally pay through more expensive methods.

Table 3.1 Median equivalised fuel bill by SAP band, 2012

Median equivalised fuel bill (£)	SAP band			
	A/B/C	D	E	F/G
Fuel poor households	£1,343	£1,400	£1,543	£2,134
All households	£917	£1,188	£1,544	£2,153

Chart 3.2 shows the distribution of SAP ratings across households in all four quadrants[13]. Fuel poor households (LIHC) and households with high incomes and high costs (HIHC) have notably lower median SAP ratings, at 50.4 and 52.2 respectively. This compares to an average SAP rating of 65.4 in low income low cost (LILC) and 65.5 in high income low costs (HILC) households.

Chart 3.2 – Distribution of SAP ratings for each quadrant under the LIHC indicator, 2012

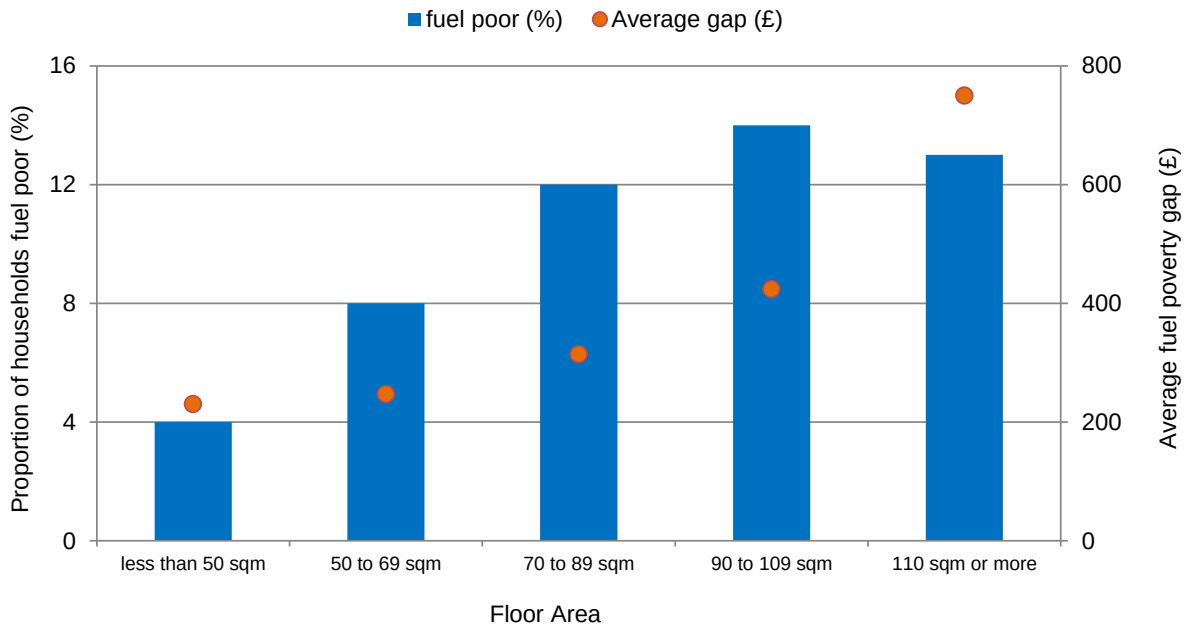


[13] The distributions presented here have been smoothed using a 7 point moving average.

3.1.2 Floor Area

The likelihood of being fuel poor increases with dwelling size, up until the 90-109m^2 category (Chart 3.3), with fuel poverty levels increasing from four per cent for households living in properties less than 50m^2 in size to 14 per cent for properties between 90-109m^2. Households living in properties larger than 110m^2 have a slightly lower fuel poverty rate of 13 per cent. This reflects the nature of the low income and high costs indicator, as households living in these larger properties tend to also have higher incomes (median after housing costs equivalised income for households occupying properties larger than 110m^2 was around £27,000 in 2012; and for properties smaller than 110m^2, around £18,000). However, the depth of fuel poverty in these larger homes (110m^2 or more) is more severe, with the average fuel poverty gap almost three times greater than households living in smaller properties (less than 50m^2), with average fuel poverty gaps of £750 and £230 respectively.

Chart 3.3 – Fuel poverty and average fuel poverty gap by floor area, 2012

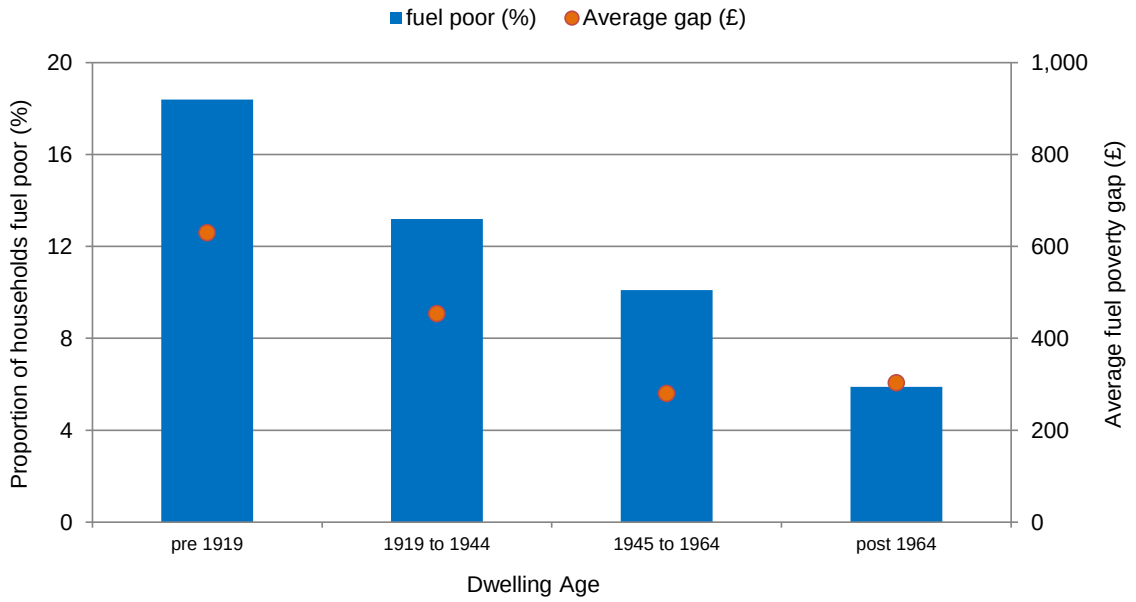


3.1.3 Dwelling Age

Much of the larger housing stock consists of pre-war properties[14] which generally have lower energy efficiency standards and so higher fuel costs. Therefore unsurprisingly the proportion of households living in fuel poverty increases with the age of the property (Chart 3.4). In 2012, 18 per cent of households living in properties built before 1919 were fuel poor, along with 13 per cent of households living in properties built between 1919 and 1964. This compares to six per cent of households living in properties built after 1964.

[14] English Housing Survey Home Report, 2011
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211324/EHS_HOMES_REPORT_2011.pdf

Chart 3.4 – Fuel poverty and average fuel poverty gap by age of dwelling, 2012



3.2 Fuel Poverty and Household Income

3.2.1 Income

Household incomes (after housing costs) are used to delineate the income threshold under the LIHC metric and so by definition, this means that households classed as fuel poor will only be from the lower end of the income spectrum. In 2012, all fuel poor households came from the bottom four income decile groups. Table 3.2 shows the level of fuel poverty and the corresponding average fuel poverty gap for these decile groups.

Table 3.2: Fuel poverty and average fuel poverty gap by income decile groups (after housing costs), 2012

After housing costs income deciles	Number fuel poor (000's)	Proportion of group fuel poor (%)	Avg. Fuel poverty gap (£)
1st decile	897	41%	469
2nd decile	797	36%	413
3rd & 4th deciles*	589	13%	445
All households	2,283	10%	443

* By definition fuel poor households will come from the bottom deciles, and in 2011, the entire fuel poplulation came from the bottom four deciles.

The above table shows that the proportion of households living in fuel poverty under the LIHC indicator reduces with increasing levels of income. In 2012, 41 per cent of all households in the lowest income decile group were fuel poor, compared to 36 per cent of all households in the second income decile group and 13 per cent of all households in the third and fourth combined income decile groups. Within the fuel poor population itself, around 39 per cent of all households were from the lowest income decile group, 35 per cent from the second group and a further 26 per cent from the third and fourth combined income decile groups.

3.2.2 Working Status

Table 3.3 shows that the fuel poverty rate is highest among the unemployed population, with three in ten of all unemployed households (approximately 268,000 households) living in fuel poverty in 2012. This suggests that being unemployed increases the risks of being fuel poor; however only 12 per cent of fuel poor households are unemployed, and in comparison 4 per cent of all households are unemployed.

The depth of fuel poverty experienced by unemployed households is the lowest (as shown by the smaller gap in Table 3.3). This is due to the fact that a large proportion of unemployed households occupy social housing, which generally tend to be smaller and more energy efficient, thus costing less to heat.

Table 3.3: Fuel poverty and average fuel poverty gap by economic activity, 2012

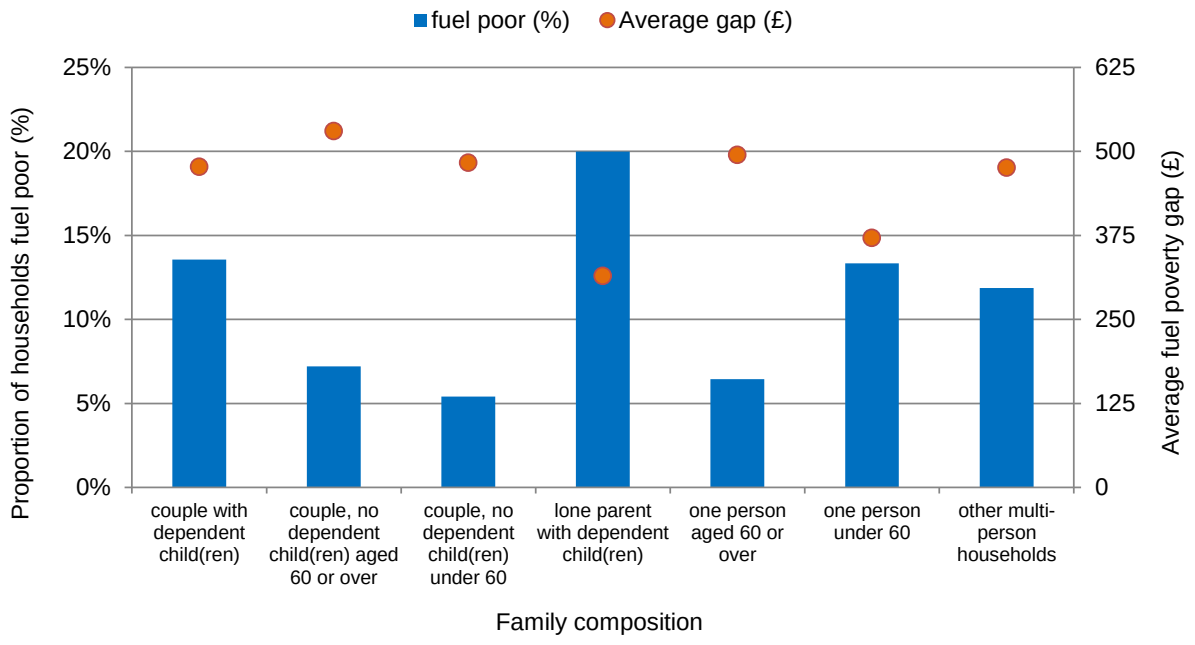
Economic Activity	Proportion of group fuel poor (%)	Avg. fuel poverty gap (£)
Inactive	11%	442
Unemployed	30%	353
Working	9%	466
All households	10%	443

3.3 Household Characteristics

3.3.1 Household composition

Fuel poverty rates vary notably across different household composition types. Chart 3.5 below shows the proportion that are fuel poor, along with the average fuel poverty gap under the LIHC indicator.

Chart 3.5: Fuel poverty and average fuel poverty gap by household composition, 2012



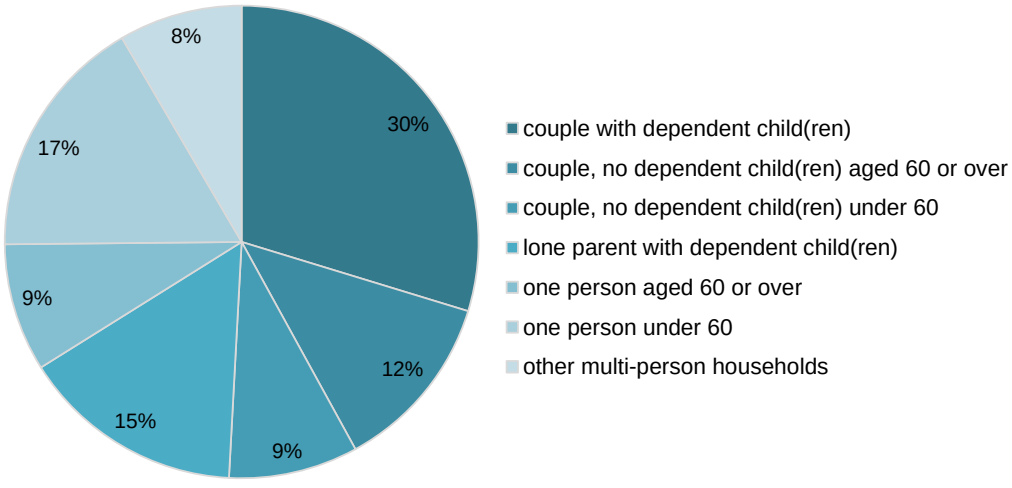
In 2012, lone parents with dependent children had the highest fuel poverty rate, with around a fifth of all lone parents (20%) classed as fuel poor. This is part due to the fact that a greater proportion of lone parent incomes are spent meeting their housing costs compared to other household composition groups, as these households tend to have lower AHC incomes. The *depth* of fuel poverty for this group however is considerably lower (£315) than that for other household types. This reflects the relatively lower energy costs incurred by such households, as they tend to contain fewer occupants and so generally occupy smaller, more energy efficient properties.

Larger household types, such as multi-person households and households with dependent children, are more likely to be fuel poor compared to smaller households. For example, 14 per cent of couples *with* dependent children were fuel poor in 2012, compared to only six per cent of couples with no dependent children. Although the propensity of being fuel poor is lower for couples with no dependent children, the depth of fuel poverty experienced by the average household in this group is greater than that observed for households with dependent children.

Households with lower housing costs or a greater potential for higher incomes tend to have a reduced likelihood of being fuel poor compared to their counterparts. For example, single person households aged over 60 are likely to have lower housing costs compared to single person households aged under 60; and couples with no dependent children and aged under 60 are more likely to have higher incomes compared to similar couples aged over 60 – both these former groups have a lower likelihood of being fuel poor compared to their opposite counterparts.

The following chart shows the breakdown within the fuel poor population by household composition.

Chart 3.6: Fuel poor households by household composition, 2012

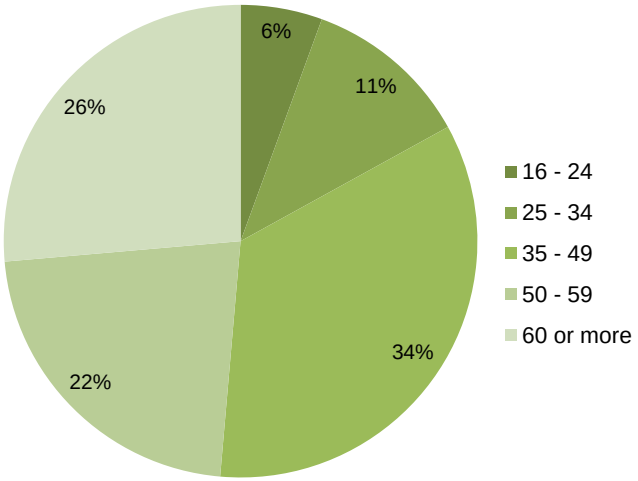


Almost one half of all fuel poor households in 2012 were couples with no dependent children or single person households, despite the prevalence of fuel poverty among these household types generally being low. This reflects the fact that these household types make up a large proportion (62%) of the overall population in England. Couples with dependent children account for around 30 per cent of all fuel poor households, while lone parent households and multi-person households account for a further 15 and eight per cent of all fuel poor households respectively.

3.3.2 Age

Chart 3.7 shows the breakdown within the fuel poor population by the age of the oldest household occupant.

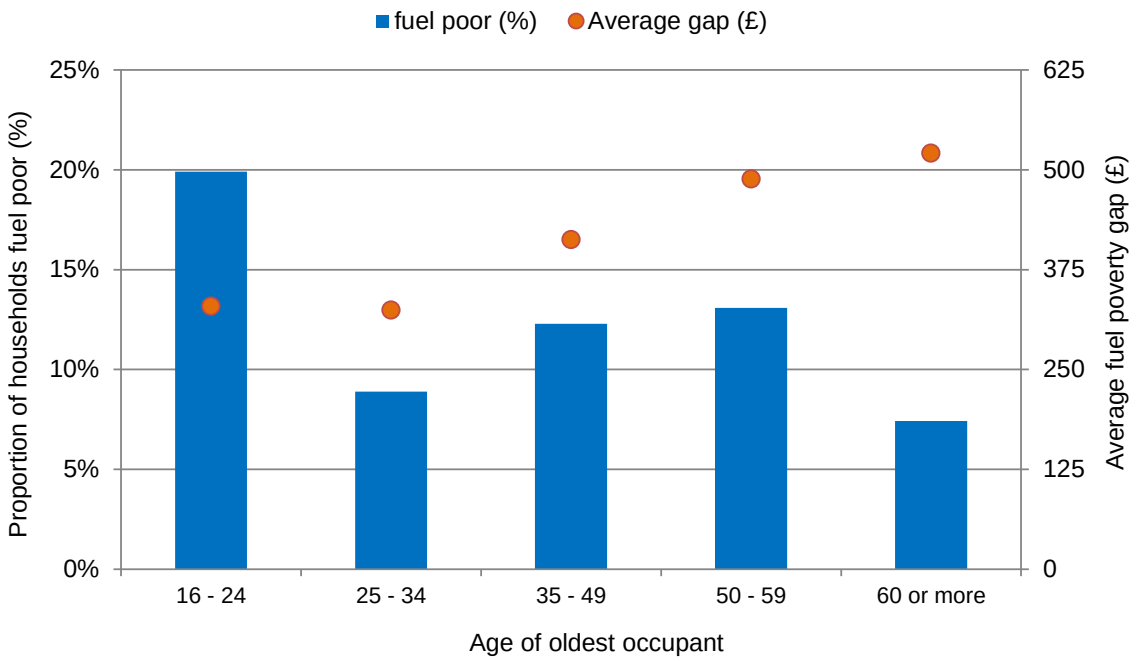
Chart 3.7: Fuel poor households by age of oldest occupant, 2012



Examining the breakdown of the fuel poor population in Chart 3.7, it is apparent that almost one half of all fuel poor households contained someone over the age of 50 in 2012. In contrast, in around six per cent of all fuel poor households the oldest person was aged between 16 and 24 (in around 3% all households the oldest person is between the ages of 16 and 24).

Chart 3.8 below shows how the proportion of households in fuel poverty varies by the age of the oldest occupant in the household, along with the associated average fuel poverty gaps in each group. From the chart it is clear that fuel poverty is most prevalent amongst the under 25 year olds, with around one in five such households (20%) classed as fuel poor in 2012. This compares to seven per cent of the over 60 year old group. This increased rate of being fuel poor in the under 25 year old group is likely to be part due to their lower average earnings, and part due to the fact that the majority of this age group (over two-thirds) live in privately rented accommodation (see Table 3.4), which tends to be less energy efficient and therefore often leads to higher fuel costs. In contrast, over three-quarters of the over 60 year old age group own the property they live in, often resulting in lower housing costs, and in turn, higher disposable incomes compared to all other age groups. To illustrate further, Table 3.4 shows the distribution of tenure and the employment status of the main household reference person (HRP) by the age of the oldest household member.

Chart 3.8: Fuel poverty and average fuel poverty gap by age of older household occupant, 2012



With the exception of households where the oldest person is below 25, the depth of fuel poverty increases as the age of the oldest household member increases. In 2012, the average fuel poverty gap for households where the oldest member was aged between 25 and 34 was £324, and for households with someone aged over 60 the gap was £521. This shows that despite the older group having a reduced likelihood of being fuel poor, those that are fuel poor are more deeply fuel poor. This may be due to the higher/longer heating requirements needed for this group.

Table 3.4: Distribution of households by tenure and employment status by the age of the oldest household member, 2012

Age of the oldest household member	Tenure			HRP employment status		
	Owner occupied	Private rented	Social	Inactive	Unemployed	Working
16 - 24	8%	68%	24%	39%	14%	47%
25 - 34	37%	46%	17%	14%	7%	79%
35 - 49	64%	20%	16%	11%	5%	84%
50 - 59	73%	10%	17%	16%	6%	78%
60 or more	77%	6%	17%	76%	1%	24%
All households	65%	18%	17%	37%	4%	59%

3.4 Fuel payment type

3.4.1 Method of gas payment

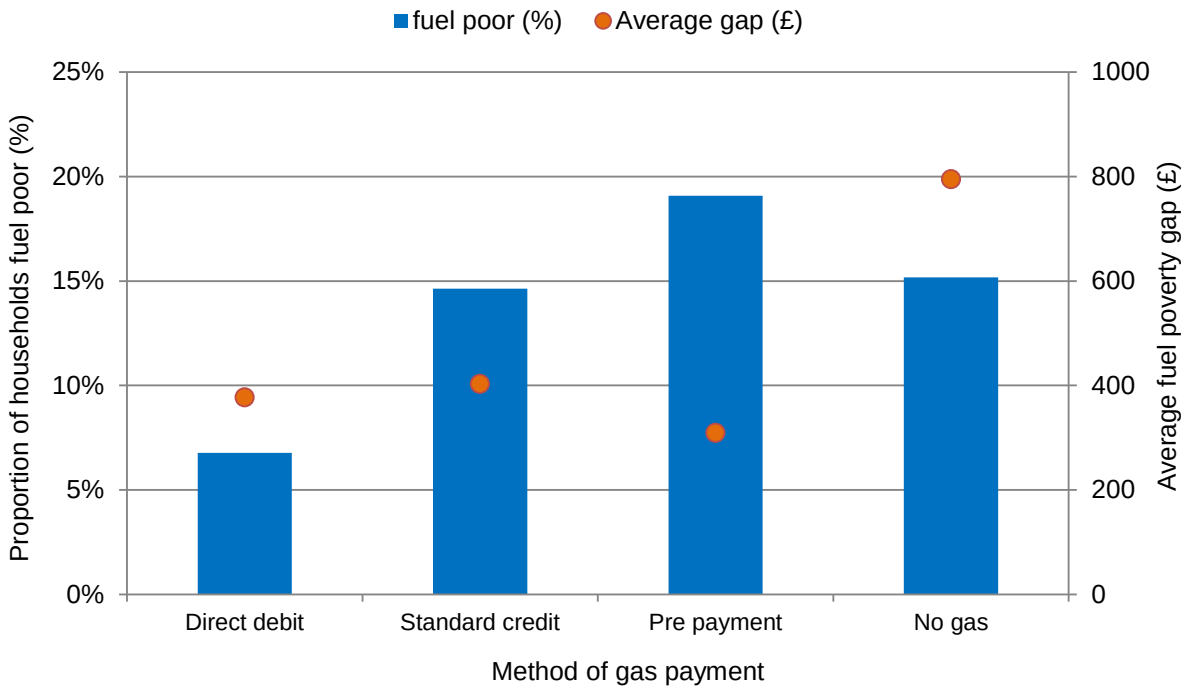
Expenditure on heating is a key element of household energy use in the fuel poverty context. Chart 3.9 below shows the proportion of households who are fuel poor, along with their associated average fuel poverty gaps, by the method of payment used for gas, the main heating fuel.

