Department of Energy & Climate Change

Annual Fuel Poverty Statistics Report, 2015

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 using the Low Income High Costs indicator, 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 2013, the number of households in fuel poverty in England was estimated at 2.35 million, representing approximately 10.4 per cent of all English households. This is broadly unchanged from 2.36 million households in 2012 (a change of around 0.5 per cent).
- The aggregate fuel poverty gap fell by four percent in real terms, from £909 million in 2012 to £877 million in 2013, and the average fuel poverty gap also reduced in real terms over this period, from £385 to £374.
- The relative nature of the LIHC measure makes it is difficult to accurately isolate absolute reasons for changes. However, low income households have seen larger rises in incomes and a smaller increase in fuel costs, than the overall population. The rise in incomes has largely been concentrated in very low income households and so has not changed their fuel poverty status, resulting in the number of fuel poor households staying broadly the same.
- Rising incomes and improvements in energy efficiency amongst fuel poor households, and a smaller increase in fuel bills than experienced in the population as a whole has meant there has been a decrease in the fuel poverty aggregate and average gap.
- The Fuel Poverty (England) Regulations 2014 set a fuel poverty target to ensure that as many fuel poor homes as is reasonably practicable achieve a minimum energy efficiency rating of Band C by 2030. This included interim milestones, of as many fuel poor homes as is reasonably practicable achieve a minimum energy efficiency rating of Band E by 2020, and Band D by 2025.
- In 2013, five per cent of fuel poor households were living in a property with an energy efficiency rating of band C or above, compared to two per cent in 2010. In addition, there was an increase in the proportion of households in band D and a reduction in fuel poor households in bands E and F.
- The depth and likelihood of being fuel poor increases markedly with lower SAP scores. In 2013, 31 per cent of households living in G rated properties were in fuel poverty, with an average fuel poverty gap of £1,274. This is compared to those living in properties with SAP ratings A-C where just two per cent were fuel poor and an average fuel poverty gap of £370.

- Households living in privately rented accommodation 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 depth of fuel poverty is largest for owner occupied properties and smallest for households living in local authority properties (with average fuel poverty gaps of £459 and £199 respectively).
- All fuel poor households come from the bottom four income decile groups. In 2013, around 40 per cent of each of the bottom two deciles were fuel poor as were 13 per cent of the third and fourth deciles (combined).
- 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. However, the depth of fuel poverty is lowest for unemployed households.
- Lone parent households have consistently been more likely to be in fuel poverty. In 2013, 25 per cent were fuel poor. However, the depth of fuel poverty was lowest in this group (with an average fuel poverty gap of £280).
- The level of fuel poverty was greatest amongst groups where the youngest member of the household was aged 16-24. In 2013, 23 per cent were fuel poor. However, the fuel poverty depth increases with age.
- The number of fuel poor households is projected to remain broadly flat, increasing to 2.36 million in 2014, before decreasing to 2.34 million in 2015.
- The aggregate fuel poverty gap is projected to remain flat in 2014 and then increase to £902 million in 2015. The average gap is also projected remain flat in 2014 before increasing to £386 in 2015.
- New analysis explored the impact of using actual annual external temperatures in the modelling of fuel poverty. It was found the number of households in fuel poverty would have been 2.42 million in 2013, using this method. However, the use of a standardised set of temperatures is preferred for the headline statistics, for assessing long term changes to levels of fuel poverty and identifying where improvements can be made.

Chapter 1: Introduction

Fuel poverty in England is measured using the Low Income High Costs (LIHC) indicator. In March 2015 the Government published 'Cutting the cost of keeping warm: a fuel poverty strategy for England'[1], setting out in detail their statutory target to raise as many fuel poor homes in England as is reasonably practicable to Band C by 2030. The strategy also set out interim milestones to lift as many fuel poor homes in England as is reasonably practicable to Band E by 2020 and Band D by 2025, alongside a strategic approach to developing policy to make progress towards those targets.

1.1 Overview of fuel poverty

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.

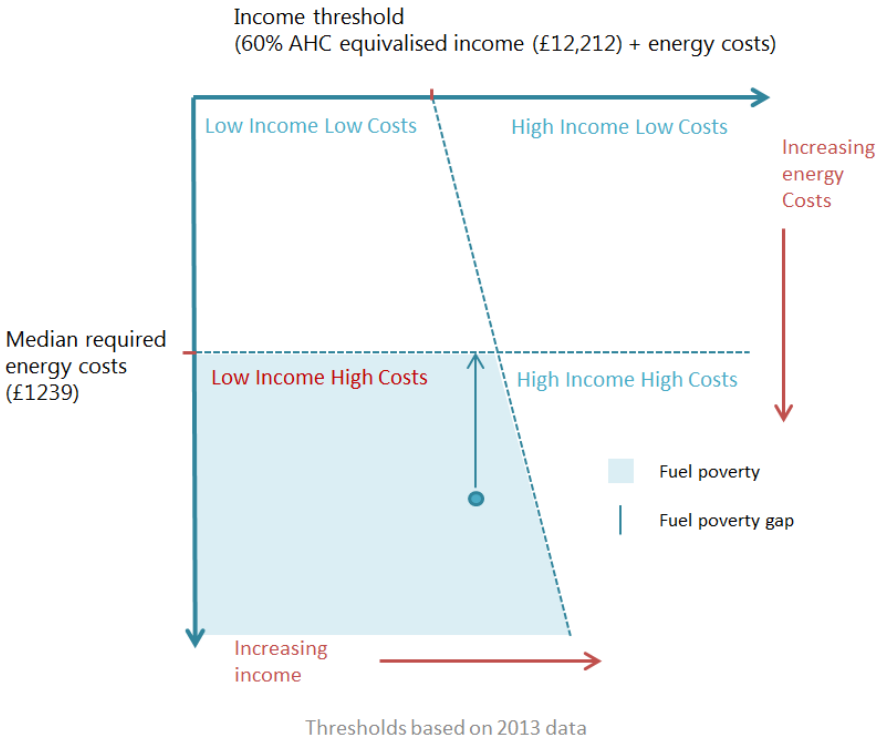
The fuel poverty gap for each individual household is then aggregated across all fuel poor households to produce an overall aggregate fuel poverty gap which gives a sense of the depth of fuel poverty on a national level. The total aggregate and average fuel poverty gap can be compared across different groups of households to assess the severity of the problem across different household types.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408644/cutting_the_cost_of_keeping_warm.pdf

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[2].

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.

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

The focus of this report is the LIHC indicator. Fuel poverty under the 10% indicator is included only (see Chapter 7) to provide an overall estimate for the United Kingdom, 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 2013, around 13,276 households took part in the interview survey which was carried out between April 2013 and March 2014. 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 2013 data, this covers the period between April 2012 and March 2014, and comprises around 12,009 households. Therefore the annual fuel poverty data is a combination of two consecutive years' worth of data – 2012/13 and 2013/14. 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

DCLG published headline results from the 2013 survey on 25th February 2015. This is available to download at:

https://www.gov.uk/government/statistics/english-housing-survey-2013-to-2014-headline-report

Full data relating to the 2013/14 EHS survey, will be made available by DCLG in summer 2015. 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 slightly different ways under both the LIHC indicator and the 10% indicator. See the Annual Report on Fuel Poverty Statistics 2013 for more detail on the 10% indicator:

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.

1.3.2 Fuel bills

Modelled fuel bills are used, 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.

Fuel bills are also equivalised. They are equivalised[3] 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.

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

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.

Chapter 9 presents some new analysis looking at this issue, exploring the impact of using actual temperature data on the fuel poverty statistics.

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 see Annex B.