Households paying for their gas by direct debit have the lowest fuel poverty rate, with around seven per cent of households in fuel poverty in 2012. This contrasts to 15 per cent of all households paying by standard credit, and 19 per cent of households using pre-payment meters. In 2012, the average fuel poverty gap was greatest for households paying by standard credit and least for households using prepayment meters (£403 and £309 respectively). For households paying by direct debit, the average gap was £377. However, the largest gap was for households with no connection to mains gas, where the average gap was £795; around 15 per cent of all households from this group were classed as fuel poor.

Although the incidence of fuel poverty is high among households using pre-payment meters, the average fuel poverty gap is the least due many of these households living in comparatively small social housing, thereby having smaller fuel costs.

In 2012, twice as many fuel poor households used pre-payment meters to pay for their gas consumption compared to the non-fuel poor households (22% vs. 11% respectively). In sharp contrast, a far greater proportion of non-fuel poor households pay for their gas consumption using direct debit compared to fuel poor households (64% vs. 40% respectively).

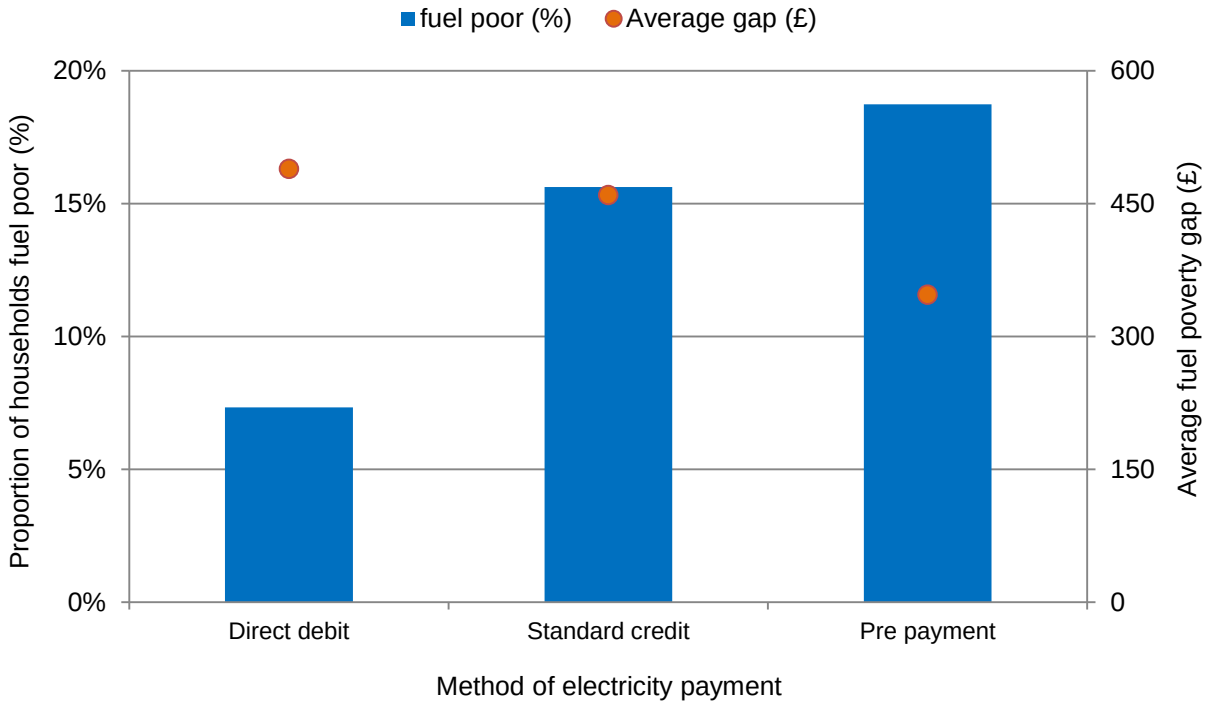
Chart 3.9: Fuel poverty and average fuel poverty gap by payment method for gas, 2012



3.4.2 Method of electricity payment

Chart 3.10 below showing the fuel poverty rates and associated gaps by method of payment for electricity, which shows similar patterns to that found above.

Chart 3.10: Fuel poverty and average fuel poverty gap by payment method for electricity, 2012



The above chart shows that as with the case for the method of payment for gas, householders paying for their electricity consumption through direct debit are least likely to be fuel poor, followed by householders using standard credit (16%). Householders using pre-payment meters to pay for their electricity usage however are most likely to be fuel poor, with almost one in five classed as fuel poor in 2012.

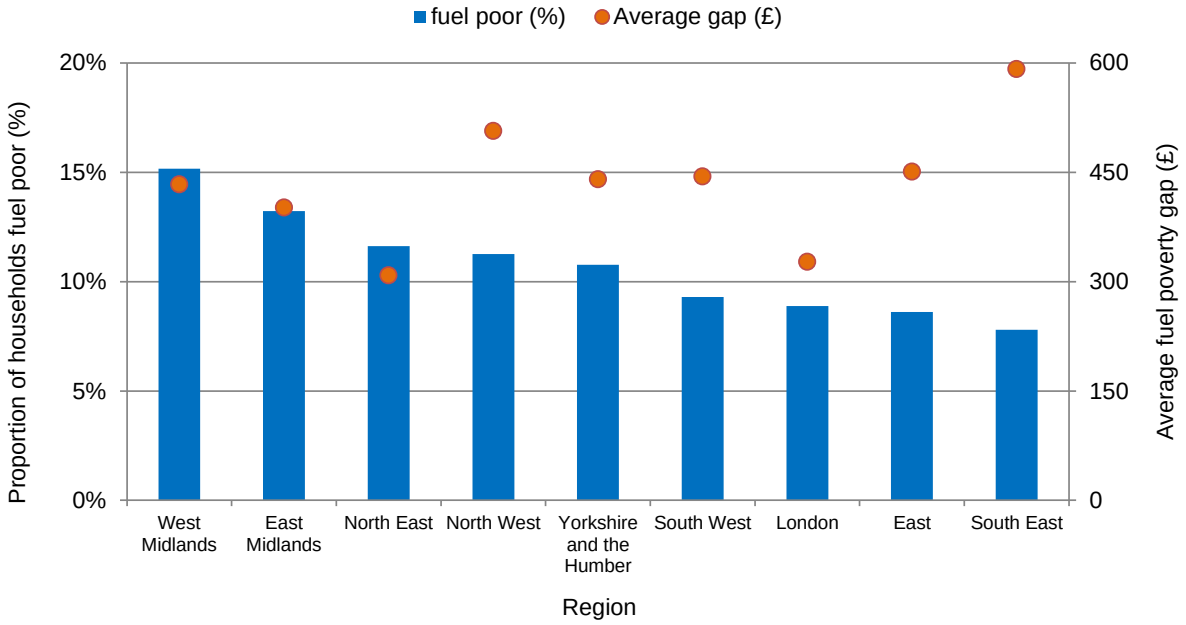
Despite the propensity to be fuel poor being the least for householders using direct debit, their severity of fuel poverty is the greatest, with an average fuel poverty gap of £489 in 2012. Householders paying for their electricity consumption through pre-payment meters have the lowest average fuel poverty gap (£347) due to the smaller fuel costs incurred by such households as many of live in comparatively small social housing (as with the case for households paying for their gas consumption through pre-payment meters).

3.5 Regional fuel poverty

Fuel poverty rates differ notably across England, as seen in Chart 3.11 below.

In 2012, the West Midlands followed by the East Midlands had the highest rate of fuel poverty (with fuel poverty rates of 15% and 13% respectively). In contrast, households living in the South East and East have the lowest levels of fuel poverty (at 8% and 9% respectively).

Chart 3.11: Fuel poverty and average fuel poverty gap by region, 2012



In general, regions with the higher fuel poverty rates (the Midlands and the North), tend to also have lower average incomes compared to London and the South, where proportionally, fewer households are in fuel poverty. This drives more households into fuel poverty. However, a general combination of smaller dwelling sizes, better insulation measures and greater access to the gas network in these regions, work to compensate the severity of the fuel poverty experienced, and so they have some of the lowest fuel poverty gaps.

There is significant variation between the average fuel poverty gaps by the different regions. The underlying cause of this is variation is most likely linked to a combination of the other prevailing regional household and dwelling characteristics discussed throughout in this chapter. For example, a combination of smaller household sizes and greater access to the gas network in London is likely to limit the average depth of fuel poverty experienced by Londoners.

Chapter 4: Trends in Fuel Poverty, 2003 to 2012

This chapter considers some of the key changes in fuel poverty between 2003 and 2012 in England under the low income high cost indicator. Trends in energy efficiency and particular household characteristics are examined in further detail here, including how these relate to fuel poverty over this period. Whilst the analysis looks at individual characteristics, users should be aware of the correlations likely to exist between these characteristics, which means any differences will be due to a combination of factors.

The figures behind the analysis in this chapter are available online in the *Trends in fuel poverty tables* at:

https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/fuel-poverty-statistics

In 2012, 2.28 million households were in fuel poverty compared to 2.39 million households in 2011, representing a drop of almost five per cent. Reasons behind the differences are explained in Chapter 2.

4.1 Dwelling characteristics

4.1.1 SAP

The SAP rating is a measure of the energy efficiency of a property, and uses a numerical scale of one to 100. Alphabetical bandings between A-G are also used to represent SAP scores. Here, properties with a SAP score of A (the high end of the numerical scale) represent the most energy efficient properties, and those with a SAP score of G (the low end of the numerical scale), represent the least energy efficient properties.

Chart 4.1 shows the proportion of households that are fuel poor by SAP band from 2003 to 2012. SAP is strongly related to fuel poverty, with a graduated higher fuel poverty level seen for each deteriorating SAP band. Between 2003 and 2012, the proportion of households who were fuel poor in the most energy efficient properties (A/B/C/D) increased by three percentage points to six per cent, whilst the proportion fuel poor in band E increased by 7 percentage points to 20 per cent. The proportion of fuel poor households in the lowest energy efficient properties (F/G) increased by two percentage points over this period from 23 to 25 per cent – although this is a fall from the 27 per cent seen in the last two consecutive years. Improvements to the energy efficiency levels of fuel poor households are likely to have contributed to this fall.

Chart 4.1: Fuel poverty by SAP band, 2003-2012

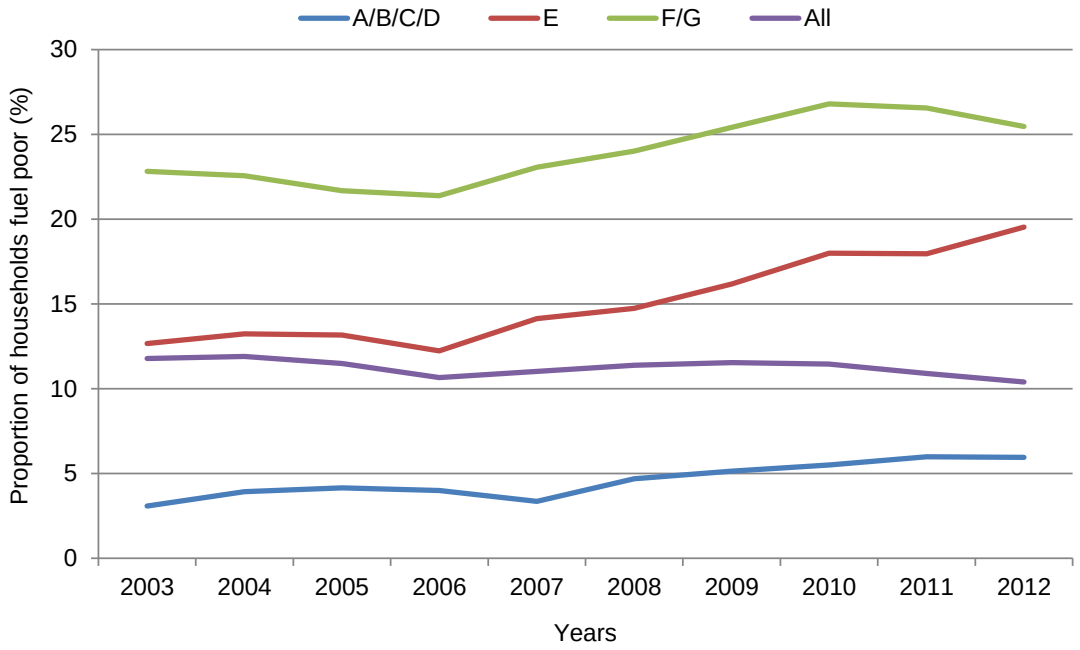


Table 4.1 shows the fuel poverty gap by SAP band from 2003 to 2012. The fuel poverty gap has more than doubled for all of the SAP bands over this period due to increases seen in fuel prices since 2003. The largest absolute increase in the average gap was seen for households in bands F/G, where the gap increased from £426 to £1,068. These patterns show that households living in the least energy efficient dwellings are more likely to be fuel poor and live in more severe fuel poverty (through higher fuel poverty gaps) compared to households occupying more energy efficient properties - highlighting the importance of improving the energy efficiency in reducing fuel poverty.

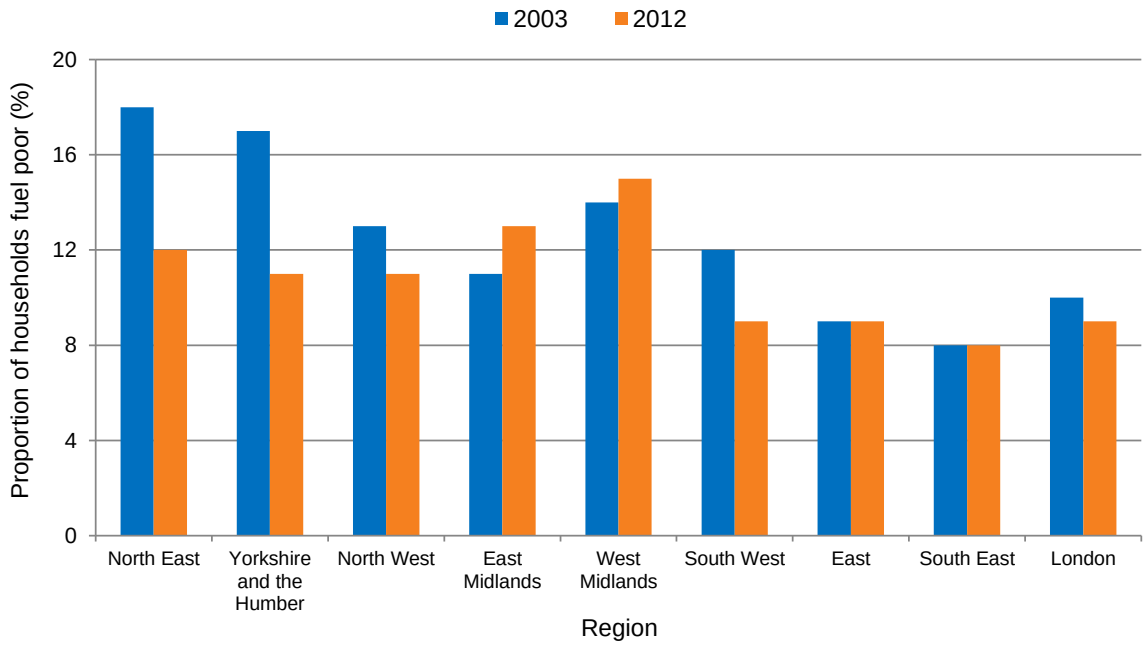
Table 4.1 Time series of average fuel poverty gaps by SAP band, 2003-2012

Years	SAP rating - Average fuel poverty gap (£): Real Terms		
	A/B/C/D	E	F/G
2003	117	146	426
2004	126	166	454
2005	155	217	544
2006	175	282	695
2007	143	251	757
2008	189	302	745
2009	228	351	795
2010	223	345	853
2011	234	398	988
2012	262	410	1068

4.1.2 Region

Chart 4.2 shows fuel poverty by region in 2003 and 2012. Just over half of regions saw a decrease in the proportion of households classified as fuel poor in 2012 compared with 2003. The North East and Yorkshire saw the greatest fall in the proportion of households classified as fuel poor between 2003 and 2012, both falling by around six percentage points. Smaller falls were seen in the South West, London and the North West. The East and West Midlands were the only regions to see an increase in the proportion of households who were fuel poor, increasing by two and one percentage points respectively. The percentage of households classified as fuel poor remained the same in the East of England and the South East.

Chart 4.2: Fuel poverty by region, 2003-2012



The average fuel poverty gap in real terms by region is shown in Table 4.2. In both 2003 and 2012, the North East had the lowest average fuel poverty gap, although it had the highest rate of fuel poverty in 2003, and the third highest rate of fuel poverty in 2012 of all the regions. As mentioned in Section 3.5 of the report, the lower severity of fuel poverty in this instance is mainly due to a general combination of smaller dwelling sizes, better insulation measures and greater access to the gas network in this region. The South East saw the greatest rise in the fuel poverty gap between 2003 and 2012, which doubled over this period and increased by 16 per cent since 2011. This is likely to be due to increased fuel costs in the south east which are a result little improvement seen in the energy efficiency of dwellings in this region since 2011. The smallest increase was seen in the North East, where the fuel poverty gap increased by £114 from £195 to £309.

Table 4.2: Time series of average fuel poverty gaps by region, 2003-2012

Years	Government Office Region: Average fuel poverty gap (£): Real Terms								
	North East	Yorkshire and the Humber	North West	East Midlands	West Midlands	South West	East	South East	London
2003	195	284	221	248	262	313	267	294	200
2004	181	262	231	244	313	341	339	274	199
2005	269	281	260	392	365	377	374	340	235
2006	349	338	455	506	409	451	374	440	296
2007	350	313	432	397	418	429	333	452	382
2008	339	362	341	411	406	525	459	479	343
2009	437	407	423	449	410	509	527	466	330
2010	409	399	438	469	390	467	447	432	344
2011	336	438	563	431	395	516	417	508	338
2012	309	440	507	402	433	444	451	591	327

4.2 Household characteristics

4.2.1 Household composition

The majority of household composition groups saw a decrease in the proportion of households in fuel poverty between 2003 and 2012. The only household composition group to see an increase between this period was couples with dependent children, where the proportion of fuel poor households increased by five percentage points from nine per cent to 14 per cent. The proportion of couples under 60 with no children in fuel poverty has remained the same since 2003, at five per cent. All other household compositions saw a fall in the proportion of households which are fuel poor. The largest fall was observed in older one person households, with the rate of fuel poverty falling by around 10 percentage points since 2003, to six per cent in 2012 This is likely to be a result of increasing incomes in this group relative to other groups as the proportion of this group who are in the high income quadrants (HILC and HIHC) increased from 67 per cent in 2003 to 84 per cent in 2012.

Chart 4.3: Fuel Poverty by household composition, 2003 and 2012

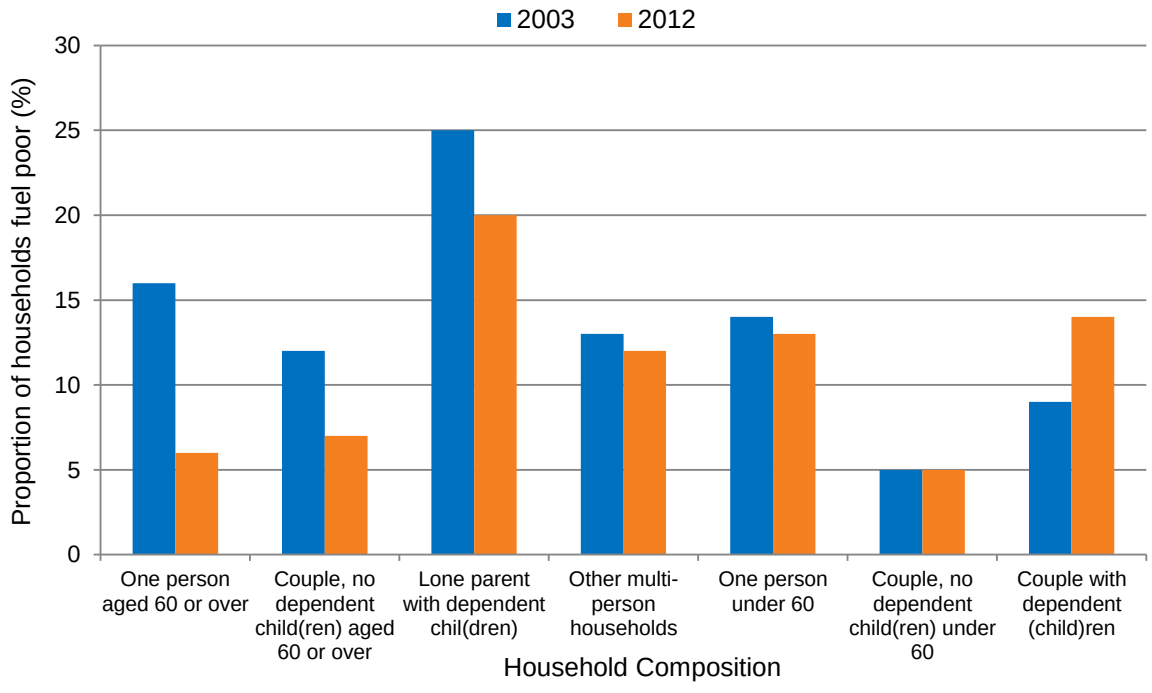


Table 4.3 shows the average fuel poverty gap in real terms by household composition between 2003 and 2012. The average fuel poverty gap has increased in all household compositions due to increasing fuel prices over this ten year period. Although older aged households showed the largest decrease in the proportion of households in fuel poverty in 2012, the average fuel poverty gap for these groups more than doubled between 2003 and 2012, showing that although a smaller proportion of these groups are in fuel poverty, the depth of fuel poverty is greater for those who remain fuel poor.

Table 4.3: Time series of average fuel poverty gaps by household composition, 2003-2012

Years	Household Composition: Average fuel poverty gap (£): Real Terms						
	One person aged 60 or over	Couple, no dependent child(ren) aged 60 or over	Lone parent with dependent chil(dren)	Other multi-person households	One person under 60	Couple, no dependent child(ren) under 60	Couple with dependent (child)ren
2003	240	238	241	301	218	327	271
2004	232	285	264	258	208	323	306
2005	298	353	280	280	254	362	378
2006	379	401	399	417	349	405	447
2007	341	423	370	421	316	356	471
2008	333	512	325	452	312	378	474
2009	379	492	385	490	341	466	479
2010	460	470	377	437	311	405	467
2011	466	506	379	480	330	527	464
2012	495	530	315	476	372	483	477

4.2.2 Age

Under the low income high costs indicator of fuel poverty, households where the oldest occupant is 16-24 had the highest rates of fuel poverty in both 2003 and 2012. The proportion of this group in fuel poverty has fallen by six percentage points from 26 per cent in 2003 to 20 per cent in 2012. In older aged households, the proportion of households which are fuel poor has also fallen between 2003 and 2012, from 12 to eight per cent in households where the oldest person is aged 60-74 and from 15 to seven per cent in households where the oldest person is aged 75 or more.

Chart 4.4: Fuel poverty by the age of the oldest occupant, 2003 and 2012

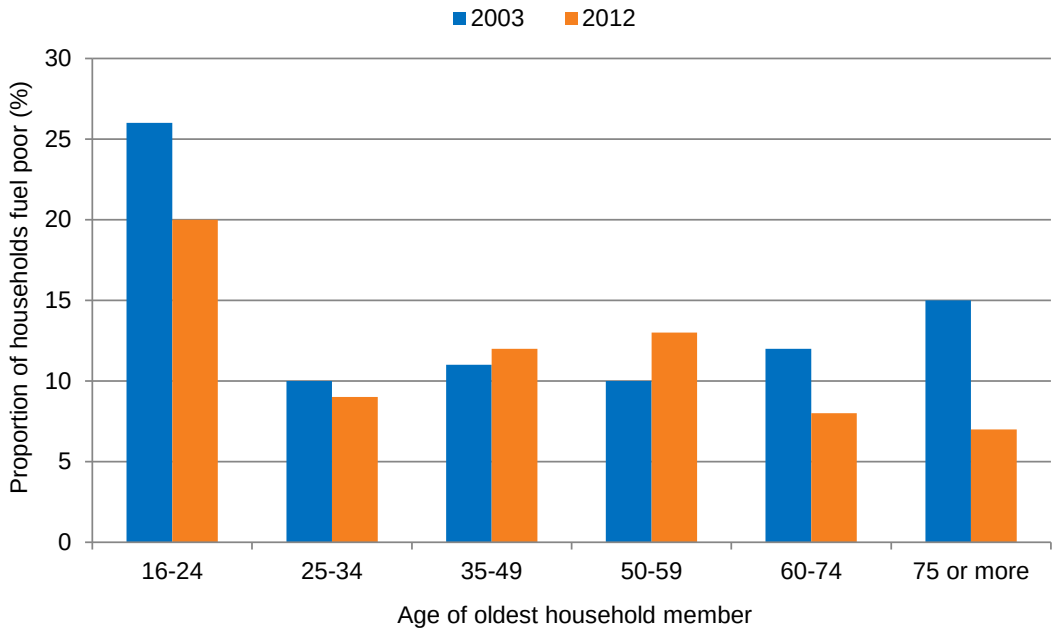


Table 4.4 shows the average fuel poverty gaps in real terms by the age of the oldest occupant between 2003 and 2012. As with household composition, the average fuel poverty gap has increased for all age groups, which is a result of increasing fuel prices. The smallest proportionate increase was observed in the 16-24 year age group, which increased by just over a third, whilst the largest proportionate increase was seen in households where the oldest person is aged 75 and older. The average fuel poverty gap for the latter group has more than doubled in size since 2003.

Table 4.4: Time series of average fuel poverty gaps by age of the oldest occupant, 2003-2012

Years	Age of oldest occupant: Average fuel poverty gap (£): Real Terms					
	16-24	25-34	35-49	50-59	60-74	75 or more
2003	246	223	271	264	241	261
2004	277	214	269	310	248	265
2005	235	255	328	357	319	332
2006	288	282	445	435	417	377
2007	296	283	431	430	395	382
2008	324	352	392	427	438	431
2009	344	326	464	427	480	434
2010	364	296	427	423	458	472
2011	379	354	420	476	473	550
2012	329	324	413	488	504	557

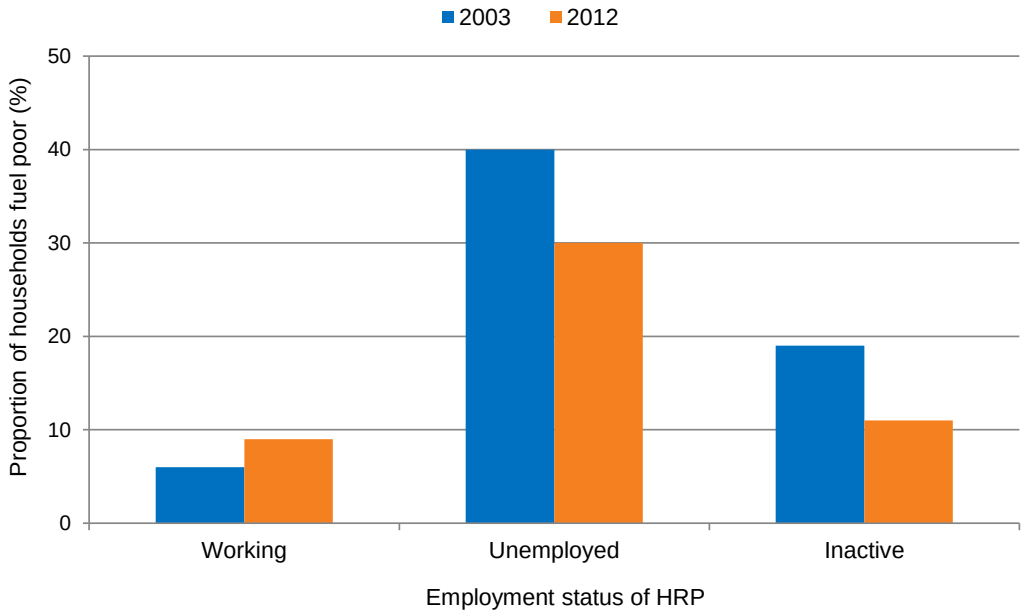
4.2.3 Employment status

In this analysis, employment is defined as the employment status of the household reference person (HRP)[15] within the English Housing Survey.

Unemployed households have the highest rates of fuel poverty. This pattern has been consistent since 2003, with at least 30 per cent of all unemployed households but less than 10 per cent of working households in fuel poverty over this time. Although this pattern has been consistent, the proportion of working households who are fuel poor has risen by three percentage points since 2003, whilst the proportion of unemployed households who are fuel poor has fallen by around 10 percentage points from 40 per cent in 2003 to 30 per cent in 2012 (see Chart 4.5 below).

[15] Household Reference Person (HRP) is the person in whose name the dwelling is owned or rented or who is otherwise responsible for the accommodation. In the case of joint owners and tenants, the person with the highest income is taken as the HRP. Where incomes are equal, the older is taken as the HRP. This procedure increases the likelihood that the HRP better characterises the household's social and economic position.

Chart 4.5: Fuel Poverty rates by employment status of HRP, 2003 and 2012



The largest increase in the fuel poverty gap between 2003 and 2012 was seen in working households, where the average fuel poverty gap increased by £204. Unemployed households saw the smallest increase in the fuel poverty gap in the same period (£58).

In every year since 2004, households in the working group have consistently had highest fuel poverty gap. A high proportion of this group live in private tenure, which is generally less energy efficient than the social sector; this, combined with rising fuel prices since 2004 has worked to increase the fuel poverty gap experienced by this group. In contrast, more unemployed households live in social housing which has seen significant improvements in energy efficiency levels in the recent past. This has helped reduce the average fuel poverty gap, and hence the depth of fuel poverty experienced by unemployed households. Further evidence of this can be seen in the next section.

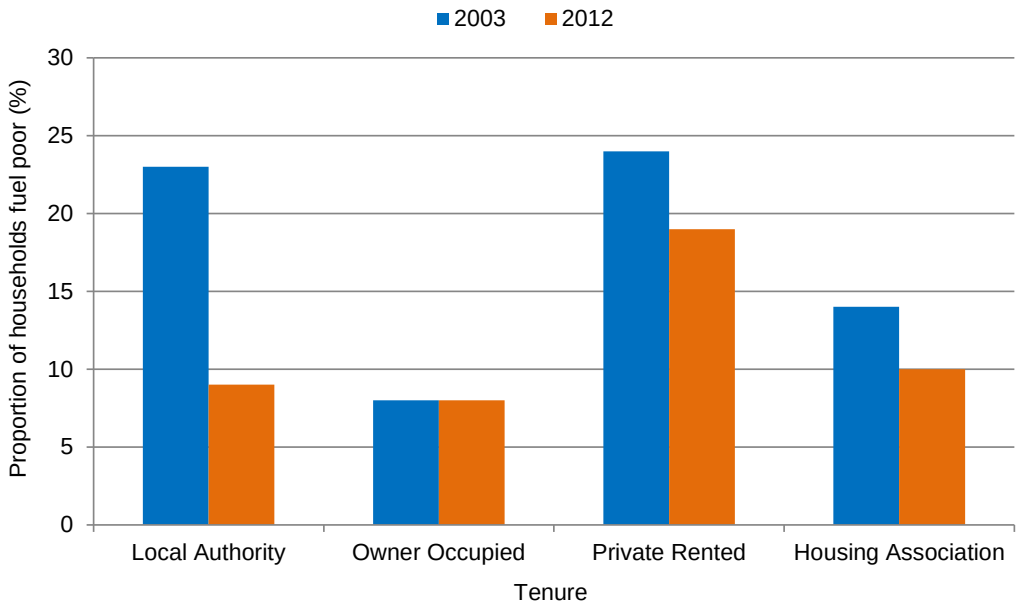
Table 4.5: Time series of average fuel poverty gaps by employment status of HRP, 2003-2012

Years	Employment Status of HRP: Average fuel poverty gap (£): Real Terms		
	Working	Unemployed	Inactive
2003	262	295	245
2004	295	260	250
2005	357	286	298
2006	454	417	358
2007	443	342	359
2008	425	284	402
2009	464	431	412
2010	433	428	408
2011	480	376	427
2012	466	353	442

4.2.4 Tenure

Of the different tenure groups, households who are privately renting have had the highest rates of fuel poverty since 2003, whilst owner occupied households have had the lowest rates of fuel poverty over this time (Chart 4.6). The largest change in the proportion of fuel poor households between 2003 and 2012 was seen in households living under a local authority tenure, where the proportion who were fuel poor fell by 14 percentage points from 23 per cent in 2003 to nine per cent in 2012. This fall is likely to be due to improvements made to energy efficiency in the social housing sector.

Chart 4.6: Fuel Poverty rates by tenure, 2003 and 2012



Since 2003, households living in all tenure types saw an increase in average fuel poverty gap as shown in Table 4.6 below. The largest increase was seen for owner-occupied dwellings, where the average fuel poverty gap doubled between 2003 and 2012 in real terms. The smallest increase was seen in households living in local authority dwellings where the fuel poverty gap increased by less than ten per cent. Again these reflect improvements in energy efficiency in local authority dwellings over this time and differences in the size of dwellings.

Table 4.6 Time series of average fuel poverty gaps by tenure, 2003-2012

Years	Average fuel poverty gap (£): Real Terms			
	Local Authority	Owner Occupied	Private Rented	Housing Association
2003	203	259	324	202
2004	180	284	337	182
2005	201	348	383	201
2006	242	442	468	243
2007	236	435	432	239
2008	244	436	459	264
2009	224	483	486	261
2010	226	485	414	253
2011	232	499	461	261
2012	218	507	445	252

Chapter 5: Sub-regional fuel poverty in England, 2012

5.1 Sub-regional fuel poverty

This chapter focuses on sub-regional fuel poverty under the Low Income High Costs indicator of fuel poverty.

DECC recently undertook a review of the methodology used to produce sub-regional estimates of fuel poverty, in conjunction with the ONS Methodology Advisory Service. This work found that estimates of fuel poverty were robust at local authority level, but were not robust at very low level geographies. As a result, DECC no longer provide estimates at Census Output Area (COA) level. Estimates of fuel poverty at Lower Super Output Area (LSOA) are still published but should also be treated with caution. The estimates should only be used to describe general trends and identify areas of particularly high or low fuel poverty. They should not be used to identify trends over time within an LSOA, or to compare LSOA's with similar fuel poverty levels.
We are continuing to develop our modelling of sub-regional fuel poverty, including providing estimates of the precision of these statistics, and plan to publish more information on this in the future.

5.1.1 Data Available

For each of the following geographical levels, estimates are available for the total number of households, the number of fuel poor households, and the proportion of households in fuel poverty:

- English Region (former Government Office Region)
- County
- Parliamentary Constituency
- Local Authority
- Lower Super Output Area (LSOA)

These data are available in a spreadsheet, which users can download from the DECC website at: https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/fuel-poverty-sub-regional-statistics

5.2 Methodology

The national and regional fuel poverty statistics are based on data from the English Housing Survey (EHS). However, given the sample size of the EHS (around 12,200 in 2012), it is not possible to use this data to directly estimate fuel poverty in smaller geographical areas, such as the 326 local authorities. Therefore a logistic regression model is created, matching data from the EHS on whether the household is fuel poor or not (as the binary dependent variable) with data from other sources available for all Census Output Areas, e.g. Census 2011 data (as the independent variables). In this

way, the model can be used to predict the levels of fuel poverty for all COAs across England, these are then aggregated to LSOA and higher level geographies. This modelling approach does introduce the possibility that small atypical areas are not accurately picked up by the model. It is therefore essential to compare, where possible, the modelled LSOA level results to the overall local area results.

A single model has been created to reflect the level of fuel poverty across all tenures. The model, produced by the Building Research Establishment (BRE) at the request of DECC, uses a stepwise selection methodology to identify the variables with the most explanatory power. A few of the key predictor variables used in the model include:

- **Dwelling age**: This is a categorical variable which provides an indication of the likely energy efficiency of a dwelling. For example, older dwellings are generally more likely to have solid walls or be listed buildings, which make fitting energy saving measures difficult. Such households are likely to have higher fuel bills in order to heat the dwelling to an adequate level of warmth.

- **English region**: This is a categorical variable which indicates the English Region (former Government Office Region) that a COA is located within. Chapter 3 illustrates the regional differences in levels of fuel poverty.

- **Lifestyle characteristics**: This is a categorical variable which provides an indication of the economic status of the households in a given COA, and therefore the likelihood of households being able to afford to adequately heat their home.

The output from this model is the percentage of households in fuel poverty at COA level. To convert this to a number of households in fuel poverty, we apply this percentage to an estimate of household numbers at COA level. The number of households classed as fuel poor and overall household totals are constrained to reflect the 2012 national fuel poverty figures. These models are then aggregated to the Lower Super Output Area, Local Authority, Parliamentary Constituency, County and Regional level.

As previously mentioned, DECC have been working on developing the small area estimation methodology, using multi-level modelling techniques. A full report on this will be published at a later date.

5.3 Mapping fuel poverty

Maps provide a useful way of comparing fuel poverty across different geographical areas. Figures 5.1 and 5.2 show the proportion of households in fuel poverty in England, at Local Authority and LSOA level respectively. At a glance, it is clear that many of the Local Authorities and LSOAs in the South East generally have lower fuel poverty levels, whilst the Midlands and the North have higher rates of fuel poverty. This data is consistent with the regional data shown in Chart 3.11, which shows the West Midlands and East Midlands have the highest fuel poverty rates (15% and 13% respectively) of all the regions. The fuel poverty rate was highest in Leicester where around one in five households was fuel poor. The rate of fuel poverty was the lowest in the City of London where less than three per cent of households were fuel poor.

Figure 5.1 Percentage of households in fuel poverty under the Low Income High Costs indicator, by Local Authority District

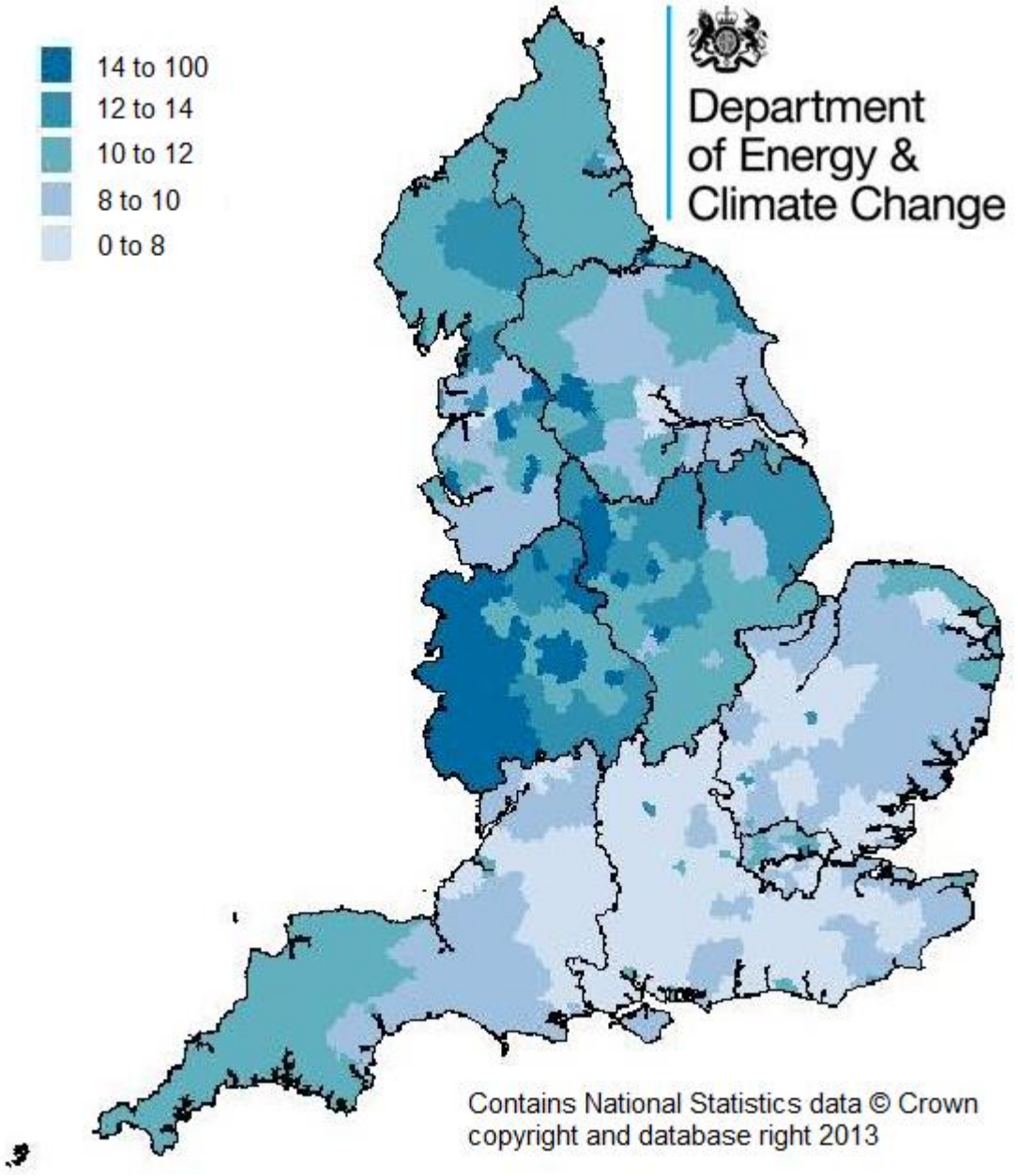
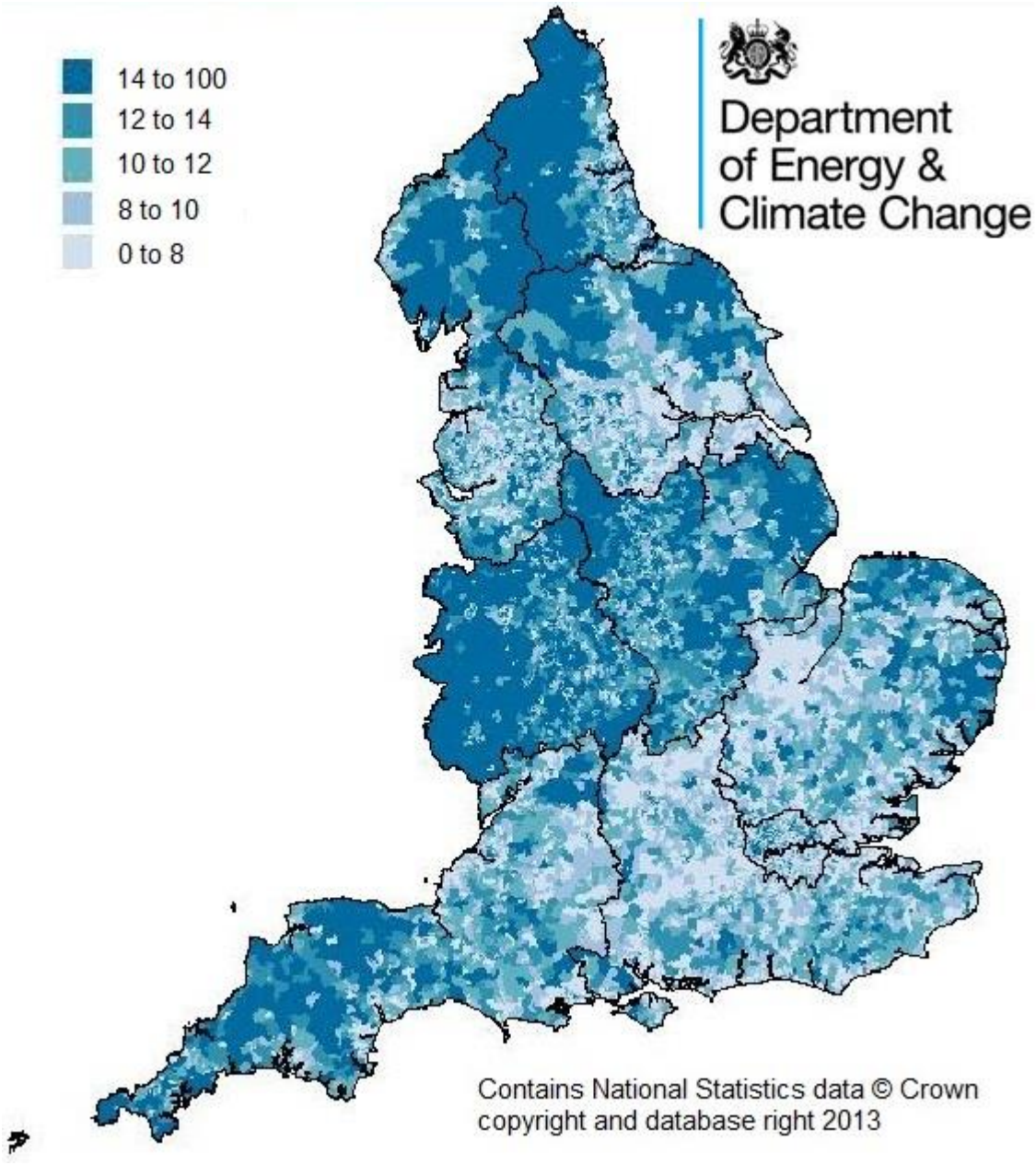


Figure 5.2 Percentage of households in fuel poverty under the Low Income High Costs indicator, by Lower Super Output Area



For more detailed regional maps showing fuel poverty in each of the regions at LSOA level, please see Annex C of this report.