1.4 Understanding changes in fuel poverty

The LIHC headcount indicator is a relative measure of fuel poverty. Therefore in order for any factor to affect the level of fuel poverty (number of households in fuel poverty), the factor must change by a greater amount, for those in fuel poverty, than for those out of fuel poverty. For example, 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 fuel poverty gap is a more responsive indicator, particularly to prices.

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 will therefore increase from £500 to £550.

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%

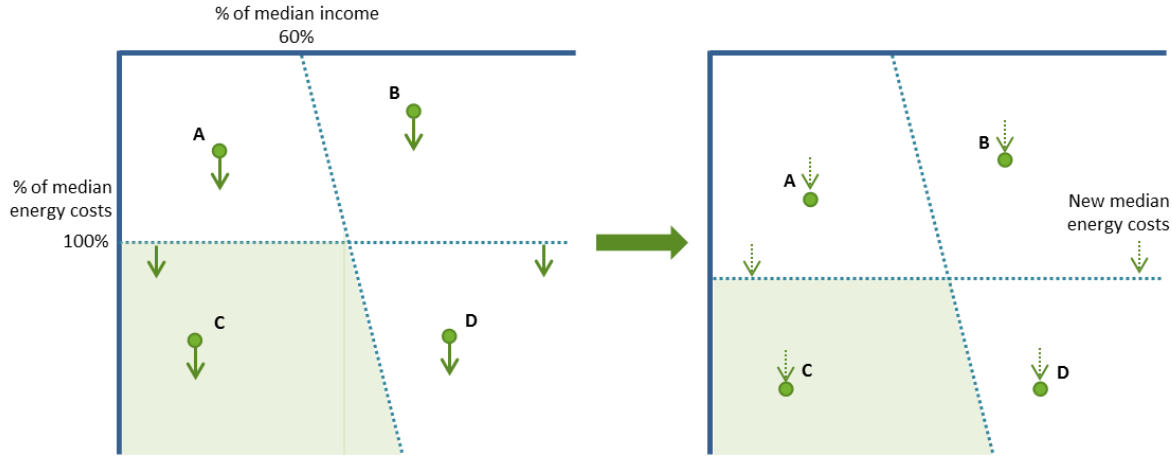
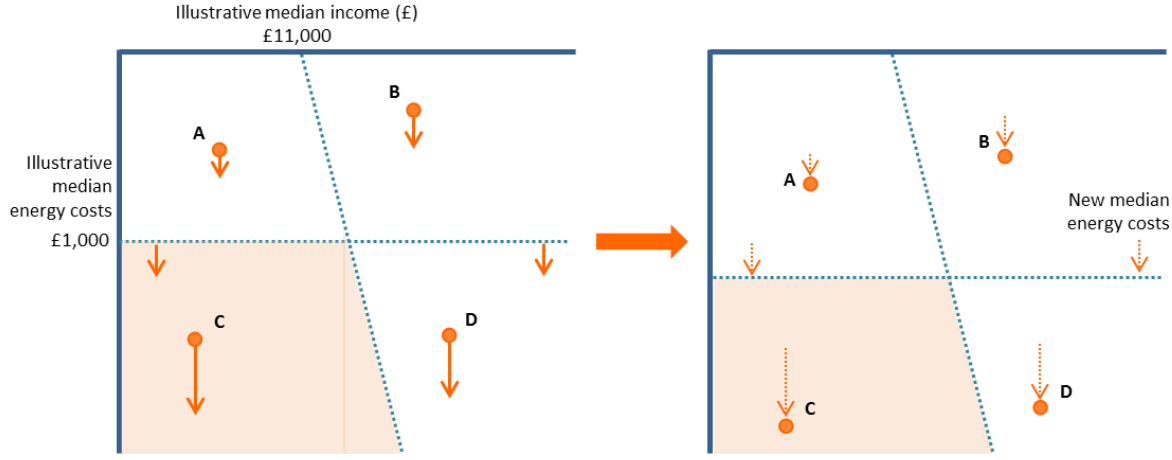


Figure 1.3: Low Income High Costs *gap* indicator under the scenario where fuel costs increase by 10%



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, the Building Research Establishment Domestic Energy Model (BREDEM), has been revised and aligned more closely with the SAP 2012 methodology. The latest version of the model, BREDEM 2012 version 1.1 (January 2015)[4], supersedes BREDEM 2012 version 1.0.

The key methodological updates which affect the calculation of the fuel poverty statistics include:

- A change to the calculation of the inter-zone heat transfer coefficient
- Small reduction in the energy content of heated water
- Alteration to the procedure for calculating the water heating efficiency from a central heating boiler
- Small reduction in heat gains produced by warm air heating system pumps

These changes are estimated to produce a small reduction in the overall energy consumption for the average household. Households classed as under-occupying (few occupants in a large dwelling) are most affected because of the change to the inter-zone heat transfer coefficient, which controls the heat loss from living room to unheated parts of the dwelling. These households make up around a third of the housing stock and have seen a larger reduction in energy consumption under the new methodology.

The overall effect of the changes is to increase the proportion of fuel poor households under the Low Income High Cost indicator, as the median energy cost threshold reduces and pushes more households into fuel poverty. However, the

[4] http://www.bre.co.uk/filelibrary/bredem/BREDEM-2012-specification.pdf

aggregate and average fuel poverty gap reduces, as the depth of fuel poverty is less for those households in LIHC. The changes disproportionately affect those classed as under-occupying, and lead to a reduction in the number of these households in fuel poverty. Comparing the published 2012 fuel poverty statistics with those produced using BREDEM 2012 v1.1 shows that the number of fuel poor households in 2012 changes from 2.28 million to 2.36 million households, the aggregate gap from £1,012 million to £891 million, and the mean gap from £443 to £377. A time series back to 2003 using a consistent model has now been produced so that comparisons and consideration of change between years can be made on a like-for-like basis without the effects of this and previous methodological changes. Detailed information on the BREDEM-2012 applied algorithms and assumption for fuel poverty modelling can be found in the updated Methodology Handbook, available at:
https://www.gov.uk/government/collections/fuel-poverty-statistics

1.5.2 Changes to the EHS grossing

In 2014 DCLG have introduced a new weighting methodology for the EHS. The main aim of this is to simplify the weighting process and control to one set of estimates for households/dwellings. More information is available at:

https://www.gov.uk/government/publications/english-housing-survey-weighting-methodology-introduced-in-2013-to-2014

The main impacts of the change in weighting are: the number of households is increased by about 600,000, the estimate of the percentage of owner-occupier households is reduced from 65.2 to 63.4 per cent, and the number of private rented sector (PRS) households is increased by about 10 per cent.

1.5.3 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

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 to assess the potential implications this new data source may have on the assumptions underlying the fuel poverty methodology (see above Methodology Handbook for further details). We will investigate the temperatures people heat their homes to, their heating patterns and the extent to which they heat their homes. We aim to consult on our findings later this year.

1.5.4 Other work on fuel poverty statistics

Work to improve the sub-regional fuel poverty estimates continues. A multi-level model is being developed further 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.