5.4 Comparisons with 2011 Data

In 2012, 74 per cent of local authorities (242) saw a decrease in the number of fuel poor households, while 22 per cent (71) saw an increase in the percentage of fuel poor households compared to 2011. The percentage of fuel poor households remained the same in 13 local authorities. Only two local authorities saw percentage point changes greater than 5 per cent. The changes observed in local authorities in the rates of fuel poverty are in line with regional changes. The West Midlands, saw the largest increase in the proportion fuel poor between 2011 and 2012. In 2012, all but one of the local authorities in the West Midlands had fuel poverty rates which were higher than the national average (10.4%). In 2011, all but three local authorities in the West Midlands had fuel poverty rates which were higher than the national average (10.9%). The East of England saw the largest fall in the proportion of fuel poor households. In 2011, 32 of the 47 local authorities in the East Midlands had fuel poverty rates below the national average; this compares to 40 Local Authorities which had rates below the national average in 2012. Caution should be exercised when looking at year on year changes for individual local authorities, as changes observed may be due to uncertainty around the modelled data.

Chapter 6: Projections

This chapter presents projections of fuel poverty for 2013 and 2014 based on the LIHC indicator of fuel poverty. The figures presented here indicate how fuel poverty levels have changed between the latest official figures for 2012 and the current year.

6.1 Methodology

The methodology used for projections is similar to that used in the DECC publication *Fuel Poverty: A Framework for Future Action*[16].

The projection model uses the 2012 EHS dataset as the baseline. Projections of fuel poverty are primarily based on three factors:

- Changes in incomes;
- Changes in energy prices;
- The estimated change in household's required energy costs, due to the installation of energy efficiency measures or direct energy bill support.

The key outputs from the projections model are the number of households in fuel poverty, the aggregate fuel poverty gap and the average fuel poverty gap per household. The projections are carried out in nominal terms and the assumptions that underpin these projections are set out in more detail below.

6.1.1 Incomes

Projecting disposable income involves combining information on the different types of household income, such as earnings, benefits and savings, and applying the relevant projected rates of change to them. Incomes from each of these sources are expected to change at different rates, as they are dependent on different factors. For example, earnings depend on activities in the labour market, whereas savings depend on interest rates.

As such, a summary of the different income types and the source used to project their future change is provided in Table 6.1. Each element is projected in nominal terms, in line with the Office of Budget Responsibility Economic and Fiscal Outlook (OBR)[17], in order that we can compare with the actual outturn next year.

[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211137/fuel_poverty_strategic_framework_analytical_annex.pdf

[17] See the charts and tables in the OBR fiscal outlook: http://budgetresponsibility.org.uk/economic-fiscal-outlook-march-2014/

Table 6.1: Projecting the different components of income

Type	Method of projection
Earnings	Percentage change in nominal earnings from OBR (2014)
Investment and savings	The percentage change in GDP from OBR (2014) is applied to both investments and savings. GDP is used because the savings rate that each household receives will vary by their choice of bank/building society etc. so we use the change in nominal GDP as a proxy for the change in interest rates.
Other private income	These include a wide range of relatively small income sources e.g. cash gifts from other family members. These are uprated by the Consumer Price Index (CPI) (a measure of inflation).
Benefits (including housing related) and tax credits	These are uprated in line with Government policy.

Housing costs (mortgage and rent payments) are uprated by the Retail Price Index (RPI), as are council tax payments. Housing costs are then deducted from income to calculate After Housing Costs Income.

6.1.2 Energy prices

For the 2013 projections, published price data is available, and this is applied to the 2012 dataset. Components of the CPI have been used for non-metered fuels, whilst DECC's estimated gas and electricity bills are used for metered fuels. [18] For the 2014 projections, published CPI data for January – April is combined with estimated changes in fuel prices for the rest of 2014. This is done for both metered and non-metered fuels. Estimates for biomass fuels are taken from the July 2013 Renewable Heat Incentive Impact Assessment[19].

6.1.3 Energy efficiency

The Government energy and climate change policy package is designed to reduce energy costs for households, mainly through the installation of energy efficiency measures and/or direct energy bill support. Assumptions are made in the projections about which households receive support and the number of measures allocated.

[18] https://www.gov.uk/government/collections/domestic-energy-prices
[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211978/Domestic_RHI_Impact_Assessment.pdf

A combination of observed delivery statistics and projected installation patterns from the most recently published policy impact assessments are used to estimate the number of major measures delivered by the policy package in each year.[20] See Tables 6.2 and 6.3 for details of the measures estimated to be delivered under these policies in 2013 and 2014.

Many of the policies are intended to deliver measures across Great Britain. For the purpose of these projections, the numbers have been scaled down to represent England only (around 86% of the GB total). The methodology does not take any account of improvements in the energy efficiency of appliances, as this is not directly accounted for in the fuel poverty methodology. It also does not include the impact of DIY measures to improve energy efficiency.

Table 6.2: Estimated uptake of insulation and heating measures ('000s) from government policies in England, 2013

2013	Loft	CWI	SWI	Replacement Boiler	Central Heating	Renewable Heat[1]	Solar PV	Bill Rebates	Condensing Boilers
Warm Front	5,000	3,000		19,000	6,000				
Green Deal and Carbon ECO	25,000	107,000	21,000						
ECO Carbon Saving Communities	76,000	33,000	2,000						
ECO Affordable Warmth	38,000	16,000		119,000	18,000				
RHI*									
FiTs							497,000		
WHD								1,506,000	
Building Regulations									1,096,000

* No delivery in 2013

[1] Includes ground source heat pumps, air source heat pumps, biomass boilers and solar thermal.

Table 6.3: Estimated uptake of insulation and heating measures ('000s) from government policies in England, 2014

2014	Loft	CWI	SWI	Replacement Boiler	Central Heating	Renewable Heat[1]	Solar PV	Bill Rebates	Condensing Boilers
Warm Front									
Green Deal and Carbon ECO	29,000	48,000	15,000						
ECO Carbon Saving Communities	53,000	117,000	10,000						
ECO Affordable Warmth	29,000	5,000		98,000	12,000				
RHI						53,000			
FITs							727,000		
WHD								1,773,000	
Building Regulations									1,142,000

[1] Includes ground source heat pumps, air source heat pumps, biomass boilers and solar thermal.

[20] Detailed delivery data is used where available at the breakdown required. For policies with no delivery data projected figures from impact assessments are used. For policies with partial delivery data the projected uptake is broadly in line with the delivery statistics, and the most appropriate source for the model is chosen.

6.2 Modelling impacts on fuel poverty

The projection model is in two parts.

6.2.1 The micro-simulation model

Firstly a 'micro-simulation model' is used to allocate the measures to households. The policy inputs (above) specify the number and type of measures that are installed as well as the types of households that can receive measures. For example, Affordable Warmth (AW) measures can only go to households which are modelled as being AW eligible. In addition, there are physical restrictions, such that cavity wall insulation can only go to households with unfilled cavity walls.
Each household that is allocated a measure is also allocated an associated reduction in their kilowatt hour (kWh) energy consumption. The amount of energy saved depends on a variety of characteristics, such as: build type (e.g. end terrace, flat, etc.), depth of roof insulation, dwelling age, boiler age, water heating source, main heating fuel and main water heating fuel. There are also different savings factors for different fuel types and fuel use (for example, heating, cooking and lighting). The energy saving factors are based on the BREDEM model, which is used in the calculation of fuel poverty.

The micro-simulation model is run 100 times, with a representative iteration then chosen by looking at the iteration that gives an 'average' saving impact or distribution. This then feeds into the second part of the model.

6.2.2 Calculating fuel poverty

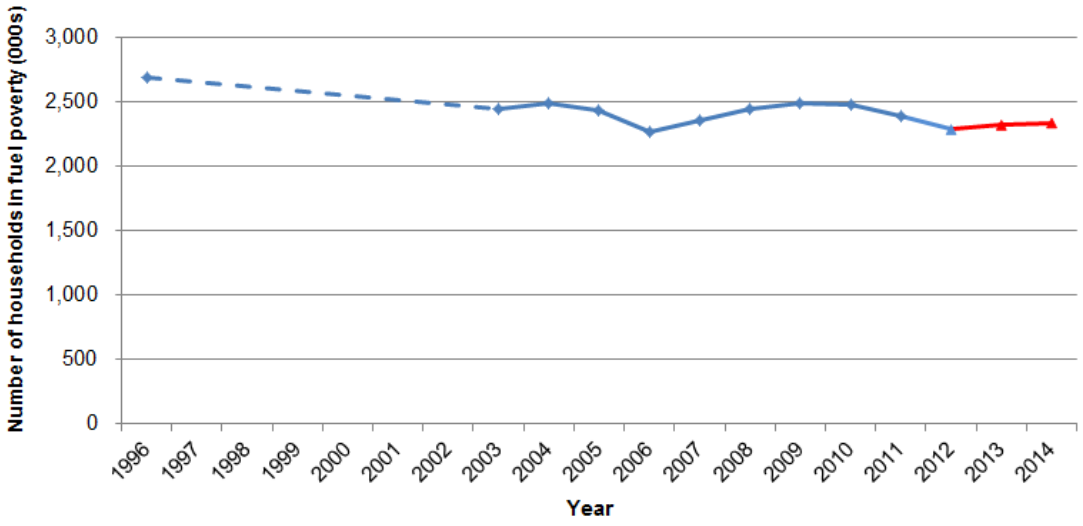
The second part of the model calculates each household's energy consumption in the year under consideration. This is based on their initial energy consumption, as reported in the EHS 2012, combined with the 'energy savings factor' (i.e. the change in energy requirement that results from the measures that are delivered). This is then combined with the relevant energy prices, for the year under consideration, to create a new energy bill.

Income for each household is also up-rated to the year of projection, using the methodology described in Section 6.2. Finally, household incomes are adjusted to reflect any additional income from feed in tariffs and/or RHI tariff payments, and the final energy bill is calculated by reflecting the impact of Warm Home Discount rebates for relevant households.
A new energy threshold and median income are then calculated for each projection year. It is then possible to calculate the number of households in fuel poverty and the fuel poverty gap.

6.4 Projected levels of fuel poverty in England, 2013 and 2014

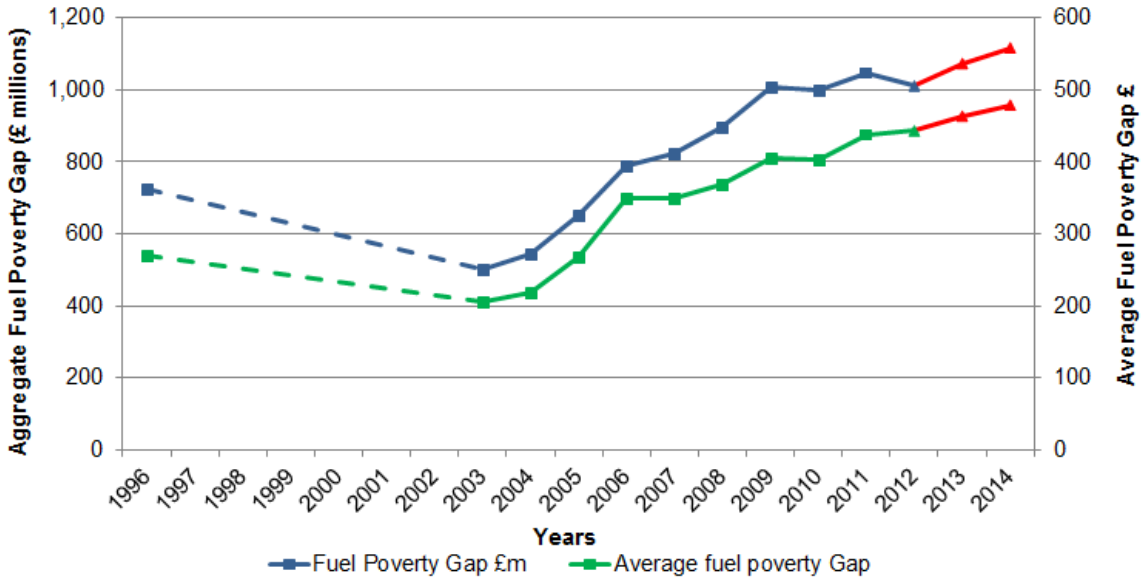
Chart 6.1 shows the projected number of households in fuel poverty in 2013 and 2014. The number of households in fuel poverty is projected to increase from 2.28 million in 2012, to 2.32 million in 2013 and 2.33 million in 2014.

Chart 6.1: Number of households in fuel poverty 1996 to 2012, and projections for 2013 and 2014



The aggregate and average fuel poverty gap is projected to increase in 2013 and 2014. Chart 6.2 shows the projected increases in cash terms. The aggregate gap is projected to increase from £1 billion in 2012, to £1.1 billion in 2014, and the average gap is projected to increase from £443 in 2012 to £480 in 2014.

Chart 6.2: Aggregate and average fuel poverty gap 1996 to 2012 in cash terms, and projections for 2013 and 2014



As noted previously, the projection for 2014 depends on prices that are, as yet, unknown. This uncertainty will have an impact on the accuracy of the projection against the outturn. For the purpose of this projection we have assumed that average prices for gas and electricity will remain unchanged from levels reached in April 2014. In addition, while the projections include the impact on energy efficiency of major Government programmes, they do not include an assessment of the impact of 'do it yourself' type improvements on households energy costs.

The extent to which the actual fuel poverty levels for 2013 and 2014 will differ from the above projections will depend on a number of important and, until the results of survey data from those years are compiled, uncertain factors. These include:

- Any price changes that apply for the remainder of the period (up to the end of 2014);
- Actual income changes;
- Any changes in the fuels used in households, and therefore the energy costs households experience;
- The impact of social and discounted tariffs;
- Changes to the structure and type of households;
- The overall number of households in England;
- The number of energy efficiency measures delivered;
- The actual impact of energy efficiency improvements on households;
- The economic climate and the degree to which employment levels change.

For the reasons above, care should be taken when interpreting the projections of fuel poverty presented here.

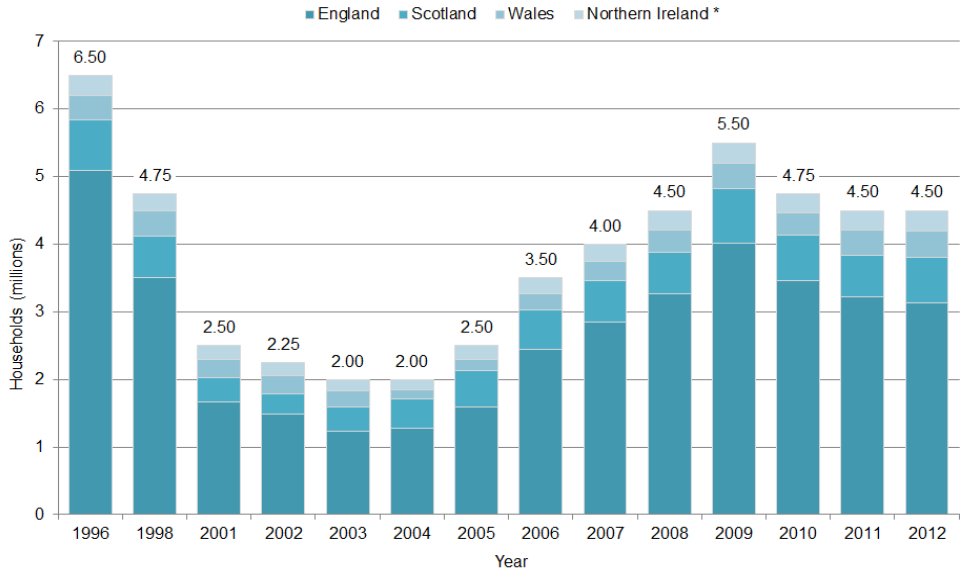
Chapter 7: Fuel Poverty in the UK, 2012

This chapter covers the trend in fuel poverty in the UK from 1996 to 2012. Fuel poverty is a partially devolved matter and currently the Low Income High Cost (LIHC) measure is only used in England. Therefore at the UK level fuel poverty is measured under the 10 per cent definition, whereby a household is said to be in fuel poverty if it needs to spend more than 10 per cent of its income on fuel to maintain an adequate level of warmth[21].

7.1 Fuel Poverty in the UK

In 2012, the number of fuel poor households in the UK was estimated at around 4.50 million representing 17 per cent of all UK households. This indicates that there has been little change in fuel poverty levels at a UK level since 2011[22]. Chart 7.1 shows the overall trend and breakdown of fuel poverty in the UK. It should be noted, the 2009 to 2012 fuel poverty figures for Wales as well as the 2010 and 2012 Northern Ireland figures are based on estimates[23].

Chart 7.1 – Fuel poverty in each country in the UK, 1996 – 2012[24]



* Fuel poverty figures have been estimated for: Wales for 2009, 2010, 2011 and 2012; Northern Ireland for 2010 and 2012. The data series for Scotland was revised in 2013 following changes to the methodology used.

[21] Typically defined as 21 degrees for the main living area and 18 degrees for other occupied rooms.
[22] Figures rounded to nearest 0.25 million.
[23] The Wales estimates are produced by the Welsh Government and the Buildings Research Establishment (BRE) http://wales.gov.uk/docs/caecd/research/130430-wales-fuel-poverty-projection-tool-2011-12-report-en.pdf . Estimates for Northern Ireland in 2010 were provided by the Northern Ireland Housing Executive. Official estimates for 2012 were not available at the time of publication; for this analysis the 2011 estimate has been used for 2012.
[24] Fuel poverty was not calculated in 1997, 1999, or 2000. For more details of the revisions in Scotland fuel poverty figures, see the 2012 Scottish Housing Condition Survey report: http://www.scotland.gov.uk/Resource/0043/00439879.pdf

Generally, the fuel poverty level in each country follows a similar trend to the overall pattern observed in the UK, with year on year reductions seen between 1996 and 2003, due to a combination of falling fuel prices and rising incomes. This trend then begins to reverse from 2004 onwards, in line with price increases.

Between 2004 and 2009, energy prices increased: domestic electricity prices rose by over 75 per cent, and gas prices increased by almost 120 per cent[25]. The overall effect of price rises since 2004 outweighed the impact of increasing incomes and energy efficiency measures in this instance. This led to the rise in fuel poverty seen over this period. This is a reflection of the sensitivity to fuel prices inherent in the 10 per cent indicator.

In 2010 the trend reversed as fuel poverty fell for the first time since 2003, due to rising energy efficiency standards (particularly among lower income households) and a fall in energy prices. Despite a subsequent increase in energy prices in 2011, fuel poverty levels followed a similar trend and continued to fall that year (energy prices increased by one per cent in real terms between 2009 and 2011).

Table 7.1 shows the official fuel poverty estimates for each country in the UK in 2011 and 2012.

Table 7.1 – Number and proportion of fuel poor households by nation in 2011 and 2012 [26]

Country	Number of fuel poor households (millions)		Proportion of the population fuel poor (%)	
	2011	2012	2011	2012
England	3.20	3.05	15%	14%
Scotland	0.61	0.65	26%	27%
Wales	0.37	0.39	29%	29%
Northern Ireland	0.29	-	42%	-

In addition to being affected by changing domestic energy prices, the number of fuel poor households within each UK country is also affected by the methodology used to measure fuel poverty, as well as the housing stock, the prevalent heating fuels and levels of household income. More information on the measurement is available in Section 7.2.

Of the four UK nations, Northern Ireland has the greatest proportion of fuel poor households, followed by Wales, then Scotland and finally England. Northern Ireland has a higher proportion of fuel poor than other nations due to a high percentage of off gas grid households (who therefore use alternative, more expensive fuels to heat their homes) and lower income households.

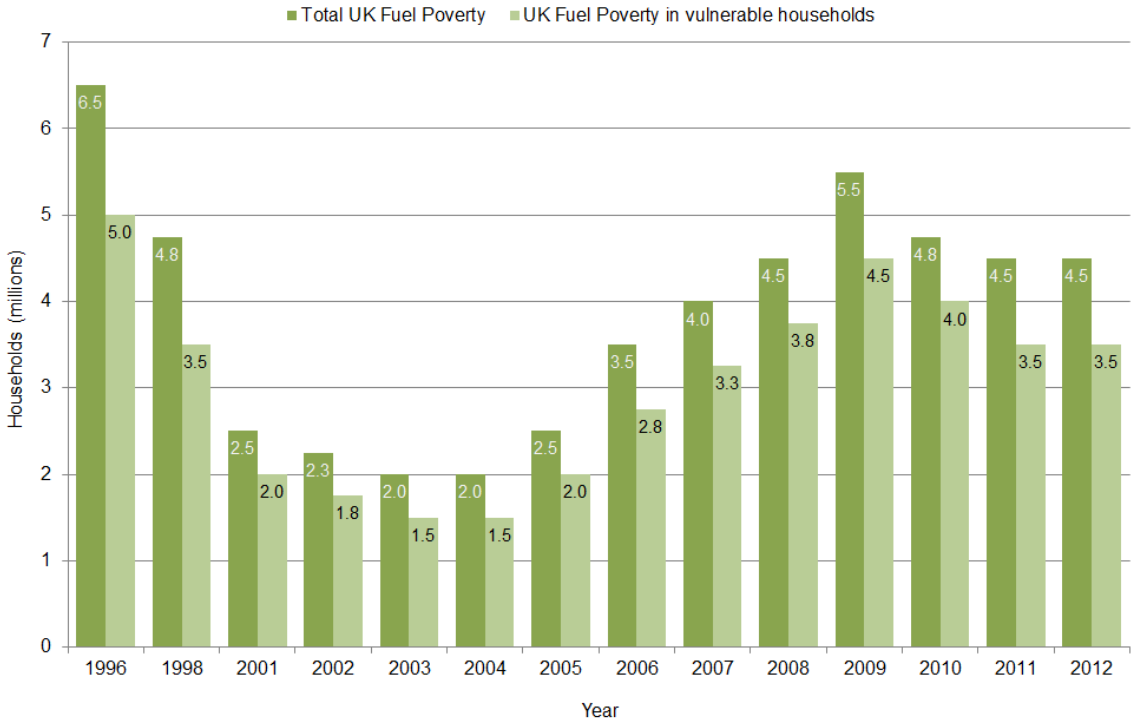
[25] Quarterly Energy Prices, table 2.1.1, Consumer Prices Index: fuel components https://www.gov.uk/government/statistical-data-sets/annual-domestic-energy-price-statistics

[26] England figures sourced from the DECC Fuel poverty report: annual report on statistics 2013, Scotland figures sourced from the Scottish Housing Condition Survey 2012, Wales figures sourced from the Wales Fuel Poverty projection tool: 2011/2012 report, and Northern Ireland figures sourced from Northern Ireland House Condition Survey 2011 (official projections for 2012 not available at time of publication).