1.5.5 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

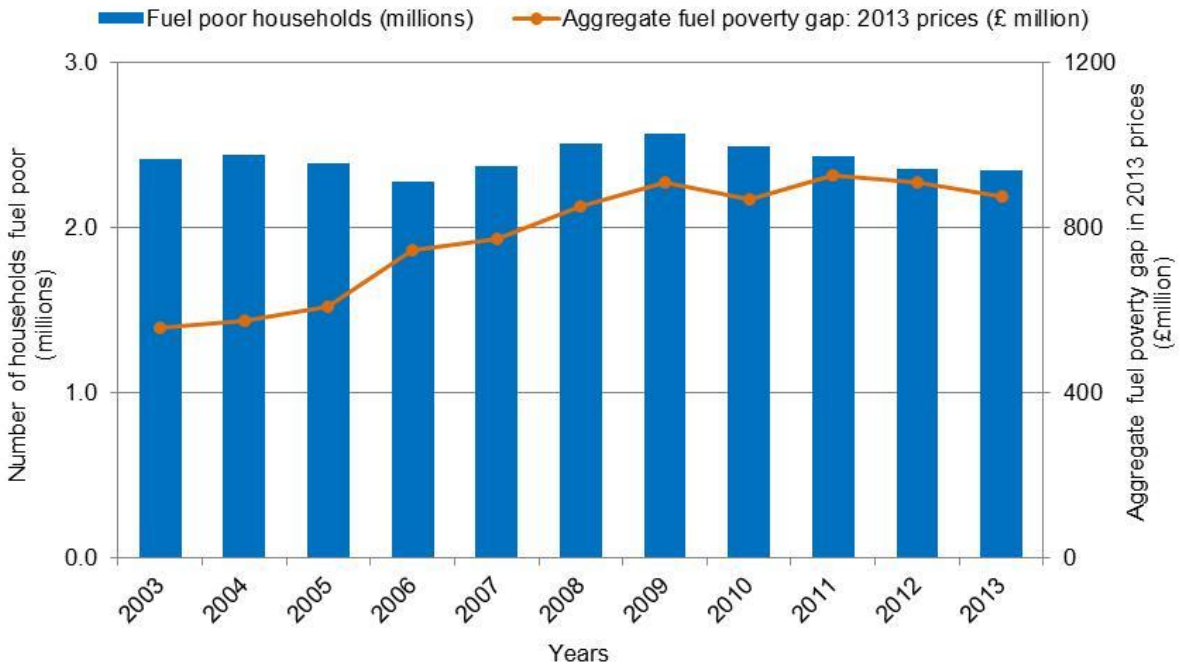
Chapter 2: Summary of fuel poverty in England, 2013

2.1 Fuel poverty in England under Low Income High Costs (LIHC)

In 2013, the number of households in fuel poverty in England was estimated at around 2.35 million, representing approximately 10.4 per cent of all English households. This is broadly unchanged from 2.36 million households in 2012 (a change of around 0.5 per cent). The aggregate fuel poverty gap[5] fell by four percent in real terms, from £909 million in 2012 to £877 million in 2013, and the average fuel poverty gap also reduced in real terms over this period, from £385 to £374[6].

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, 2003 – 2013



[5] Note the historic aggregate and average fuel poverty gaps are rebased to 2013 prices.
[6] These figures are based on BREDEM version 1.1 and so will not match the 2014 publication. Please see section 1.5.1 for further details.

Table 2.1: Fuel poverty in England, 2003 – 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Fuel poor households (millions)	2.41	2.44	2.39	2.28	2.38	2.51	2.57	2.49	2.43	2.36	2.35
Aggregate fuel poverty gap: 2013 prices (£ million)	556	575	608	744	773	851	911	869	926	909	877
Average fuel poverty gap: 2013 prices (£)	231	236	254	327	325	340	355	349	380	385	374

The Government set a fuel poverty target to improve the energy efficiency of fuel poor homes, by getting as many households as reasonably practicable to a minimum standard of band C by 2030 (with interim targets of band E and band D by 2020 and 2025). Table 2.2 shows fuel poor households by the Fuel Poverty Energy Efficiency rating[7] of their dwellings. Recent trends show an increase in the proportion of households in band D and a reduction in fuel poor households in bands E and F.

Table 2.2: Fuel Poor Households by the Fuel Poverty Energy Efficiency Rating, 2010- 2013

Band	2010		2013	
	Households (millions)	Proportions	Households (millions)	Proportions
A/B				
C	0.04	2%	0.11	5%
D	0.69	28%	1.09	46%
E	1.23	49%	0.84	36%
F	0.39	16%	0.23	10%
G	0.14	6%	0.08	3%
Total	2.49	100%	2.35	100%

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 2012 and 2013. We then examine how this has affected fuel poor households under the Low Income High Costs indicator, both 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.

[7] For details on the Fuel Poverty Energy Efficiency Rating Methodology see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332236/fpeer_methodology.pdf

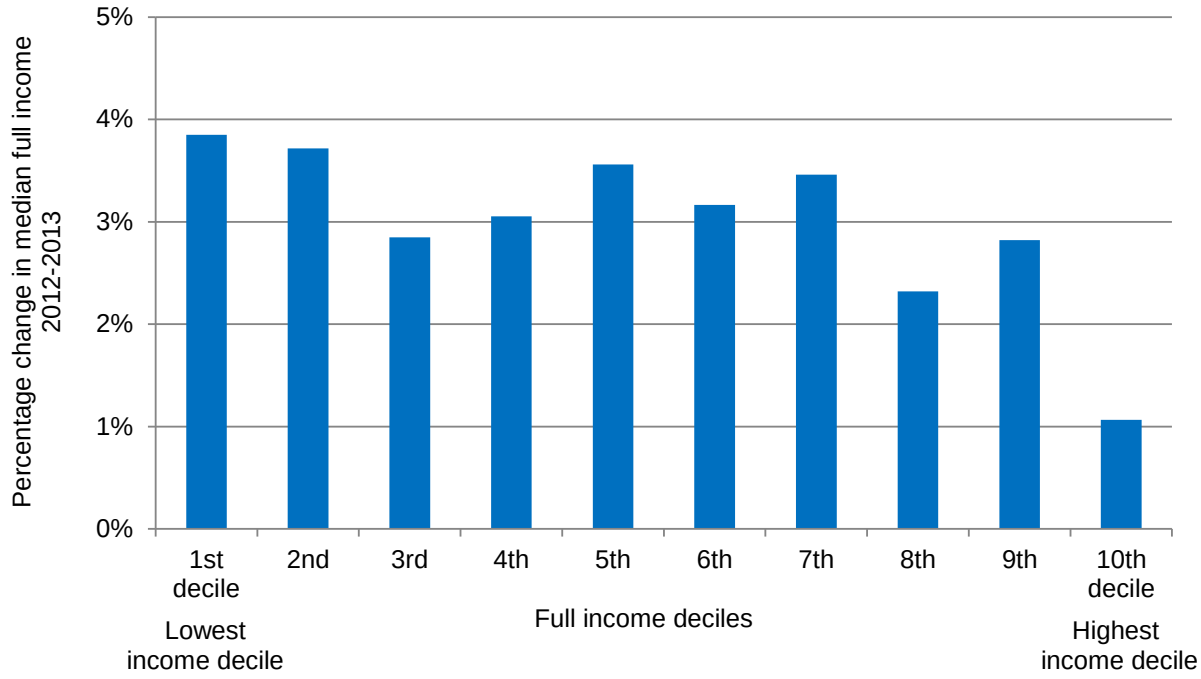
2.2.1 Income

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

In 2013, average median full incomes (before housing costs) continued to increase, rising from £23,950 in 2012 to £24,260 in 2013 (around one per cent). However, as Chart 2.2 shows, incomes did not rise equally across all household income decile groups. The poorest 20 per cent saw slightly bigger rises in income, while the higher income groups saw more modest increases.

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. As a result, increases in state benefits and housing income are a major factor behind income rises in the lower deciles, whilst in general earnings saw smaller increases, affecting the incomes of households in the higher income deciles. Household income is made up of various elements, including benefits, earnings and income from additional adults. In 2013 there has been an increase in income from additional adults in the household, across all deciles, reflecting the growth in multi-person households.

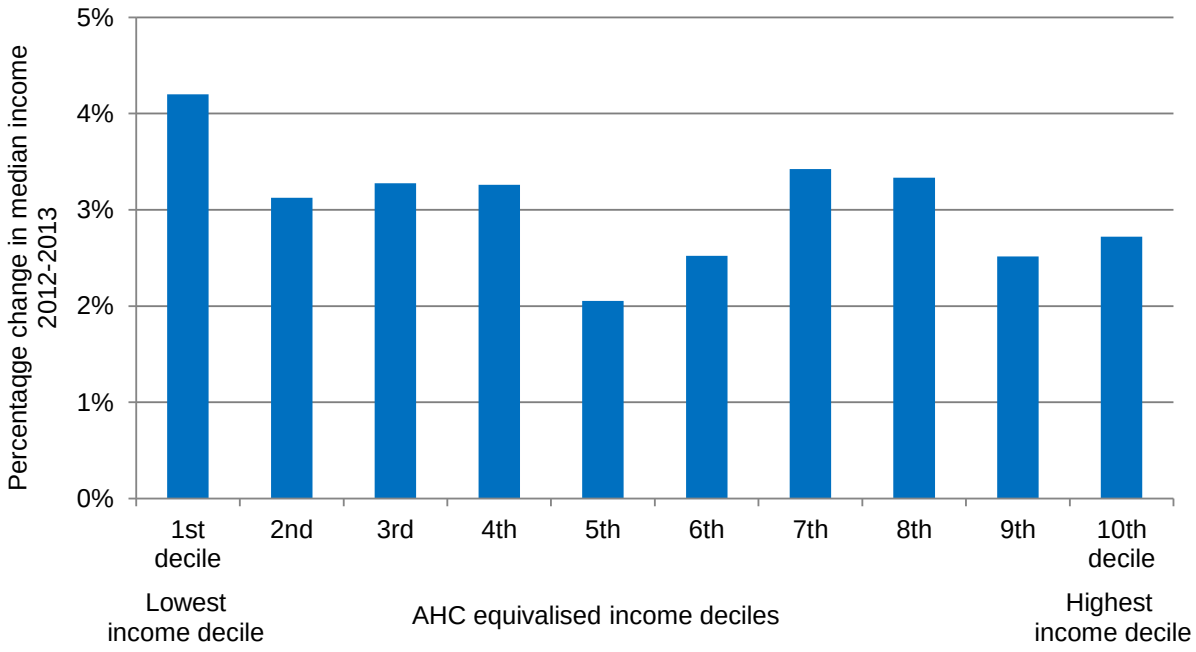
Chart 2.2: Annual percentage change in median full income by income deciles, 2012 – 2013



Under the LIHC indicator, housing costs are taken off the income of each household. This makes households who own their homes outright (and so have no housing costs) relatively better off to those with rent or mortgage payments. Therefore in the past households in the lower income deciles have seen smaller increases in After Housing Cost (AHC) equivalised income, as they are most likely to have housing costs.

However, in 2013 households in the lower deciles have seen an increase in AHC equivalised income. This is because median housing costs for the bottom decile have risen by just 0.6 per cent between 2012 and 2013, compared to 4.0 per cent for the population as a whole[8]. Moreover, rent payments for the bottom decile have risen by just two per cent. This coupled with an increase in the proportion of households renting in the bottom decile (from 68 to 74 per cent), has led to income increases outstripping the rise in housing costs.

Chart 2.3: Annual percentage change in median AHC equivalised income by income deciles, 2012 – 2013



An increase in equivalised AHC income for households in the very bottom decile is however unlikely to have a large impact under the LIHC metric, as despite their income increasing they are still likely to be classed as having 'low incomes'. Figure 2.1 (page 27) shows this more clearly, unless those households near the income threshold (in the red box) see an increase in incomes there is likely to be a minimal impact on the number of households in fuel poverty.

2.2.2 Prices

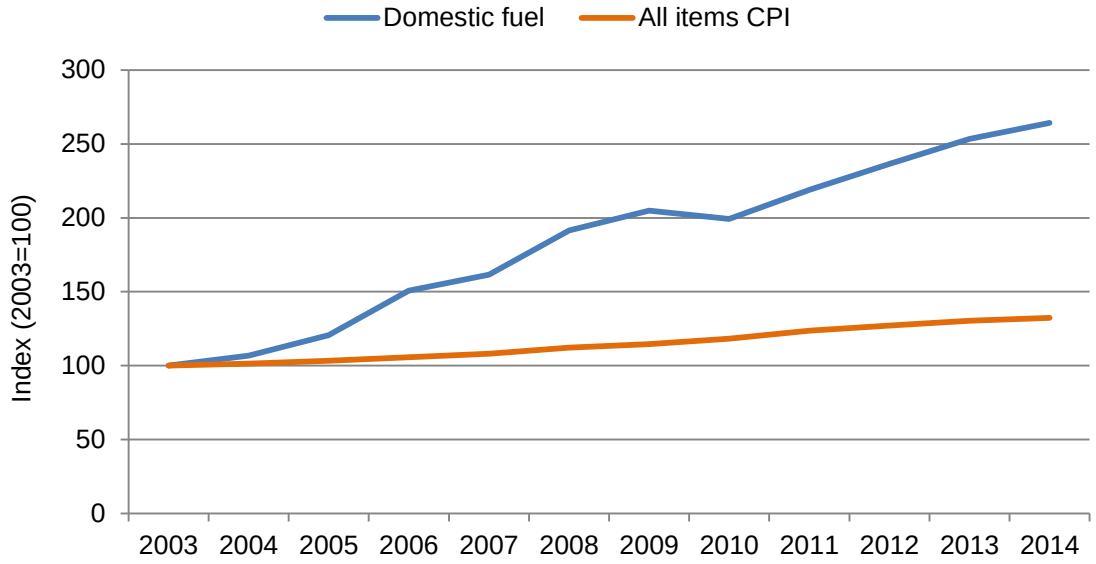
Chart 2.4 shows the retail prices of domestic energy[9] since 2003, and compares these against the prices of a 'typical' basket of goods and services that make up the Consumer Prices Index (CPI).

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

[8] Of those that have housing costs.
[9] 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).

inflation over this period. However, from 2011 onwards fuel prices have continued to rise in line with recent trends.

Chart 2.4: Domestic energy prices and the Consumer Price Index, 2003 – 2013

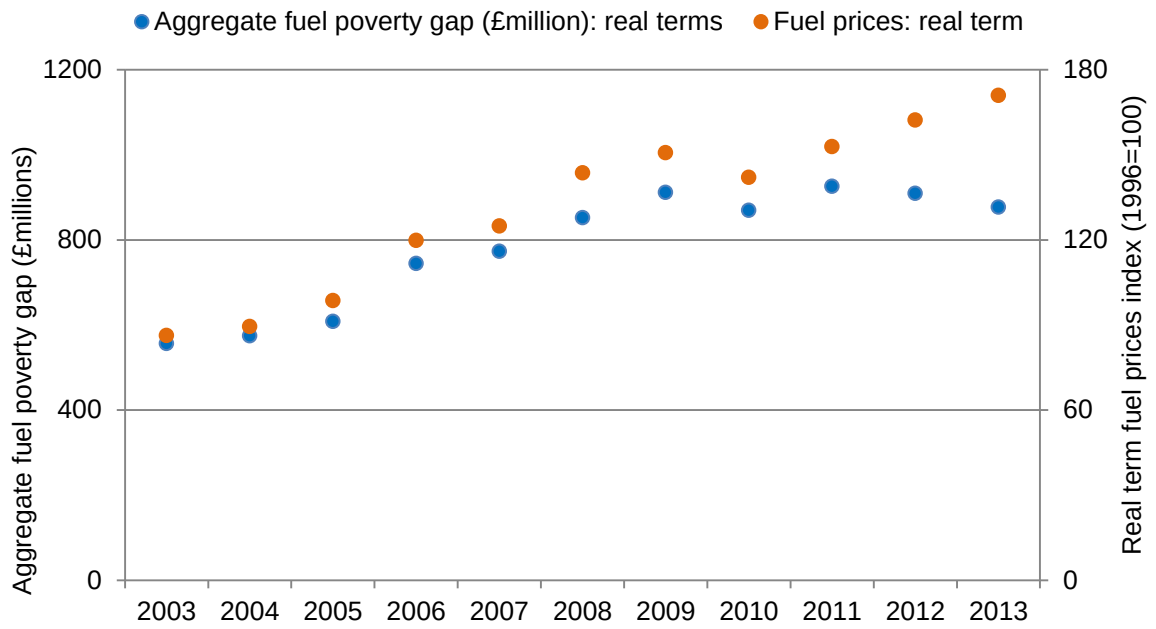


As explained in Section 1.4, there is a strong correlation between fuel prices in real terms and the depth of fuel poverty as shown by the aggregate fuel poverty gap (Chart 2.5). As prices increased steadily between 2003 and 2009, the fuel poverty gap also increased; and when prices fell sharply in 2010,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