Chart 7.1 shows that fuel poverty at a UK level remained unchanged between 2011 and 2012, as the effect of price rises was almost balanced by the effect of rising incomes and energy efficiency standards. Table 7.1 shows that the proportion of fuel poor households fell by one percentage point in England, increased by one percentage point in Scotland, and remained about the same in Wales. The reduction in fuel poverty in England can largely be attributed to a change in methodology, involving using BREDEM 2012 to calculate notional energy use. See Section 1.5.1 of this report for more details. Had there not been a change in methodology it is anticipated that fuel poverty under the 10 per cent indicator at a UK level would have been slightly higher.

Chart 7.2 shows the trend in fuel poverty amongst vulnerable[27] households in the UK. In 2012, around 3.5 million vulnerable households in the UK were fuel poor, which is similar to 2011 levels. Overall around 73 per cent of households were classified as vulnerable in 2012 in the UK.

Chart 7.2 – Fuel poverty in the UK in vulnerable households, 1996 – 2012



7.2 Fuel poverty in the devolved administrations

Fuel Poverty is a partially devolved issue, with each separate administration having their own targets. The main reason for this is that the devolved administrations have the power to affect certain aspects of fuel poverty policies (for example energy efficiency programs) but not others (such as incomes and energy market conditions, which impact on fuel prices).

[27] A vulnerable household is one that contains the elderly, children or someone who is disabled or has a long term illness. Figures rounded to nearest 0.25 million.

The devolved administrations continue to measure fuel poverty using the 10 per cent definition.

England

In England, fuel poverty (under both the LIHC and 10 per cent definitions) is modelled using the data from the English Housing Survey (EHS). More information on the EHS is available in Section 1.2 of this report.

Scotland

In Scotland, the Scottish House Condition Survey (SHCS) is used to model fuel poverty. The main differences in the Scottish definition compared to the English 10 per cent definition are:

- A more stringent interpretation of a satisfactory heating regime for pensioners, long-term sick and disabled households. This essentially means that these groups are assumed to require a higher temperature to reach an adequate standard of warmth in their homes.
- A different approach to under-occupancy with regard to heating regimes.

Scotland publishes its own report on their national level of fuel poverty. The latest report was published in December 2013 and relates to fuel poverty in 2012. The report is available at:

http://www.scotland.gov.uk/Publications/2013/12/3017

The Scottish Government also publishes fuel poverty figures at a local authority level, which are available at:

http://www.scotland.gov.uk/Topics/Statistics/SHCS/keyanalyses

The latest data relates to fuel poverty in 2010, 2011 and 2012 combined.

Wales

The Living in Wales Survey is used to calculate fuel poverty figures for Wales.
The Welsh Assembly published fuel poverty projections in April 2013, based on the 10 per cent and low income high cost definition. The aim was to show the changes in fuel poverty since the 2008 survey. The report is available at:

http://wales.gov.uk/docs/caecd/research/130430-wales-fuel-poverty-projection-tool-2011-12-report-en.pdf

Northern Ireland

The Northern Ireland House Condition Survey is used to calculate the Northern Ireland fuel poverty levels. The latest statistics, which were published in 2013 and relate to 2011, are available at:

http://www.nihe.gov.uk/index/corporate/housing_research/house_condition_survey.htm
It is anticipated that estimates for fuel poverty levels in Northern Ireland in 2012, based on projections, will be available later in 2014.

Chapter 8: Uncertainty in the 2012 fuel poverty statistics

The fuel poverty estimates for England are based on data from a number of different sources, primarily the English Housing Survey (as discussed in Chapter 1) and DECC's Domestic Fuels Inquiry (DFI)[28] for fuel price information. To a greater or lesser degree, each of the inputs into the fuel poverty calculation are themselves best estimates or approximations. The fuel poverty inputs derived from both these sources are therefore subject to a degree of inherent uncertainty and estimation. By estimating the levels of uncertainty around each of the fuel poverty inputs, we can approximate the level of corresponding uncertainty associated with the overall national fuel poverty figures.

The analysis in this chapter considers uncertainty in all three components of the fuel poverty calculation: household incomes, fuel prices and fuel consumption. The effect of standard error in the fuel poverty statistics is also taken into account.

8.1 Methodology

The number of fuel poor households is determined relative to the national thresholds, through calculating the fuel costs and incomes for each household in the EHS, using data particular to that household combined with energy price information from the DFI. In order to consider the effect of uncertainty within the fuel poverty calculation, we need to recalculate fuel poverty after incorporating the amount of variability within each of the fuel poverty inputs. We do this using a simulated repeated sampling technique known as the 'Monte Carlo' method.

The Monte Carlo approach to the measurement of uncertainty makes use of the existing fuel poverty calculation procedure but, for each household, the input data are modified by the random addition and subtraction of small amounts which are representative of the level of uncertainty in the data. Each run of the Monte Carlo model produces an estimate of the number of households in fuel poverty, which will differ slightly from the previous run and the national estimate. If the model is run very many (typically thousands of) times, and on each occasion different adjustments to the input data are made, a distribution of estimates of fuel poverty are generated. As long as the adjustments to each input data accurately mimic the uncertainty associated with the particular input, the resulting distribution represents the overall uncertainty in the national fuel poverty estimate – or the possible range around the central 'best estimate'.

[28] The DFI is used to collect data on pricing structure and customer numbers directly from energy suppliers at the tariff level, and captures around 99% of domestic energy consumers in the UK. More information is available at: https://www.gov.uk/government/collections/domestic-energy-prices

8.2 Uncertainty in fuel poverty inputs

The starting point for this analysis is to establish, for each component of the input data, a frequency distribution (error distribution) representing the range of possible values which the input variables can take and the likelihood of each of these values. For many of the inputs there is little or no data on which to base these distributions, and it is inevitable that arbitrary distributions are chosen based on expert knowledge of the raw input data and data collection procedure, and the workings of the calculation itself. This is an important consideration when interpreting the results of this analysis, as discussed below. A cautious approach has been taken in this analysis, with conservative assumptions in the context of fuel poverty made throughout.

8.2.1 Uncertainty in incomes

The EHS collect information on the following three forms of main incomes sources:

- income from employment;
- income from state benefits; and
- income from savings

The data collected on each of these aspects of income has an accompanying level of uncertainty. This may result from incorrect reporting of income by the respondent (for example, they may not be fully aware of the accurate income levels of other people in the household, and so report incorrect information) or from any structural imprecision of the interview when collecting data (for example, if income data is collected in banded amounts – recorded this way to maximise response rates).

Errors in income are typically made up of a random error component and a reporting bias. Random errors are distributed around the reported value, whereas the reporting bias tends to act towards a lower or higher value than that reported. This analysis considers the effect of random uncertainty; specific reporting biases are not included as they are inherent in most surveys on income, and not specific to fuel poverty modelling.

To allow us to incorporate income uncertainty, a *coefficient of variation*[29] for each element of income is used to construct error distributions for each household, and these distributions form the sample used in the Monte Carlo method. The principal source of data for this analysis is based on an examination of uncertainty around incomes from the Family Expenditure Survey (FES), which compares reported income from the survey to data from Administrative Records (AR) between 1985 and 1992[30].

In the uncertainty analysis of fuel poverty, we have applied appropriate coefficients of variation derived from the FES, to each different aspect of reported income (shown in Table 8.1). Here for example, the error distribution of savings income is defined using a standard deviation which has a value of 15.9% of the reported savings income for each case.

[29] The coefficient of variation shows the extent of variability relation to the mean.
[30] "How reliable is the Family Expenditure Survey? Trends in Incomes and Expenditure over Time " eds. Banks & Preston. Institute for Fiscal Studies, 1998.

Table 8.1: Coefficients of variations for different aspects of income

Aspect of income	Coefficient of variation (%)
Income from savings	15.9
Income from employment	1.6
Income from housing benefit	8.7
Income from all other benefits	1.9
Income from other sources (including occupational pensions)	6.8

8.2.2 Uncertainty in fuel prices

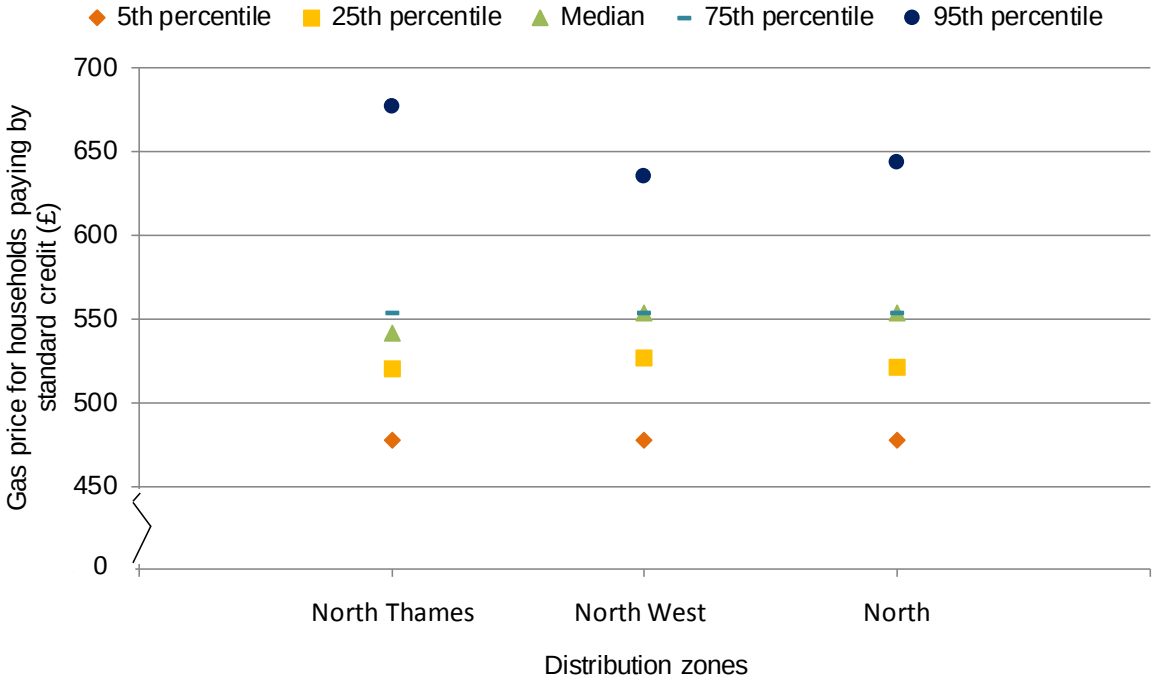
The fuel prices within the fuel poverty calculations come from two main sources:

- DECC quarterly energy prices (for metered fuels)
- Consumer price index data (for non-metered fuels)

The gas and electricity prices are applied within the fuel poverty calculation using a mean fuel price for each English region and method of payment. This is a simplification of the real situation where actual fuel prices vary by both supplier and tariff within each particular region. This introduces a further amount of uncertainty.

To investigate the effect of this uncertainty we are able to use supplementary data on the spread of fuel prices paid by households across the country. This additional information is based on the DECC Domestic Fuels Inquiry, and provides details on the shape of the fuel price distribution for all regions and payment methods for gas and electricity – this is used to approximate a simple error distributions on fuel prices. The chart below provides an example of average bills for households using standard credit to pay for their gas consumption across three of 12 Local Distribution Zones. Here for example, 90% of households in North Thames may pay anything between £477 and £677 for their gas consumption, and this distribution is used in the Monte Carlo analysis.

Chart 8.1 Example of gas prices paid through standard credit



For non-metered fuels, the spread of fuel prices is published as part of the Consumer Prices Index, and used for this analysis to produce the error distributions.

8.2.3 Uncertainty in fuel consumption and inter-surveyor variability

The nature of the EHS is such that there will always be an element of variability between surveyors. Variability is introduced by some of the judgements required in the course of the physical survey, and by human error in the measurement of the various aspects of the dwelling or identification of systems.

Levels of inter-surveyor variability in the EHS are closely monitored to allow better interpretation of the data, and feedback into subsequent surveys. This currently takes the form of a surveyor call-back survey. In this survey properties are initially inspected as normal by one surveyor. Comparing the data for the two different surveys allows us to estimate levels of inter-surveyor variability.

The results of the call-back survey are used to estimate the uncertainty in fuel costs. Fuel costs are considered (as opposed to fuel consumption directly) as this takes into account the possibility of surveyors mis-identifying the fuel type of a system. Running both the original and the call-back surveys through the fuel poverty calculation procedure produces two different fuel consumptions. These consumptions can then be combined with fuel prices to give two different fuel costs based on the different surveys. These fuel costs can then be compared. The results of this analysis are shown in Table 8.2 below where percentage differences have been used to construct a distribution of fuel cost variation which occurs as a result of inter-surveyor variability. The table here shows the in 34% of households, the follow-up fuel costs were within $\pm$5% of the original costs (41% of households had follow-up fuel costs between 5 and 15% etc.).

Table 8.2: Percentage difference in fuel costs between the two surveys

Percentage difference in fuel costs	Percentage of sample with this difference (to nearest whole %)
< 5%	34%
5% - 15%	41%
15% - 25%	14%
25% - 35%	7%
> 35%	4%

8.2.4 The adjusted LIHC calculation

The adjusted LIHC calculation is now performed by combining the adjusted fuel costs with the adjusted incomes. The number of fuel poor households with low incomes and high fuel costs are estimated with each run of the Monte Carlo model.

8.2.5 Sampling error

The final uncertainty introduced is the sampling error, which results from the use of a sample of the population rather than a census.

The EHS makes use of a sample of households, drawn by a random process from the whole population of households in the country. If the sample is truly

representative of the total population then conclusions drawn from the sample may be attributed to the full population, to provide statistics at a national level. There is always the chance that any sample is not exactly representative, and this is more likely when the sample is small or has a complicated structure. The uncertainty introduced into the national estimate by the possibility of the sample not being representative is described by the standard error. This is calculated using the equation below.

The standard error is related to the sample size and the number of fuel poor households relative to the population size. In addition, account is taken of the effect of the complex sampling frame and non-response to the survey at this point in the model by applying a 'design effect factor' of 1.2 (as shown in equation below).

$$Standard\ error = 1.2 \times \sqrt{\frac{no.\,fuel\ poor \times (total\ households - no.\,fuel\ poor)}{total\ number\ of\ cases}}$$

The magnitude of the standard error applicable to the headline number of fuel poor households (i.e. standard error for fuel poor households / total number of fuel poor households) is also used to provide a standard error to apply to the fuel poverty gap estimates.

As shown in the above equation, the standard error is dependent on the overall survey sample size. As a piece of additional analysis of the effect of sampling, the impact of reducing the EHS combined year sample size from ~16,000 households to ~12,000 households (as occurred between 2010 and 2012) has also been examined. This found that reducing the sample size increased the uncertainty around fuel poverty estimates by widening the 95% confidence intervals given below by 50,000 more households.

8.3 Results of uncertainty

The distribution of possible values when incorporating the various uncertainties mentioned above is shown in Chart 8.2 for the number of households in fuel poverty, and in Chart 8.3 for the resulting aggregate fuel poverty gap.

The mean value for the level of fuel poverty is approximately 2.43 million households (with a 95% confidence interval between 2.26 and 2.59 million) – an increase of around 150,000 households on the official measured estimate of 2.28 million. The aggregate fuel poverty gap also shows an increase to the official estimate of £1.01 billion, with a mean estimated value of £1.18 billion (95% confidence interval of £1.09 billion and £1.27 billion).

This analysis suggests that the addition of uncertainty is likely to increase the levels of fuel poverty observed. We can interpret this in the context of the distribution of households across the LIHC metric – particularly in terms of how many households can be placed into the LIHC quadrant by the addition of uncertainty, compared to how many can be removed from this quadrant. As just over 10% of households are

in fuel poverty, there are more households outside the LIHC quadrant than inside and in particular more households outside the LIHC quadrant close to the income and fuel costs thresholds (in the HIHC and LILC quadrants).Therefore the application of uncertainty is able to move more households into fuel poverty than out of it (i.e. of 10 households, one would be in fuel poverty and nine not fuel poor – so it is more likely to place a number of the nine households into fuel poverty than remove the one household out of fuel poverty). This has the net effect of increasing the average number of fuel poor households, resulting in a slightly higher distribution of possible values for the number that are fuel poor, and so consequently the aggregate gap, after the addition of uncertainty.

These results need to be interpreted with caution. Any analysis of this kind is ultimately dependent on the input distributions used within the modelling, and the majority of the input distributions used are in themselves best estimates of uncertainty in each factor. Further to this, the analysis has been designed with a cautious approach, with conservative assumptions made throughout. As a result, these figures should be treated as indicative of the effect of uncertainty upon the national estimates of fuel poverty, rather than strictly quantitative.

Chart 8.2: Distribution of the possible number of households in fuel poverty after accounting for uncertainty

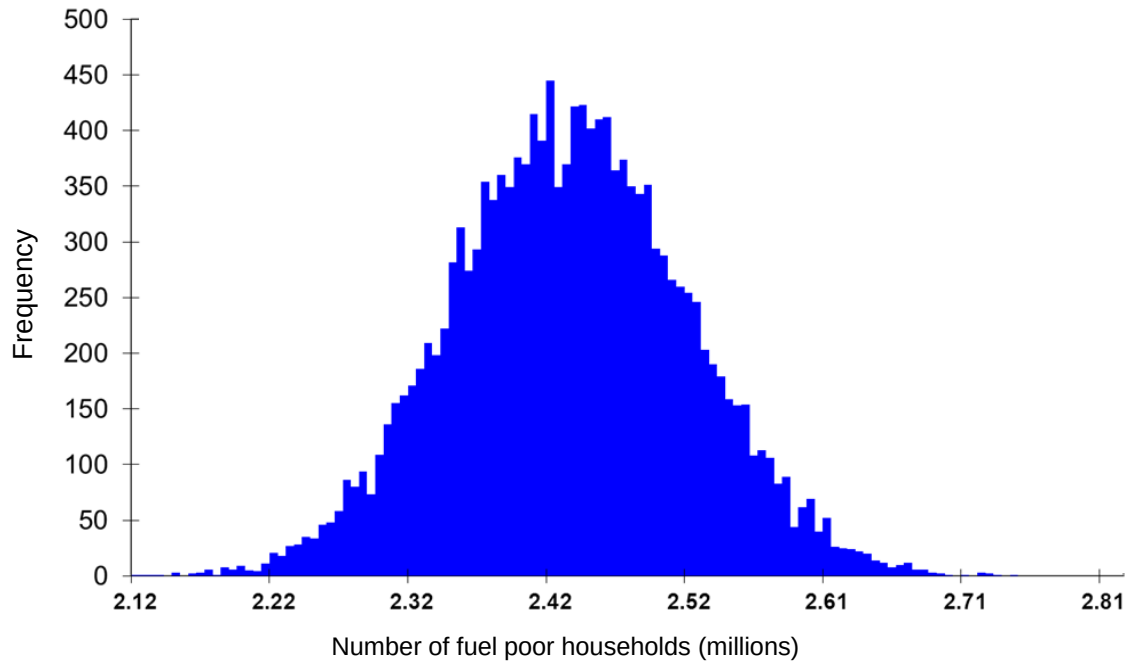
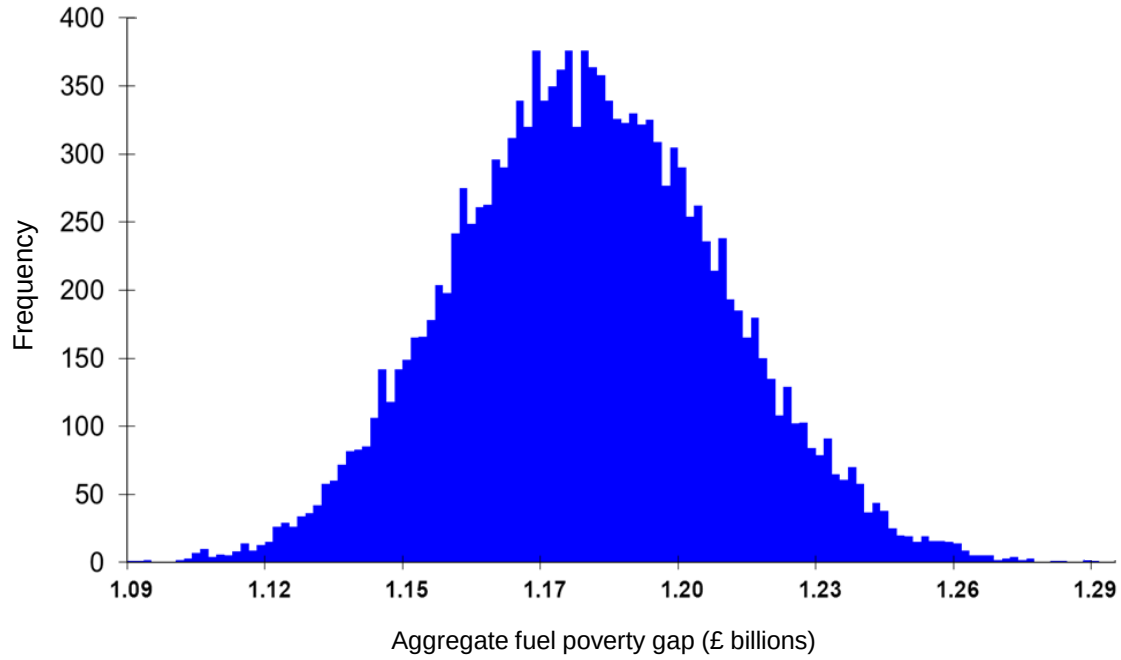


Chart 8.3: Distribution of the aggregate fuel poverty gap after accounting for uncertainty



Chapter 9: Data relating to drivers of fuel poverty

This chapter considers other sources of relevant data that are associated with the main drivers of fuel poverty. This includes comparing actual expenditure on fuel with the modelled expenditure used in the measurement of fuel poverty, as well as looking at the trend in uptake of insulation levels in Great Britain.

A full set of supplementary indicators is available at the following link (under Additional Indicators):

https://www.gov.uk/government/collections/fuel-poverty-statistics

9.1 Expenditure on fuel

The fuel poverty methodology models the amount of energy each household needs to consume to achieve an adequate standard of warmth[31], and, following on from this, the amount that each household would need to spend to achieve this level of warmth. It is also useful to compare this level of modelled spend with the *actual* spend on energy by different types of households.

The Living Costs and Food Survey (LCFS) is an annual survey of around 5,500 households in the UK. Information about semi-regular purchases (including utilities) is obtained from a household interview. Table 9.1 below compares the average annual actual expenditure on fuel in 2012 (excluding petrol and diesel used for transport purposes), from the LCFS [32] with the average annual modelled expenditure on fuel in 2012, taken from the fuel poverty dataset. In other words, we compare what households in each income decile group need to spend with what they actually spend.

It should be noted that the LCSF data covers the UK, while the modelled expenditure data are for England.

[31] See the Fuel Poverty Methodology Handbook for more information, available at the following link: https://www.gov.uk/government/collections/fuel-poverty-statistics

[32] In the LCFS, data is published as average weekly spend, therefore these were multiplied by 52 in order to calculate the yearly averages shown in Table 9.1.