In 2013, despite a rise in real term fuel prices, the aggregate fuel poverty gap shows a reduction. This is largely due to rising incomes among the low income group, which helped to temper any increase in fuel costs. This effectively moved fuel poor households closer to the income threshold (see section 2.3). In addition, the fuel costs of the LIHC group increased by less than the overall median fuel costs, bringing them closer to the fuel cost threshold. The average fuel poverty gap also shows a reduction.

It should be noted 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 2013 data is a combination of 2012/13 and 2013/14 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, 2003 – 2013



2.2.3 Energy efficiency

The average energy efficiency of households, as indicated by the Standard Assessment Procedure (SAP 12) continued to increase in 2013, rising to 60 from 58.7 in 2012[10]. In line with this, a greater proportion of dwellings are now classed SAP band D or above (75% of dwellings in 2013 compared to 69% in 2012 and 64% in 2011) as shown in Chart 2.6.

[10] Note, this figure excludes vacant homes, and therefore differs from the SAP changes recorded in the EHS report. This is based on SAP 2012, rather than SAP 09 which was used in previous reports. For more information on SAP ratings, see http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf.

Chart 2.6: Proportion of dwellings by SAP 12 bands, 2011 – 2013

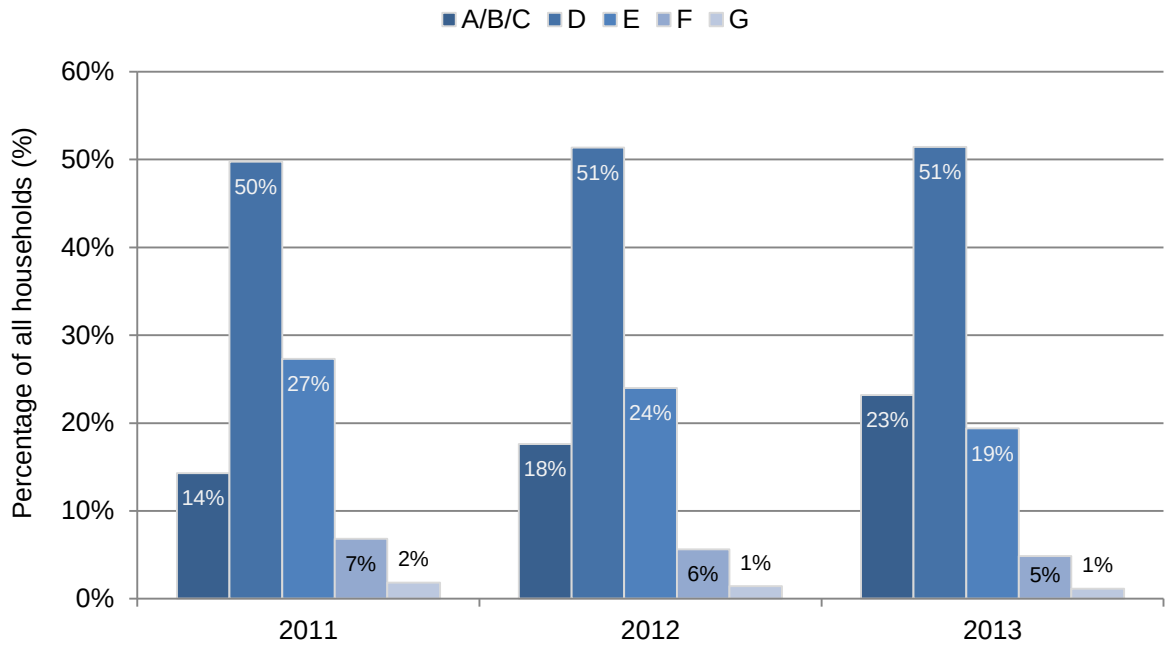


Table 2.3 examines the average SAP rating by tenure, comparing owner occupied housing with private and social rented housing. This indicates that social housing is generally the most energy efficient, with SAP ratings around seven points higher than the other two groups. Nonetheless, improvements have been made across all tenures in the last year, which appears to be part of a longer term trend.

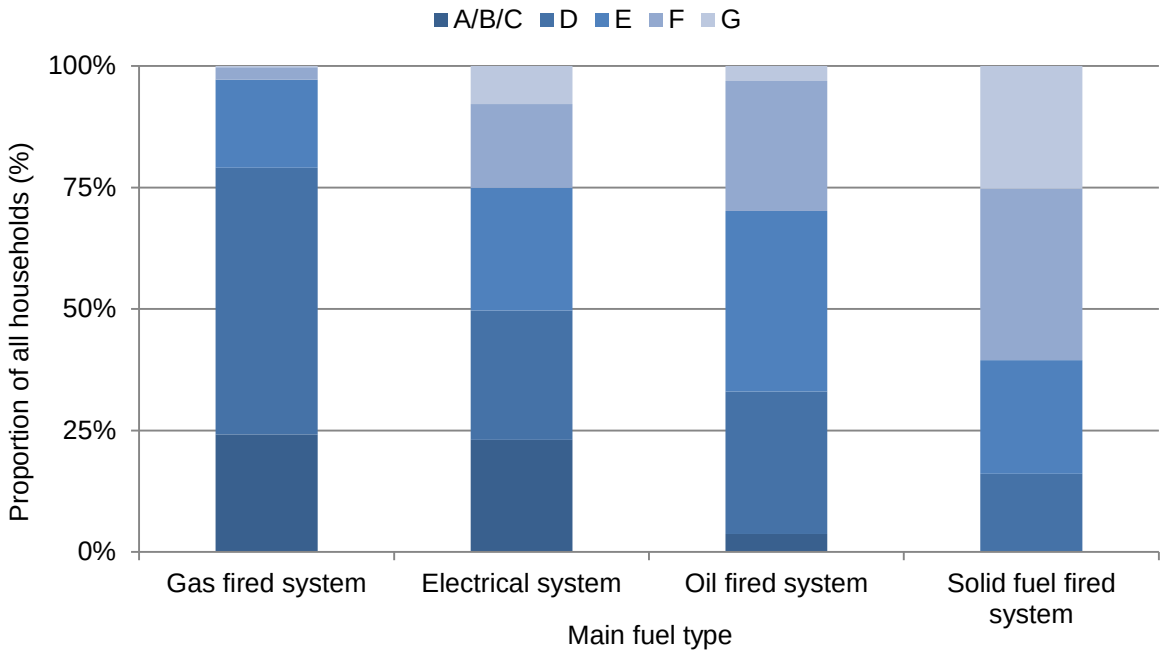
Table 2.3: Average SAP 12 ratings by tenure, 2011– 2012

Tenure	2011	2012	2013
Social	63.4	64.7	65.6
Private rented	55.6	57.3	58.8
Owner occupied	55.7	57.5	58.7

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 systems with less expensive running costs 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, 2013



2.3 Changes in fuel poverty since 2012

Between 2012 and 2013, fuel poverty in England remained broadly unchanged, reducing by around 12,000 households (0.5%) 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 all the other quadrants. This suggests that between 2012 and 2013, some households who would previously have been classed as having low incomes and high costs, have either seen increases in their incomes, or decreases in their energy consumption levels.

Chart 2.8: Percentage change in the number of households in each quadrant of the LIHC metric, 2012 – 2013

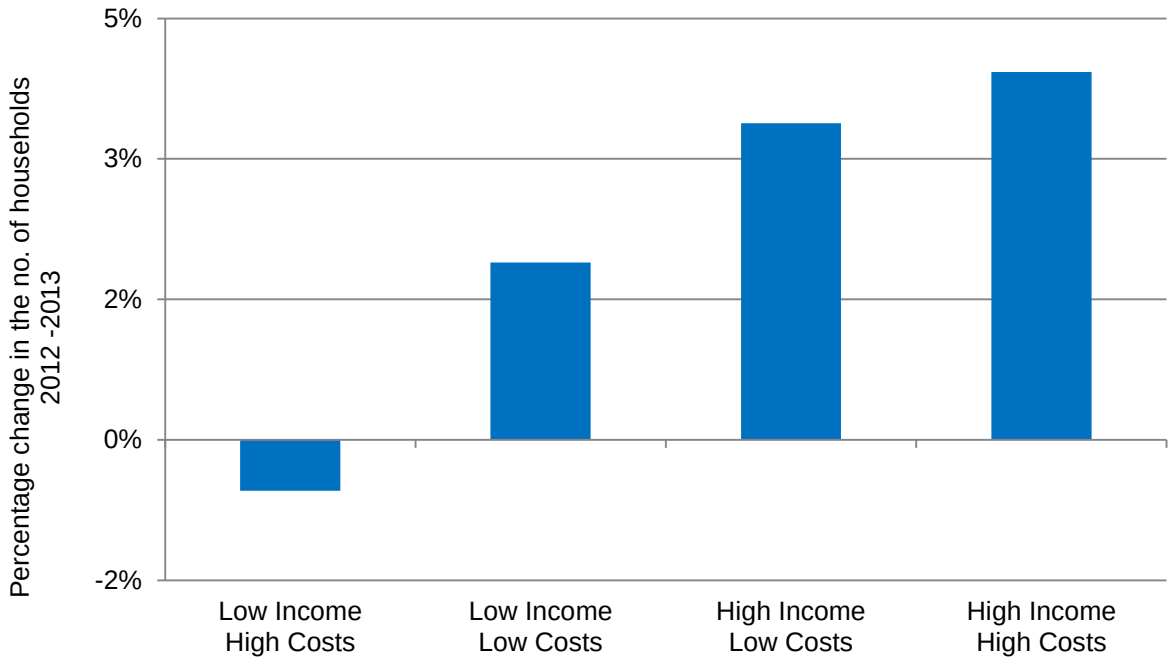


Chart 2.9 shows how incomes, fuel costs and SAP ratings changed for households in the LIHC group, compared with all households, between 2012 and 2013. In summary, the LIHC group saw a bigger increase in median income compared to the overall population and a smaller increase in fuel costs. In addition they saw a slightly larger increase in energy efficiency levels, as measured by SAP.

Chart 2.9: Change in income, fuel costs and SAP by LIHC status, 2012 – 2013

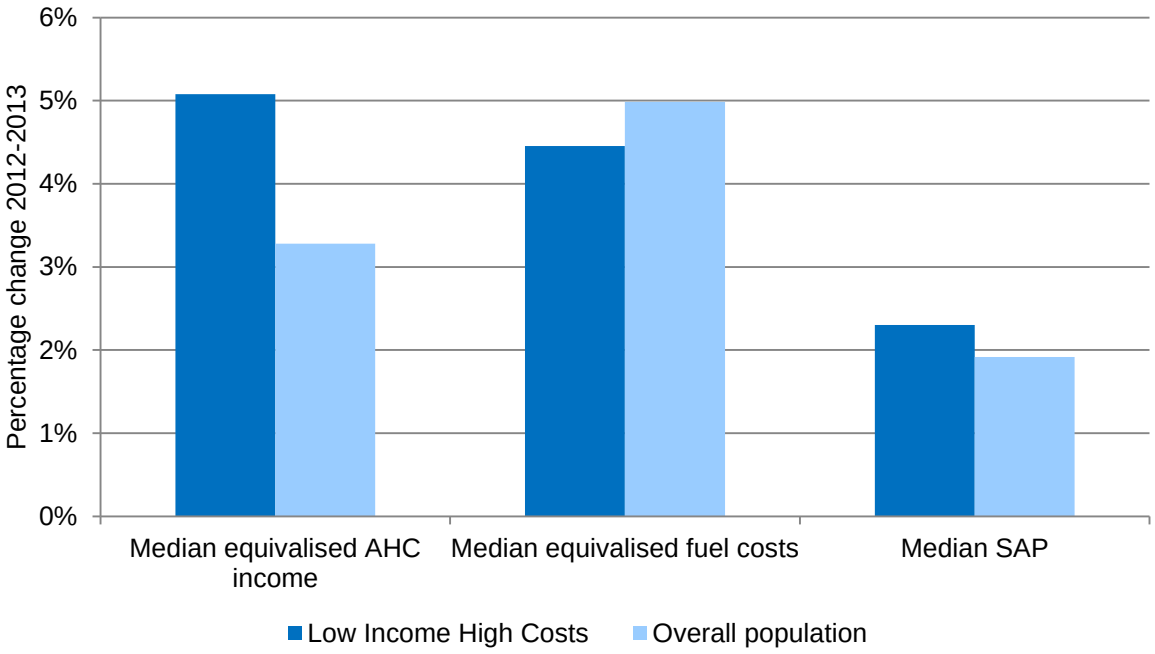


Table 2.4 below shows how average incomes have increased for each quadrant of the LIHC metric and support the earlier findings from Chart 2.3, which shows an increase in income among low income households.

Table 2.4: Median AHC income by each quadrant of the LIHC metric, 2012-2013

	Median equivalised after housing costs income (£)			% change in income at the:	
	2012	2013	% change	10th decile	90th decile
Low Income High Costs	£9,415	£9,895	5.1%	44.4%	3.0%
Low Income Low Costs	£9,260	£9,430	1.8%	-10.4%	3.1%
High Income Low Costs	£22,085	£23,100	4.6%	3.8%	2.5%
High Income High Costs	£25,855	£26,400	2.1%	2.9%	-0.9%
Overall population	£19,705	£20,355	3.3%	3.7%	0.3%

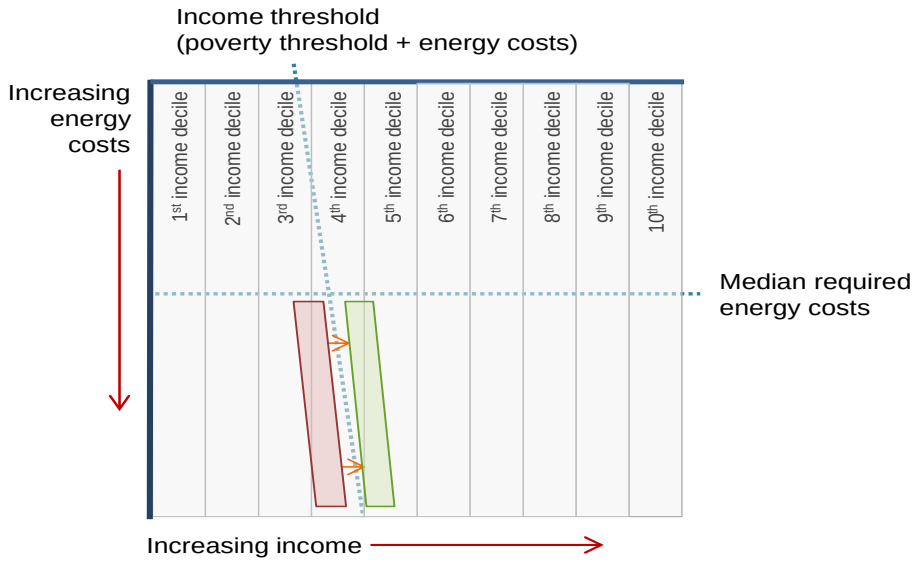
Note, median incomes are rounded to the nearest £5 but the percentage change is calculated on the unrounded incomes

There was a relatively large increase in incomes in the fuel poor group (5.1% vs. 3.3% for the overall population). As can be seen this is concentrated in the bottom deciles, where households in the 10th decile saw an increase of over 40 per cent in their income. The reason this does not result in a significant reduction in the number of fuel poor households is because all quadrants saw an increase in incomes, and the larger rises in the LIHC group were seen among the very bottom incomes.