Table 9.1 – Actual and modelled household annual spend on fuel, 2012[33]

Income decile group	Average actual annual expenditure on fuel (£)	Modelled average annual spend on fuel (£)	Percentage difference
1st (lowest)	770	1,146	33%
2nd	931	1,138	18%
3rd	1,009	1,222	17%
4th	1,066	1,263	16%
5th	1,196	1,321	9%
6th	1,243	1,392	11%
7th	1,274	1,453	12%
8th	1,394	1,544	10%
9th	1,425	1,533	7%
10th (highest)	1,747	1,806	3%
All households	1,206	1,382	13%

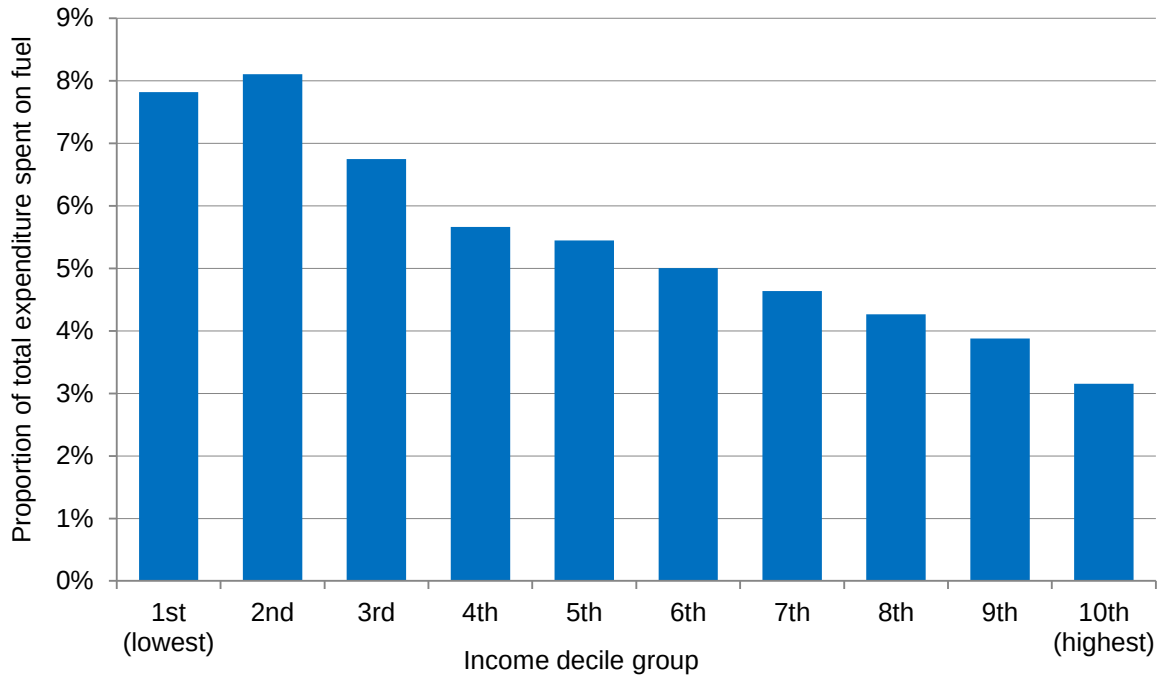
Households with higher incomes tend to have a higher actual spend on fuel than those with low incomes. As Table 9.1 shows, households in the highest income decile group spend, on average, more than twice as much as households in the lowest group. This is likely to reflect both the greater affluence of higher income households, such that they can afford to heat their homes properly and also the likelihood these households live in larger dwellings, which cost relatively more to heat and light than smaller dwellings. Modelled spend is higher than actual spend for all income decile groups, indicating that the heating regimes applied in the fuel poverty model are likely to be aspirational rather than a reflection of actual use.

The key result from Table 9.1 is that the difference between modelled and actual spend is greatest amongst lower income households. For example, in the lowest income decile group, households spent around two thirds (on average) of what they would need to in order to maintain an adequate standard of warmth. However, in the highest income group, households' actual spend is almost the same as their modelled spend. It is difficult to separate out how much of this difference in energy spend is due to low income households under heating their homes due to financial constraints and how much is due to the limitations in the modelling. Further work is currently being undertaken in this area looking into the temperatures households actually heat their homes to, following the recent availability of detailed temperature data from the Energy Follow Up Survey (EFUS) - see Section 1.5.2 for further details.

[33] The LCFS data used in this table is made available in the Office for National Statistics publication, Family Spending 2013, at the following link (see table A6)
http://www.ons.gov.uk/ons/rel/family-spending/family-spending/2013-edition/index.html

Although low income households spend the lowest absolute amount on fuel, it accounts for a greater proportion of their overall expenditure than amongst high income households. Around eight per cent of total expenditure in the lowest income decile group is on domestic fuels, compared to just three per cent in the highest income decile group (see Chart 9.1).

Chart 9.1 – Proportion of total expenditure spent on fuel, by gross income decile group, 2012

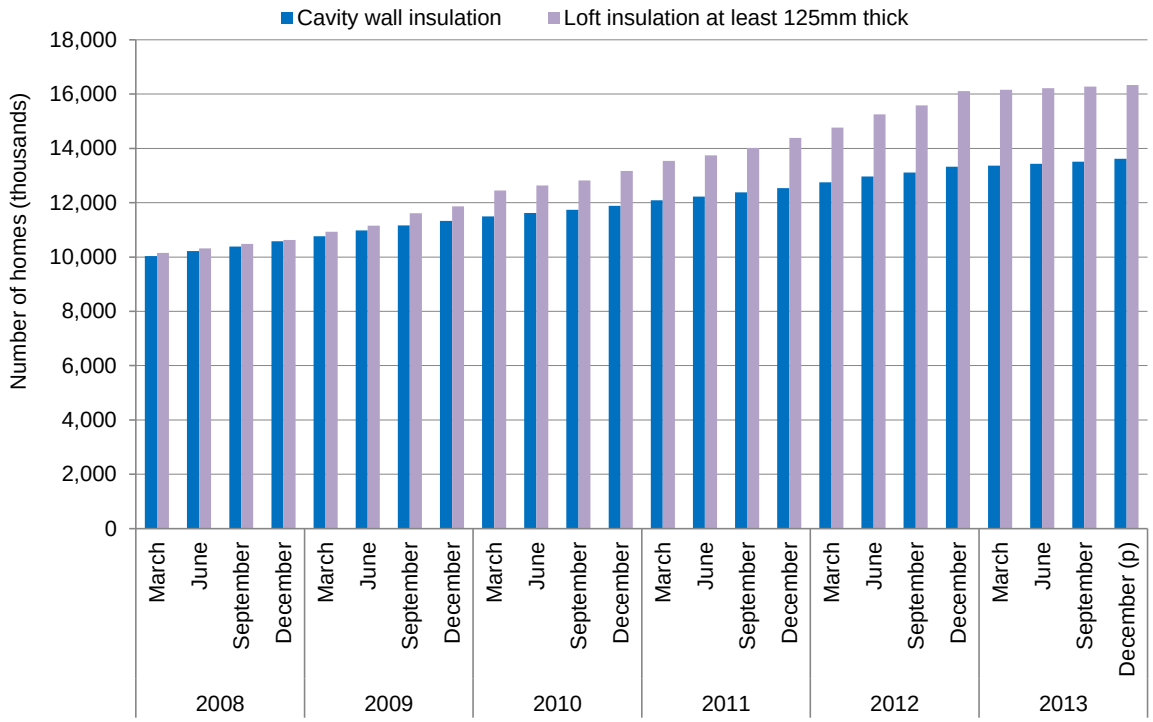


Source: Living Costs and Food Survey, ONS

9.2 Energy efficiency measures

One way to remove households from fuel poverty is by improving the energy efficiency of the housing stock, particularly for dwellings lived in by the fuel poor. As discussed in Chapter 2, the average SAP rating of all households has increased between 2003 and 2012. DECC publishes estimates of home insulation levels in Great Britain on a quarterly basis. Chart 9.2 below shows the number of homes with cavity wall insulation and loft insulation (where loft insulation levels are greater than 125mm in thickness).

Chart 9.2 – Number of homes with cavity wall insulation and loft insulation in Great Britain, March 2008 to December 2013[34]



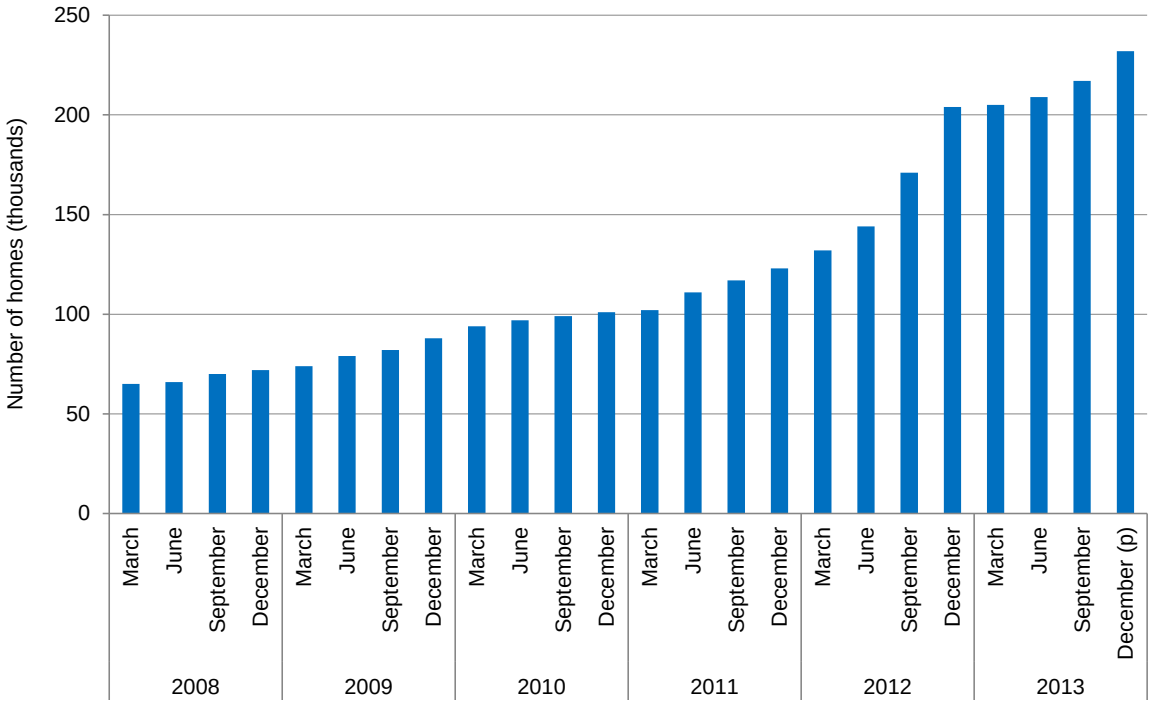
At the end of December 2013, there were around 27 million homes in total in Great Britain, of which 23.8 million have lofts. Between March 2008 and December 2013, the number of homes with loft insulation with thickness greater than 125mm increased from 10.2 million to 16.3 million, a rise of 61 per cent. Therefore, by end December 2013, around 69 per cent of homes with lofts had loft insulation thicker than 125mm.

Since March 2008, the number of homes with cavity wall insulation increased from around 10.0 million to around 13.6 million in December 2013, a rise of 36 per cent. In December 2013 there were around 19.3 million homes with cavity walls, and therefore around 71 per cent of homes with wall cavities had cavity wall insulation.

Chart 9.3 below shows the number of homes with solid wall insulation.

[34] The figure for December 2013 is provisional and figures shown apply to the end of each month. Data available from Green Deal, Energy Company Obligation (ECO) and Insulation Levels in Great Britain, Quarterly reports:
https://www.gov.uk/government/collections/green-deal-and-energy-company-obligation-eco-statistics

Chart 9.3 – Number of homes with solid wall insulation in Great Britain, March 2008 to December 2013[35]



Between March 2008 and December 2013, the number of homes with solid wall insulation has increased from 65,000 to 232,000, more than doubling the level of uptake. In December 2013, there were 8.0 million homes with solid walls, of which around 2.9 per cent had solid wall insulation[36].

More information on these energy efficiency statistics and the methodology used to derive them are available on the DECC website at:

https://www.gov.uk/government/statistical-data-sets/estimates-of-home-insulation-levels-in-great-britain

[35] The figure for December 2013 is provisional and figures shown apply to the end of each month. Data available from Green Deal, Energy Company Obligation (ECO) and Insulation Levels in Great Britain, Quarterly reports: https://www.gov.uk/government/collections/green-deal-and-energy-company-obligation-eco-statistics

[36] Solid wall insulation is defined here as internal or external wall insulation installed through Government programmes such as Carbon Emissions Reduction Target (CERT) or Energy Efficiency Commitments (EEC1, EEC2). It does not include households paying for their own solid wall insulation. In addition, in April 2008, about 900,000 homes are known to have other forms of non-cavity wall insulation that fall outside this definition of solid wall insulation.

9.3 Household income distribution

The Department of Work and Pensions (DWP) 'Households Below Average Income' (HBAI) publication will be released in July 2014, and will provide statistics on income up to the end of the financial year 2012/13.

The HBAI publication provides a useful source of information to understand how incomes change over time for various groups at the lower end of the income spectrum, and is helpful to contextualise the effect changes in income have on fuel poverty levels over time. Many of the statistics in the HBAI are produced on an equivalised income basis, using a similar methodology for treating incomes as the fuel poverty statistics. Through equivalising incomes to adjust for household size, the higher income needs of larger households to obtain a comparable standard of living as smaller households, is reflected.

More information is available on these statistics on DWP's website at:
https://www.gov.uk/government/collections/households-below-average-income-hbai--2

Annex A: Related data

Alongside this headline statistical report on the latest 2012 fuel poverty data, the following detailed analyses are available at:
https://www.gov.uk/government/collections/fuel-poverty-statistics

Detailed tables

These tables, which are available to download as an excel spreadsheet, present the 2012 figures on fuel poverty by a range of household and dwelling characteristics under the LIHC indicator.

Long term trends

These tables, which are available to download as an excel spreadsheet, present trends in fuel poverty between 2003 and 2012 under the LIHC indicator. The tables are a compilation of the key annual detailed tables (see above) from the past few years.

Additional Indicators

This document presents a range of indicators linked to fuel poverty, which focus on incomes, fuel costs and housing. These can be used alongside the findings in the main report to provide a greater depth to the understanding in the changes underlying fuel poverty. The suite of indicators included in this document has been decided on through discussions with the Fuel Poverty Methodology Group, and is periodically reviewed by the group.

Fuel Poverty Methodology Handbook

This is a comprehensive methodology document detailing technical information on the modelling of fuel poverty, as well as more general information on fuel poverty data.

Sub-regional fuel poverty statistics

The 2012 sub-regional fuel poverty data are available at the Lower Super Output Area (LSOA) level, local authority level, and parliamentary constituency level for England. An excel spreadsheet containing this data, is available at:
https://www.gov.uk/government/collections/fuel-poverty-sub-regional-statistics

Fuel poverty dataset

The fuel poverty dataset, including supplementary data and full EHS datasets, will be made available to download later this summer via the UK Data Archive – please note, users are required to register with UKDA to access the data:
http://data-archive.ac.uk/

The monitoring indicators described above, contain data from a number of sources which with the fuel poverty data. These include:

English Housing Survey (EHS)

As described in Chapter 1, this is the main source of dwelling and household data used to compile the fuel poverty statistics. The EHS data is available to download from the UKDA (see above). For more information on the EHS, see:
https://www.gov.uk/government/collections/english-housing-survey

Quarterly Energy Prices (QEP)

This quarterly DECC publication reports on average annual domestic gas and electricity bills for different regions of the UK and for different payment methods (for example, standard credit, direct debit and prepayment meters). The data from these publications are the main source of price data used in producing modelled fuel bills in the fuel poverty data. QEP is available at:
https://www.gov.uk/government/collections/quarterly-energy-prices

Households Below Average Income (HBAI)

This is published by the Department for Work and Pensions (DWP) and provides information on low income households. More information is available at:
https://www.gov.uk/government/collections/households-below-average-income-hbai--2

Living Costs and Food Survey (LCF)

Previously known as the Expenditure and Food Survey. This is a useful source of information on actual (rather than modelled) spending on a range of households goods and services. The LCFS is compiled by the Office for National Statistics (ONS), and feeds into their Family Spending publications. More information is available at:
http://www.ons.gov.uk/ons/about-ons/get-involved/taking-part-in-a-survey/information-for-households/a-to-z-of-household-and-individual-surveys/living-costs-and-food-survey/index.html

Energy Consumption in the UK (ECUK)

DECC publishes various data relating to the energy consumption and energy efficiency levels, split by the type of fuel used and consumer type. These are available via excel spreadsheets published at:
https://www.gov.uk/government/collections/energy-consumption-in-the-uk

Identifying local areas with higher than expected domestic gas use

Energy Trends March 2012: Analysis aiming to produce a statistical model predicting gas consumption at a local area level using published data:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65909/4779-energy-trends-mar12.pdf

Energy Follow-Up Survey (EFUS)

The EFUS collects new data detailed data on domestic energy use. Extensive analysis on this data is available via a series of reports published at:
https://www.gov.uk/government/publications/energy-follow-up-survey-efus-2011

The data collected via this survey is also available to download at the UKDA for registered users.

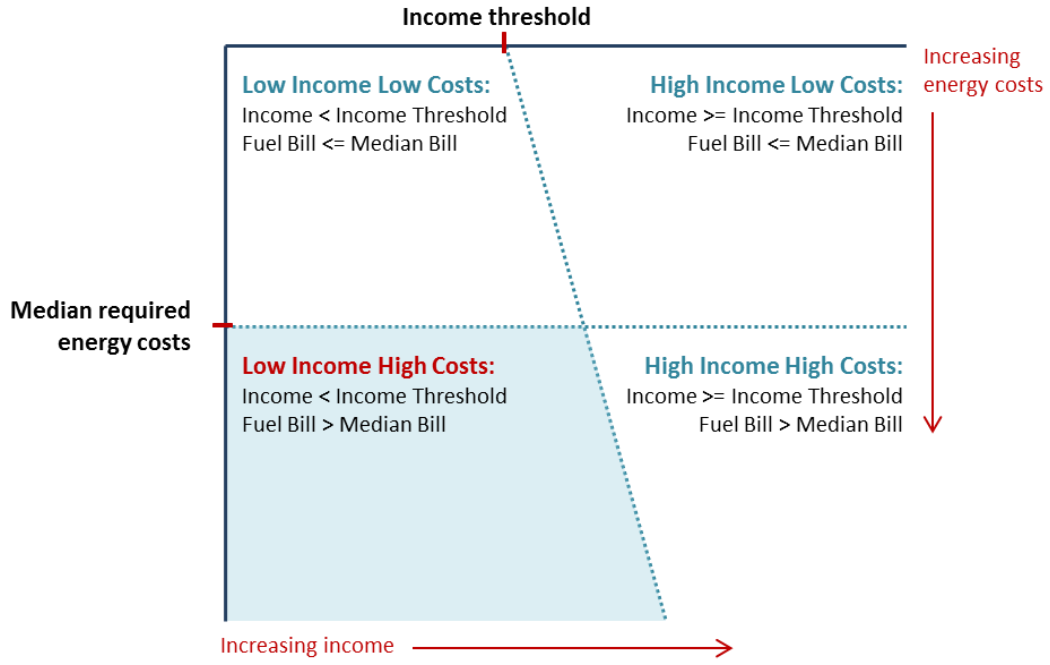
Annex B: Calculating fuel poverty under Low Income High Costs (LIHC)

This annex describes the method used to identify households living in fuel poverty under the Low Income High Costs (LIHC) indicator. Under this indicator, households are considered to be fuel poor if:

- they have required fuel costs that are above average (the national median level)
- were they to spend that amount, they would be left with a residual income below the official poverty line.

The depth of fuel poverty is defined as the amount by which the assessed energy needs of fuel poor households exceed the threshold for reasonable costs. This is referred to as the fuel poverty gap. The methodology used to calculate the fuel poverty gap for each household is described in Section B2 of this annex.
Figure B1 shows the four possible groups a household can fall into under this indicator.

Figure B1: Classifications under the low income high costs matrix



B1: Calculating the number of households in fuel poverty

The following section describes how to calculate whether a household has a ‘low income’ coupled with ‘high costs’.

Fuel costs threshold

Households with required fuel costs that are above average (the national median level) are calculated by:

1. Taking the required fuel costs for the household from the fuel poverty dataset (the "fuelexpn" variable)
2. Applying the corresponding equivalisation factor for each household. These are shown in Table A1 below.

Table B1: Equivalisation factors for fuel bills under the Low Income High Costs indicator

Number of people in the household	Equivalisation factor
One	0.82
Two	1.00
Three	1.07
Four	1.21
Five or more	1.32

3. Dividing the required fuel costs by the equivalisation factor to get the equivalised required fuel costs for that particular household. Equivalising effectively increases the bills of single person households, and decreases the bills of multiple person households, with the aim of making them comparable.
4. To calculate the fuel cost threshold, simply take the weighted median of all of these equivalised required fuel costs.

In other words, half of all households should have "high costs" i.e. above the threshold, and half should have "low costs" i.e. below the threshold.

The threshold for fuel costs is the same for all households.

Fuel cost equivalisation Factors

The fuel costs equivalisation factors are not intended to be reviewed on an annual basis. We may, however, consider revisiting them periodically in the future to ensure they do not become dated.

The fuel costs equivalisation factors are based on three years of required fuel cost data from the English Housing Survey (using the 2008, 2009 and 2010 Fuel Poverty datasets). The combined 3 year weights (from the EHS"3yr_weight890" file) were used to arrive at the above set of equivalisation factors.

Median fuel costs for each of the above five household size group from this dataset[1] are calculated. These medians are then indexed to the two-person households.
Note, adults and children are treated equally in the equivalisation of fuel costs - that is, a household with 2 adults and 2 children are treated the same as a household with 4 adults.

[1] Based on the "hhsizex" variable from the EHS interview file.

Fuel spend leaves the household with a residual income below the official poverty line. This is calculated by:

1. Taking the required fuel costs for the household from the fuel poverty dataset (the "fpfullinc" variable).
2. Subtracting housing costs from the income to arrive at After Housing Costs (AHC) income. Housing costs consist of:
   i) Weekly mortgage payments ("mortwkx" variable from the EHS interview file)
   ii) Weekly rent payments ("rentExS" variable from the EHS interview file). This variable also includes housing benefit. Note, the "rentExS" variable is used rather than the "rentwkx", as "rentwkx" includes the cost of any services that the household pay alongside their rent. To ensure consistency in reporting only the true housing costs, variable "rentExs" is used.
3. Divide the after housing costs income by the relevant After Housing Costs (AHC) income equivalisation factor. Equivalising effectively increases the incomes of single people, and reduces the incomes of larger households, again with the intention of making them comparable.
   The equivalisation factors for each person in the household are shown in Table B2 below.

Table B2: After Housing Costs income equivalisation factors for the Low Income High Costs indicator

Number of people in the household	After Housing Costs (AHC) income equivalisation factor
First adult in the household	0.58
Subsequent adults (includes partners and children aged 14 or over)	0.42
Children under 14	0.20

4. To calculate the income threshold for each individual household, take the following steps:
   i) Take the weighted median of all of the AHC, equivalised incomes in the dataset
   ii) Calculate 60% of this value.
   iii) Add on the equivalised required fuel costs of the particular household

The income threshold is therefore higher for households with large bills compared to those with smaller bills. In other words, households with larger bills require a greater level of income to meet this greater cost. As a result, the income threshold will appear as a diagonal line on diagrams of the measure.

The threshold for income varies by household, depending on the fuel costs of the household.

After Housing Costs (AHC) income equivalisation factors

The AHC income equivalisation factors used are consistent with that used by the DWP in their production of Households Below Average Income (HBAI) statistics. These factors were first devised by the OECD, and are used widely across Europe, including by Eurostat.

Two key elements are needed to derive an individual household's equivalisation factor: the number of occupants in the household, and their age (as the OECD scale distinguishes between under and over 14 year olds).

The number of household occupants is taken from the "hhsize" variable (from the EHS "interview file") and combined with information on the occupants age from the "DVHsize" variable (from the EHS "people" file)[1]. The difference in the number of additional adults between "hhsize" and "DVHsize" are assumed to be additional adults who live in halls of residence. These adults are removed from these calculations. The AHC income equivalisation factor therefore, excludes any household members who are living away in halls of residence, making the calculation of AHC income equivalisation factors consistent with fuel costs equivalisation factors, by counting only household members living in the residence.

A worked example of how to arrive at a households AHC income equivalisation factor is given below. Suppose a household consists of the following members:

Household member	Age	Status	AHC equivalisation factors
HRP	54 year old	Lives at home	0.58
HRP partner	52 year old	Lives at home	0.42
Additional adult	21 year old	Lives in halls of residence	0.42
Additional adult	18 year old	Lives in halls of residence	0.42
Additional adult	16 year old	Lives at home	0.42
Child	12 year old	Lives at home	0.20
		Total	**2.46**

Here the:
Hhsize = 4 (excludes the two people living in halls of residence)
DVHsize = 6 (includes the two people living in halls of residence)

The overall equivalisation factor, after accounting for the 2 people living in halls of residence, is given by:

AHC income equivalisation factor = 2.46 – (2*0.42) = 1.62

The key assumptions here are:

i) We assume the difference between the "hhsize" and "DVHsize" is due to people living away in halls of residence; and more crucially

ii) that all individuals living in halls of residence will be over 14 years old, and so have an equivalisation factor of 0.42 rather than 0.20.

[1] The "hhsize" variable only excludes people living in halls of residence from 2008 onwards, following a change from the EHCS to the EHS. Prior to that, "hhsize" was consistent with "DVHsize", and so people living in halls of residence were included in our income equivalisation method. There is therefore a small break in the time series between2007 and 2008.

Summary of income and fuel costs thresholds

Income threshold = 60% of the weighted median for AHC equivalised income, plus the equivalised fuel costs of that household

Fuel costs threshold = the weighted median for the equivalised fuel costs of all households.

Worked example: fuel poverty status (2012)

EHS case : K2060611

Family composition : lone parent (one adult, one dependent aged >14 years, one dependent aged <14 years)

Number of people : 3

Fuel costs : £1,593

Total income : £15,596

Housing costs : £96.92 mortgage repayments per week

Equivalised fuel costs = £1,593 / equivalisation factor (1.07)
= £1,489

AHC equivalised income = (income – annual housing costs)/ equivalisation factor
= (£15,596 – 52*£96.92) / (0.58+0.42+0.2)
= £10,555 / 1.2
= £8,797

Here:

Equivalised fuel bill (£1,489) > median fuel costs threshold (£1,242)
ACH equivalised income (£8,797) < income threshold (£11,824 + £1,489 = £13,313)

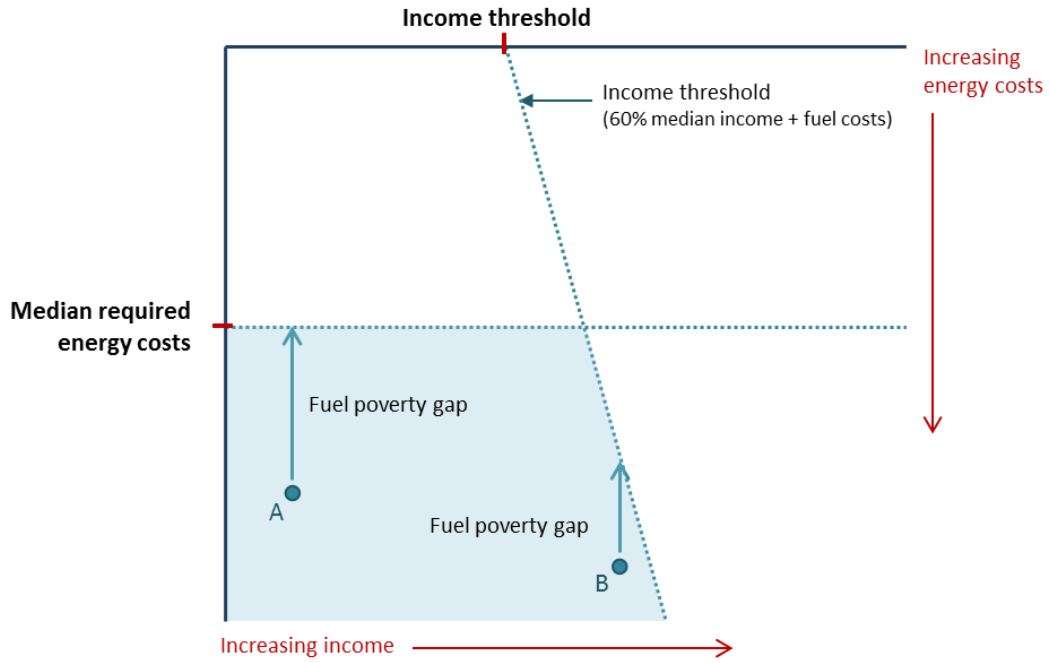
Therefore the household is considered fuel poor under the LIHC indicator

B2: Calculating the fuel poverty gap

Under the Low Income High Costs indicator of fuel poverty, the depth of fuel poverty is represented by the 'fuel poverty gap'. This is defined as the amount by which the assessed energy needs of fuel poor households exceed the threshold for reasonable costs.

Figure B2 below shows the overlap between the equivalised AHC household income and the equivalised fuel costs (shaded trapezium area) under which a household is considered to be fuel poor. The fuel poverty gap for a particular household is the difference between the household's required fuel costs and what these fuel costs will need to be for them not to be in fuel poverty. This is shown by the vertical arrows for households A and B below.

Figure B2: Fuel poverty gaps under the Low Income High Costs indicator



Calculating the fuel poverty gap

For fuel poor households, the fuel poverty gap can be generalised as:

Fuel poverty gap = $(y - y_m) - \max\{[x - (x_m + y_m)],0\}$

Where:

x = household income
x_m = 60% of median income
y = household energy costs
y_m = median energy costs

From the 2011 fuel poverty dataset:

- 60% of AHC median income = £11,824
- Median required energy costs = £1,242

These are based on the equivalised incomes and equivalised energy costs. For more information on equivalisation, and the factors used for both incomes and energy costs, please see Section B1 of this annex.

Worked example: fuel poverty gap (2011)

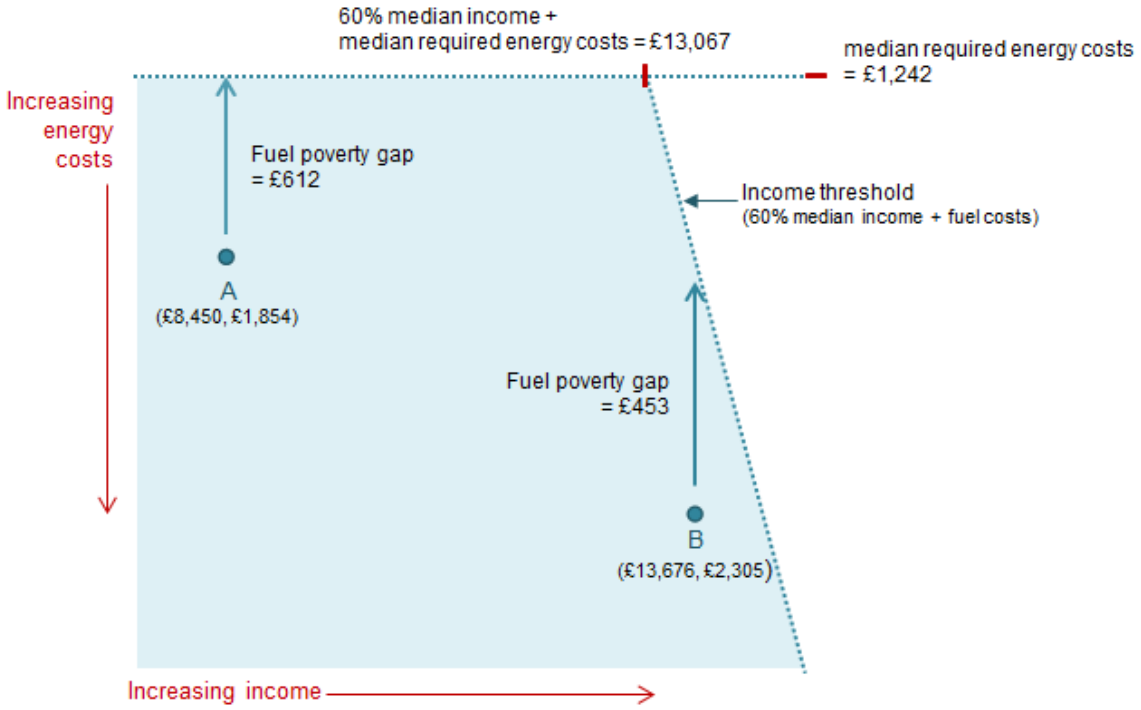
Figure B3 below illustrates the fuel poverty gap calculation for two typical fuel poor households, A and B. Here, household A has an income level below the overall threshold of £13,067 (60% median income + median energy costs); and household B has an income level above this overall threshold. The income (x) and fuel costs (y) for each household is shown in Figure B3 below as (x, y).

The fuel poverty gap for household A is calculated as follows:

$(\text{Fuel poverty gap})_A$ = Excess energy costs
= Household energy costs – median required energy costs
= £1,854 - £ 1,242 = £612

$(\text{Fuel poverty gap})_B$ = Excess energy costs – Extra income above the overall threshold
= (Household energy costs – median required energy costs) – [current income – (60% of median income +median energy costs)]
= (£2,305 - £1,242) – [£13,676 – (£11,824 + £1,242)] = £453

Figure B3: Worked example: fuel poverty gap calculation



Once the fuel poverty gap is calculated for each household, the energy cost equivalisation factors (see Table B1 in this annex) need to be applied to return the gap to an unequivalised value in pounds (£). This is done through multiplying the equivalised gap by the respective equivalisation factor for the household.

The resulting gap for each individual household is then aggregated across all fuel poor households to produce an overall aggregate fuel poverty gap. This gives a sense of the depth of fuel poverty on a national level. In addition, this aggregate gap can then be divided by the total number of fuel poor households to give an average fuel poverty gap. By examining the average fuel poverty gap for different groups of households, the severity of the problem can be compared.

Annex C: Sub-regional fuel poverty in 2012, regional maps

Figure C.1: Percentage of households in fuel poverty at LSOA level, London, 2012

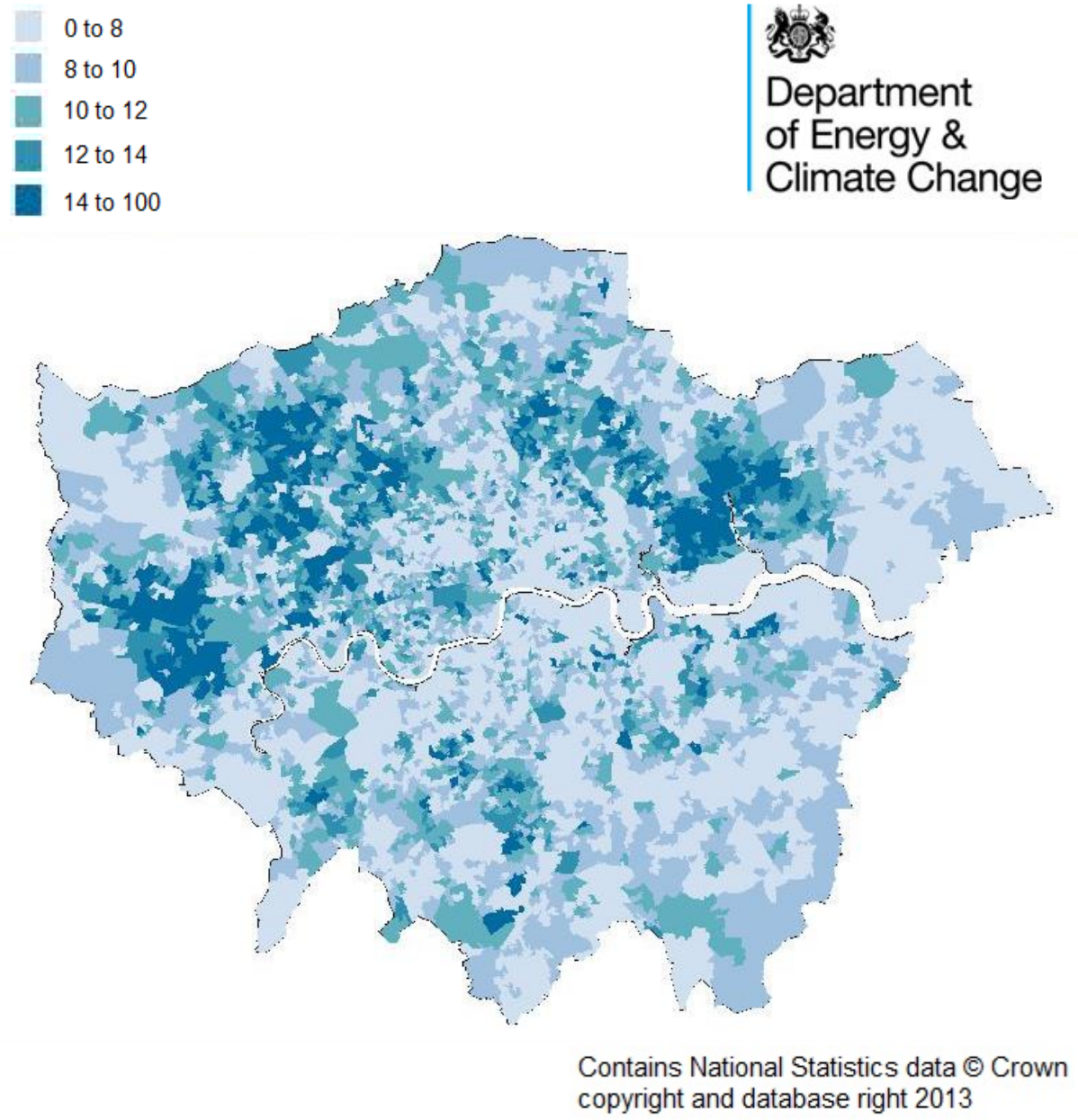


Figure C.2: Percentage of households in fuel poverty at LSOA level, South East, 2012

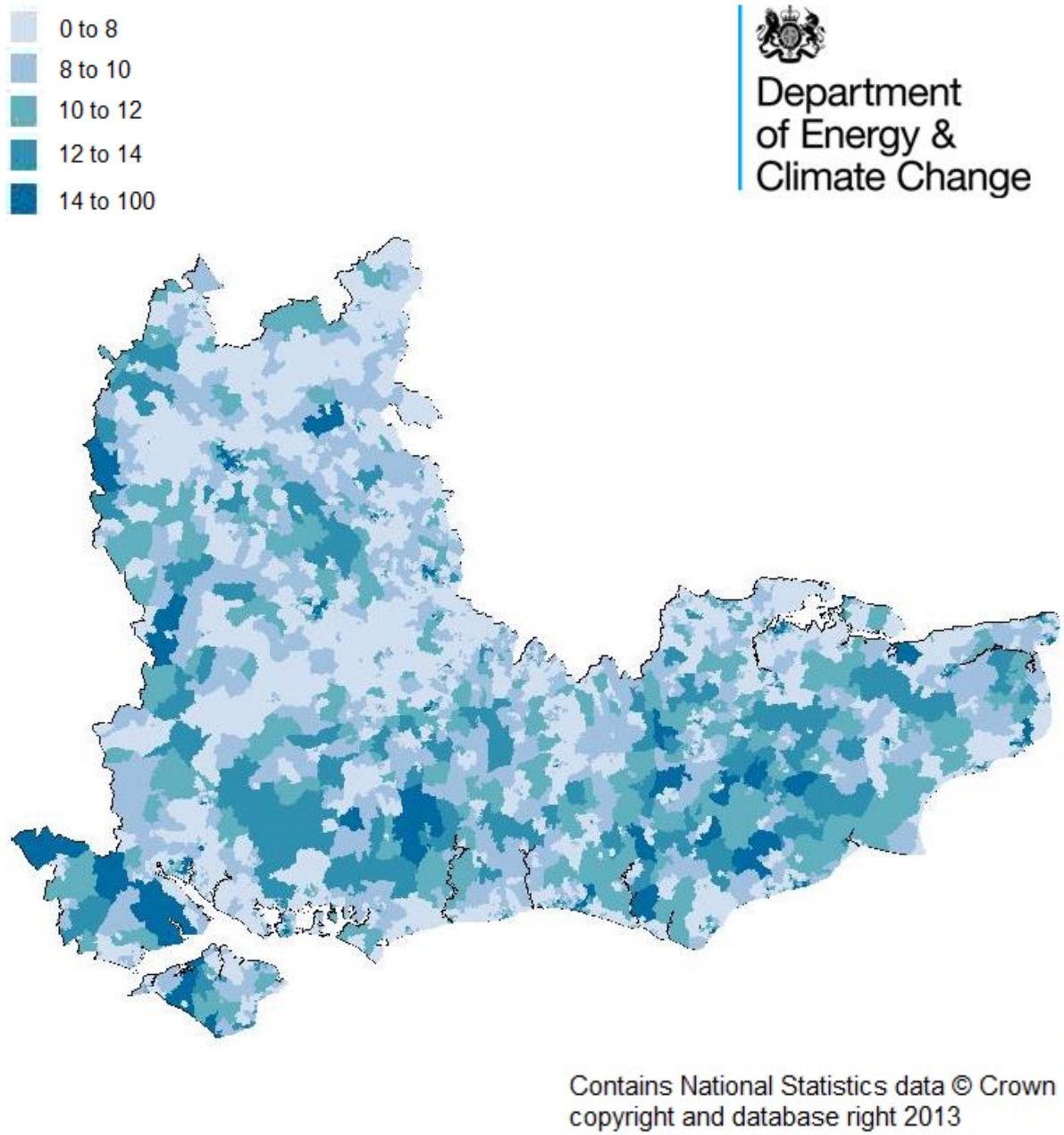


Figure C.3: Percentage of households in fuel poverty at LSOA level, South West, 2012

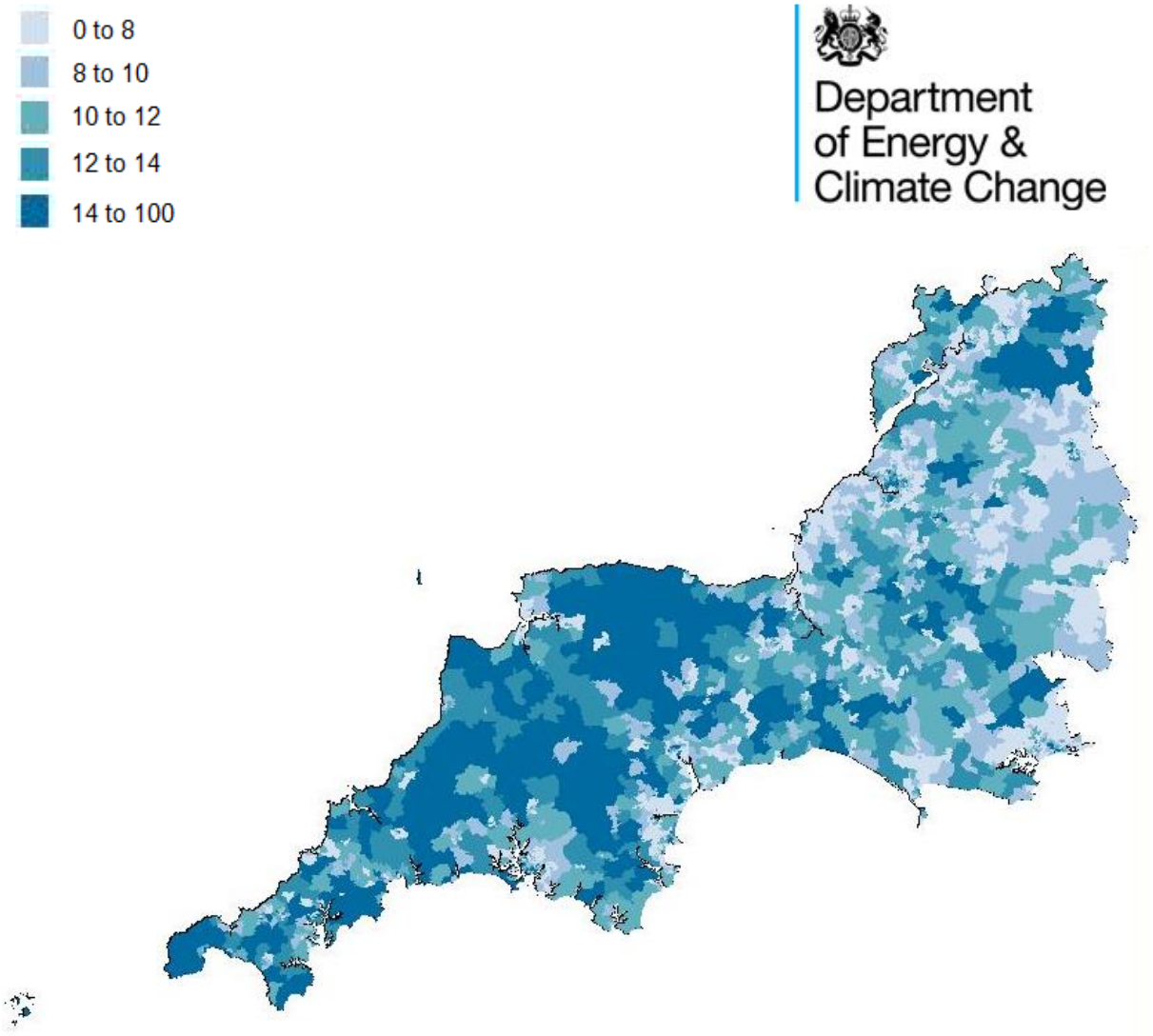


Figure C.4: Percentage of households in fuel poverty at LSOA level, East of England, 2012