As discussed previously, an increase in incomes across the LIHC group can move some households out of fuel poverty, only 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. In 2013 the biggest increases were concentrated in the bottom deciles which moved them to the right, but did not move many households over the threshold.

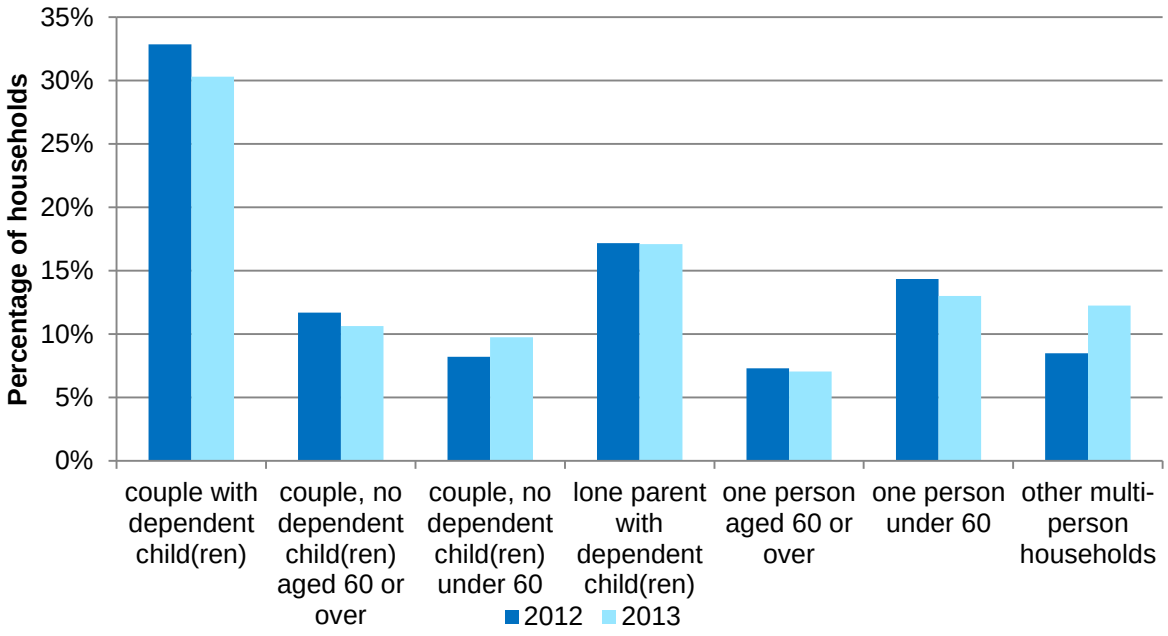
The large income rises across the population, and in particular the high income high costs (HIHC) group, also works to prevent additional households from this group falling into fuel poverty. These factors are likely to contribute to the small reduction in the number of fuel poor households seen in 2013.

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



The reasons for the increase in income among the LIHC group are discussed in section 2.2.1. In addition, in 2013 there has been a shift in the composition of the fuel poor group, largely driven by the changes in the EHS weighting methodology (see section 1.5.2). This has led to an increase in multi-person households and couples under 60 with no dependent children. There has also been a reduction in couples with dependent children and single households under 60 (Chart 2.10). This change in composition appears to have driven some of the increase in income seen in the LIHC group.

Chart 2.10: Comparison of composition of the LIHC group, 2012 and 2013



In addition, the households removed from fuel poverty tended to have higher fuel poverty gaps than average. The changes to the grossing could also be having an

impact on the aggregate and average fuel poverty gap, by removing those households in the deepest fuel poverty. However, it is hard to establish the exact impact of the grossing changes, as the new weighting methodology is only available for the 2013 EHS year.

Fuel costs rose for each quadrant under the LIHC metric, although by slightly less for the low income groups (low income low costs and low income high costs). This is shown in Table 2.5. Rising incomes and a smaller than average increase in fuel costs for the LIHC group has had the effect of reducing the fuel poverty gap, as households have moved closer to the income threshold (the slanting line) and the fuel cost threshold (the horizontal line). On average the fuel cost threshold rose more than the fuel costs of the LIHC group. The fuel poverty gap, calculated as the fuel cost of LIHC household minus the fuel cost threshold, is therefore reduced.

Table 2.5: Median fuel costs by each quadrant of the LIHC metric, 2012-2013

	Median equivalised fuel costs (£)		
	2012	2013	% change
Low Income High Costs	£1,410	£1,470	4.5%
Low Income Low Costs	£990	£1,030	4.4%
High Income Low Costs	£1,005	£1,055	4.8%
High Income High Costs	£1,430	£1,500	4.8%
Overall population	£1,180	£1,240	5.0%

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

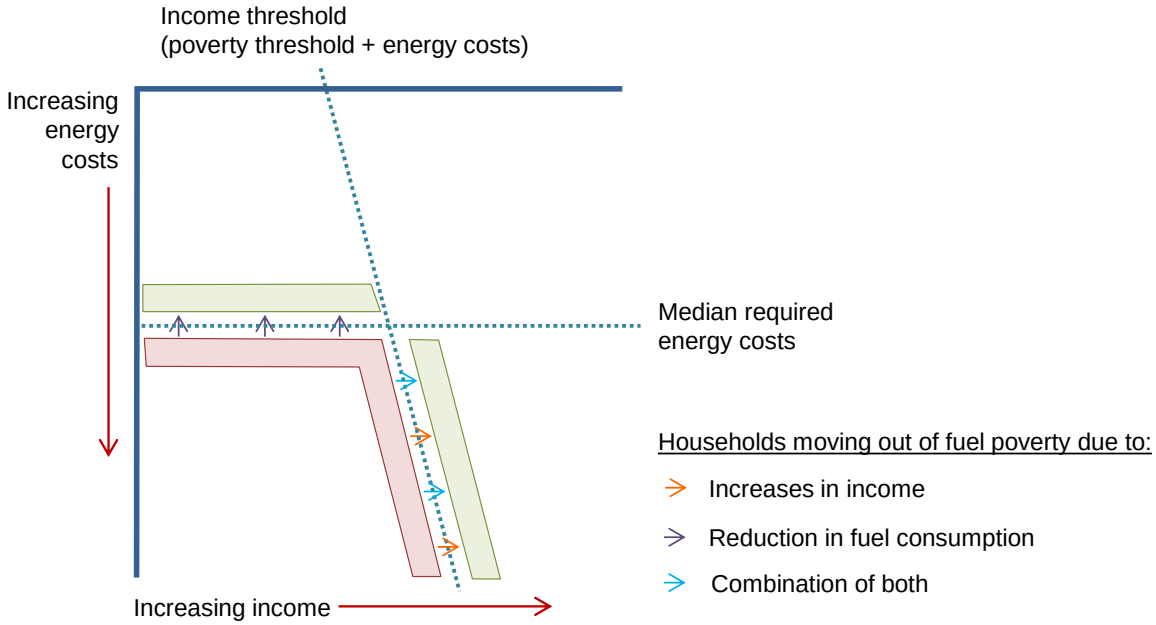
The increases in the fuel costs seen above show the impact of energy costs and energy efficiency. Table 2.6 below shows that households who already have low costs have seen smaller improvements in SAP (so fewer energy efficiency improvements) and as such their energy cost increases are driven by energy prices.