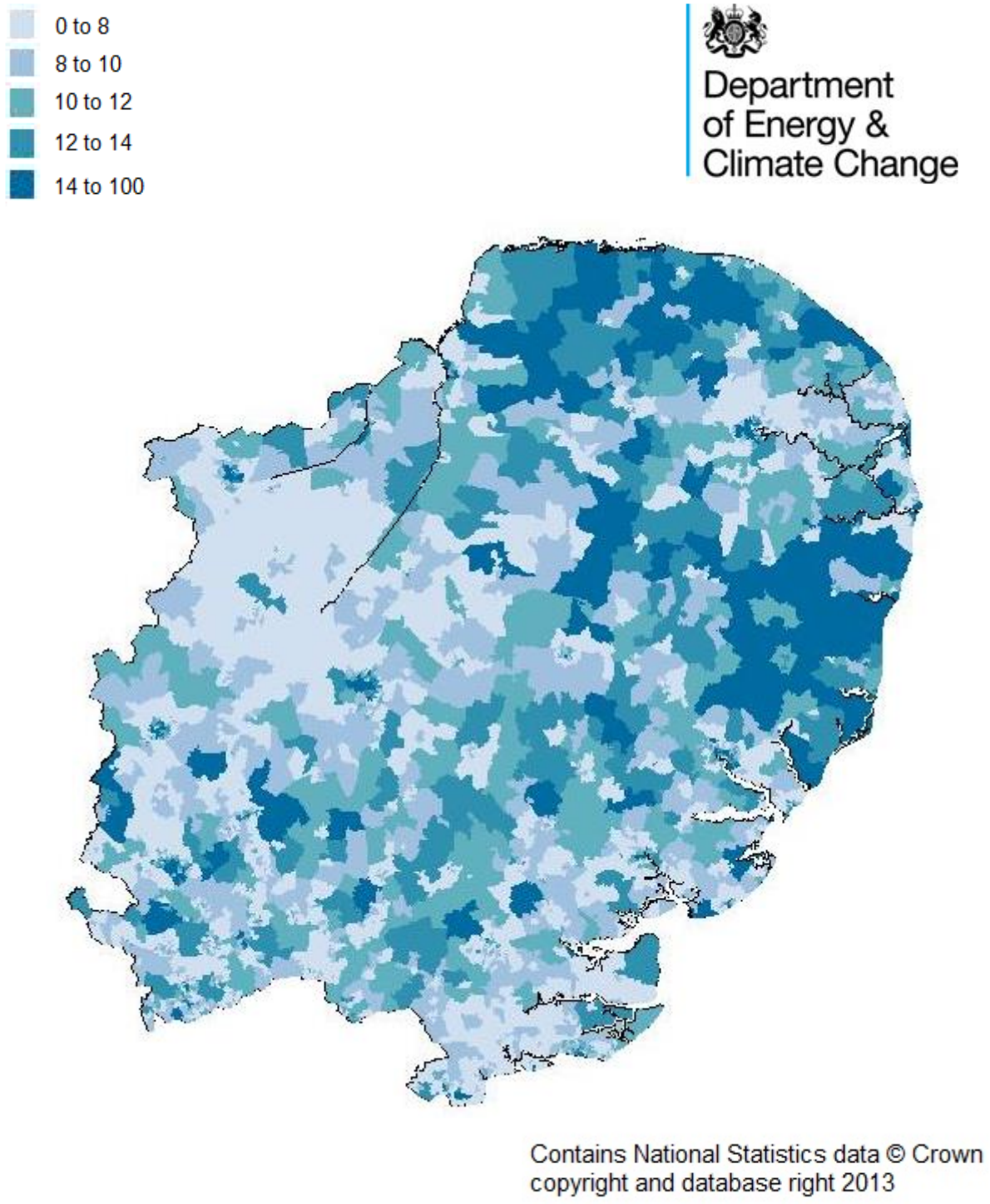


Figure C.5: Percentage of households in fuel poverty at LSOA level, East Midlands, 2012

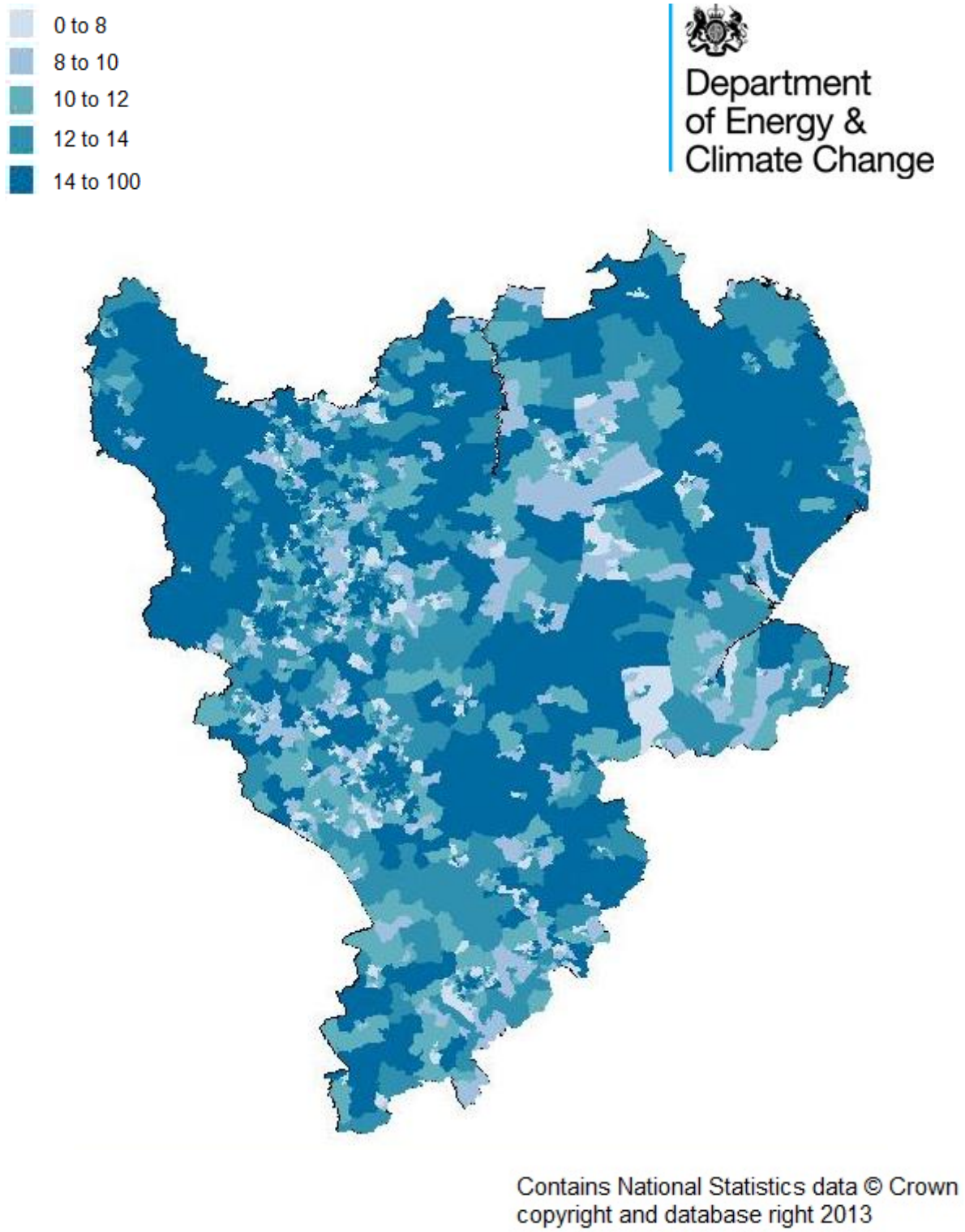


Figure C.6: Percentage of households in fuel poverty at LSOA level, West Midlands, 2012

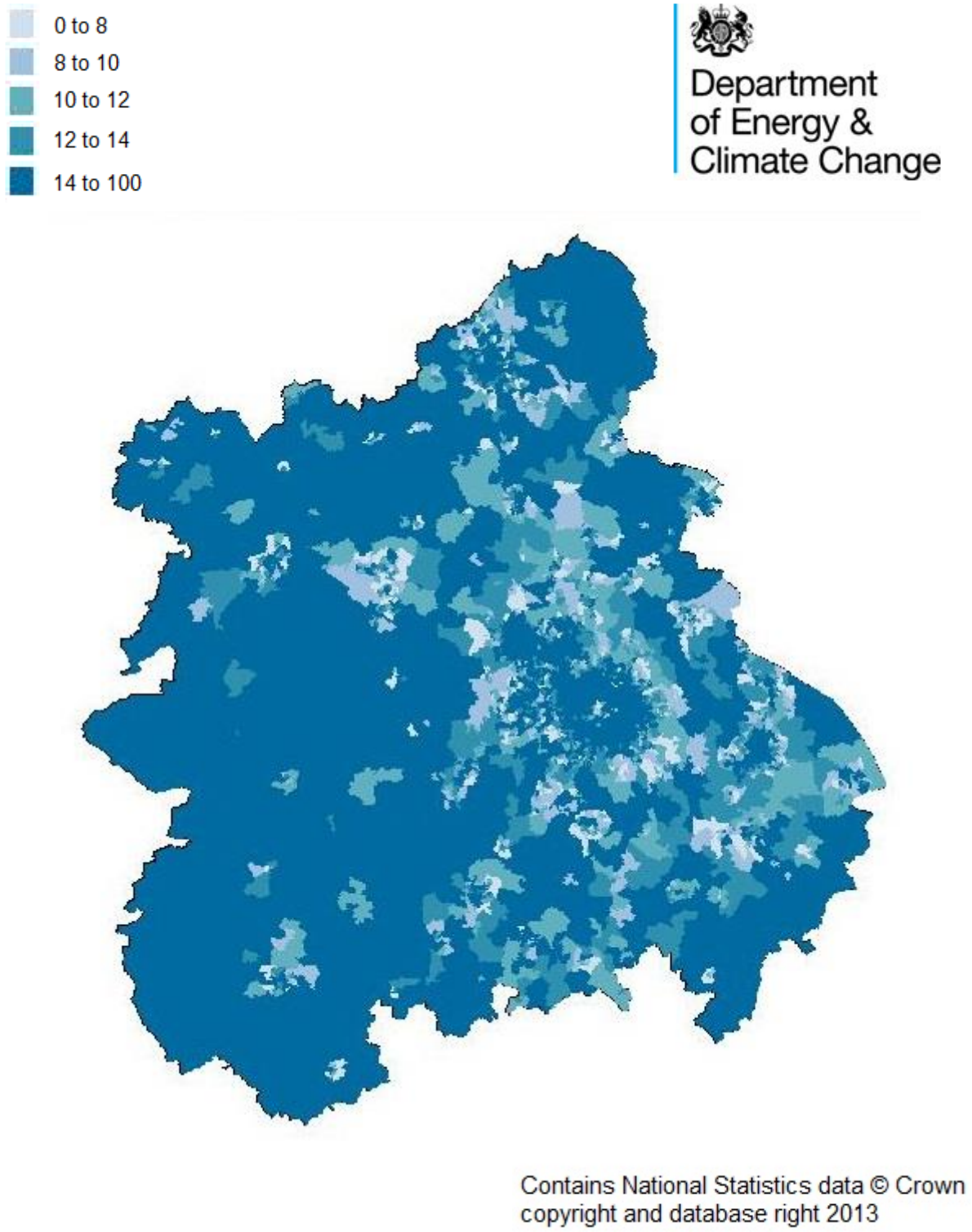


Figure C.7: Percentage of households in fuel poverty at LSOA level, Yorkshire and the Humber, 2012

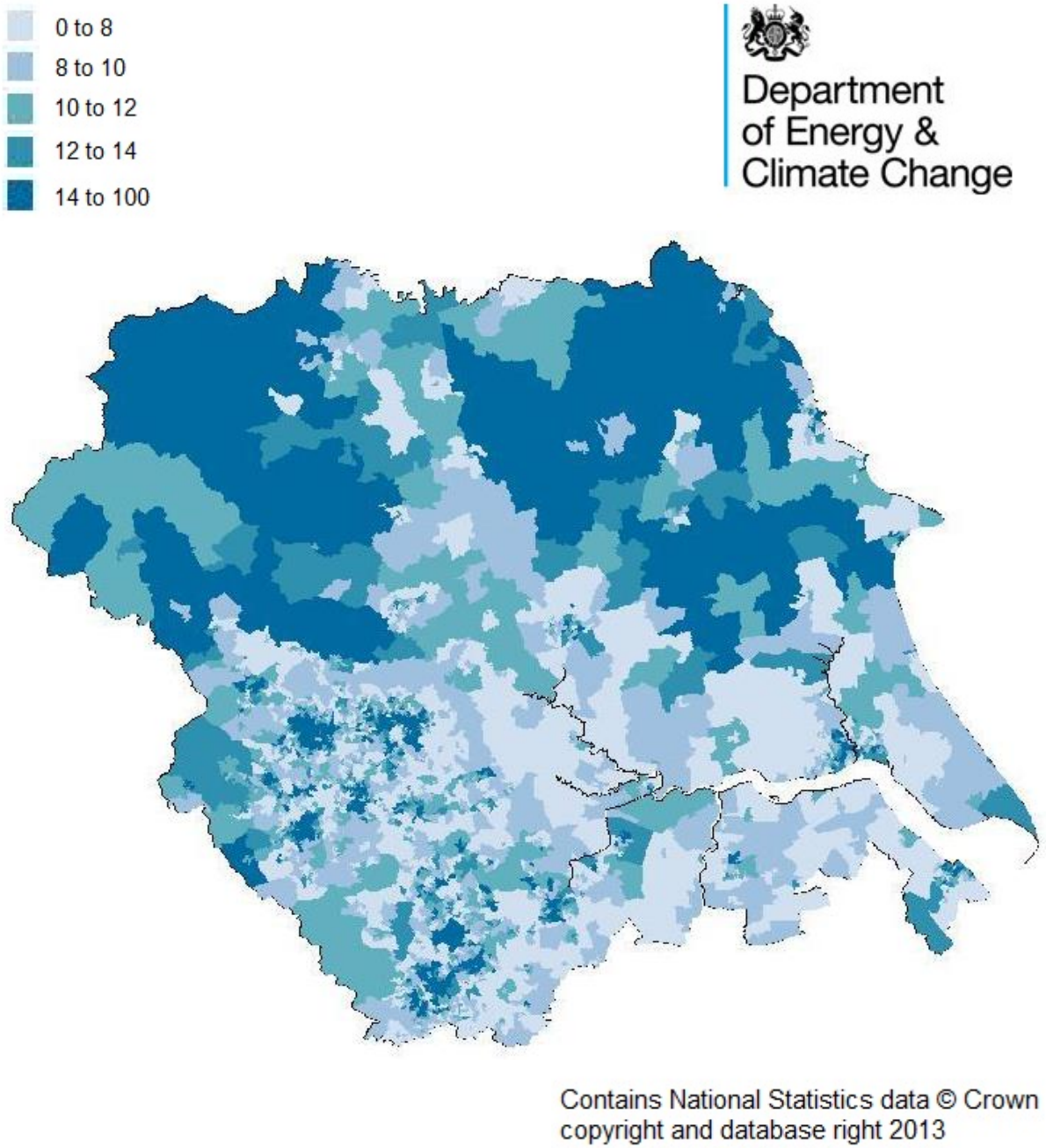


Figure C.8: Percentage of households in fuel poverty at LSOA level, North East, 2012

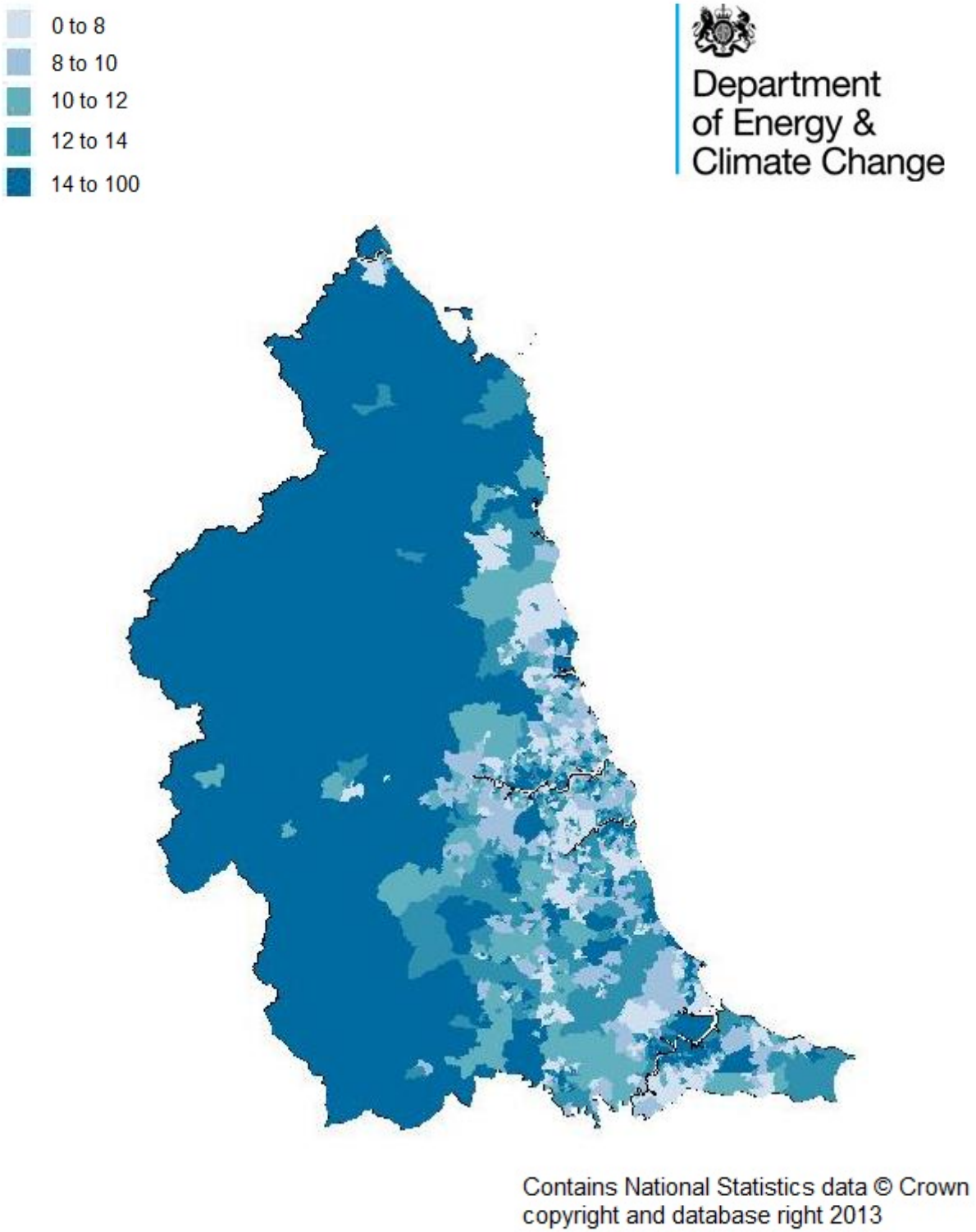
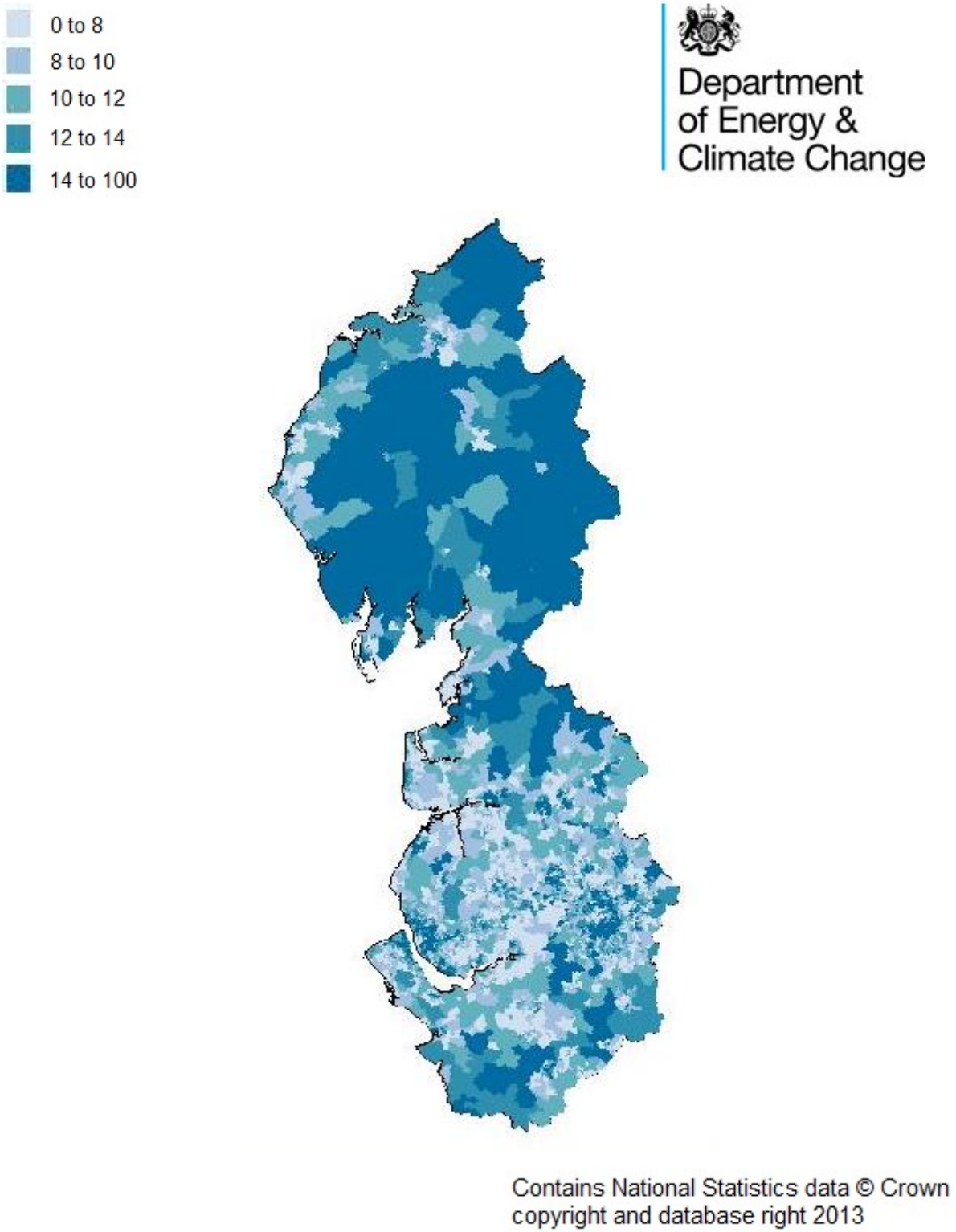


Figure C.9: Percentage of households in fuel poverty at LSOA level, North West, 2012



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