Table 2.6: Median SAP ratings by each quadrant of the LIHC metric, 2012-2013

	Median SAP score		
	2012	2013	% change
Low Income High Costs	53.0	54.3	2.3%
Low Income Low Costs	66.4	67.1	1.1%
High Income Low Costs	66.1	67.1	1.6%
High Income High Costs	53.6	55.4	3.2%
Overall population	61.0	62.2	1.9%

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



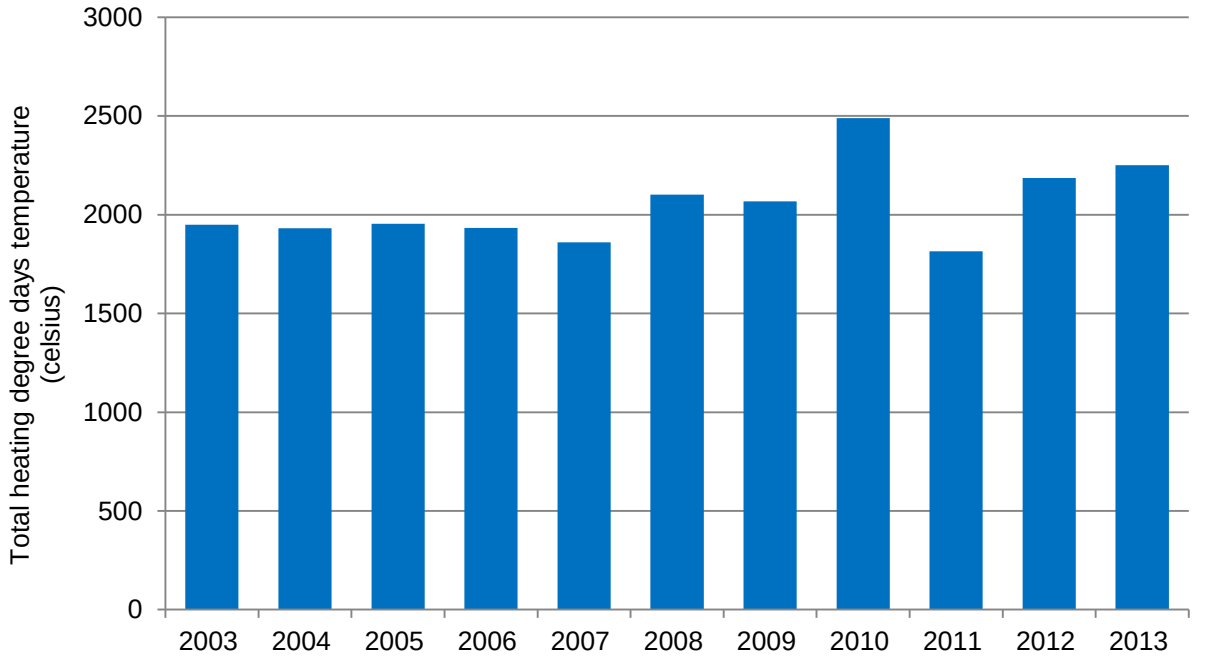
Due to the relative nature of the LIHC measure, it is difficult to accurately isolate absolute reasons for change. However, in summary, increases in income have moved some households over the income threshold and thus out of fuel poverty. The improvements to incomes and energy efficiency levels for fuel poor households and the slightly smaller increase in fuel bills have also reduced the aggregate and average fuel poverty gap.

2.4 The impact of weather on fuel poverty, 2013

Chart 2.11 shows the winter months falling in 2013 (that is the end of the 2012/13 winter and the start of the 2013/14 one), were marginally cooler than the previous year, thereby resulting in an increase in overall higher heating degree days[11] of around three per cent.

[11] 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.

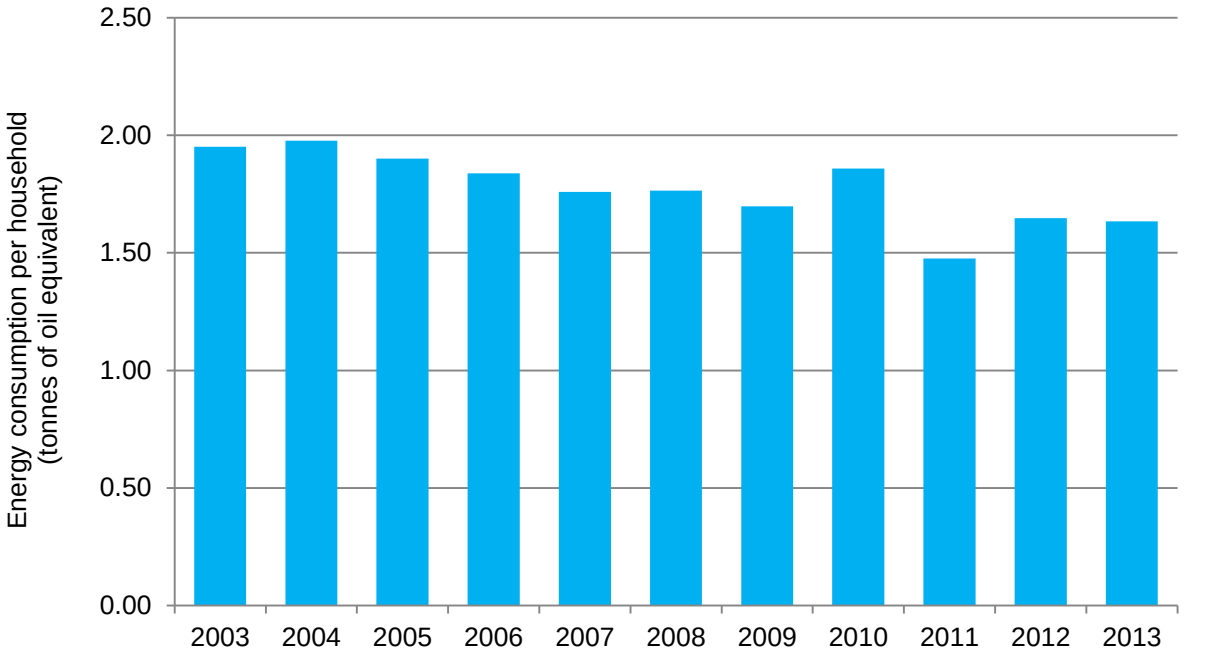
Chart 2.11: Total annual number of degree days in the UK, 2003 – 2013



Source: Energy Trends, Table 7.1

However, average annual household energy consumption remained broadly the same as in 2012. This is shown in the Chart 2.12 below.

Chart 2.12: Average annual domestic energy consumption, 2003 – 2013



Source: Energy Consumption in the UK, Table 3.35

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 2.12 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, would 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).

However, additional analysis has been undertaken this year to explore the impact on fuel poverty statistics of using actual external temperatures. See Chapter 9.

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 2.7 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 2.7: Fuel poverty under the LIHC indicator, excluding and including housing costs from income, 2013

	After housing costs (main LIHC) indicator	LIHC calculated using income before housing costs	% Difference
Fuel poor households (millions)	2.35	1.98	-15%
Aggregate fuel poverty gap (£million)	877	759	-13%
Average fuel poverty gap (£)	374	382	2%

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 represent a move away from current Government practice, 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 2.8 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 2.8: Fuel poverty under the LIHC indicator, including and excluding disability benefits from income, 2013

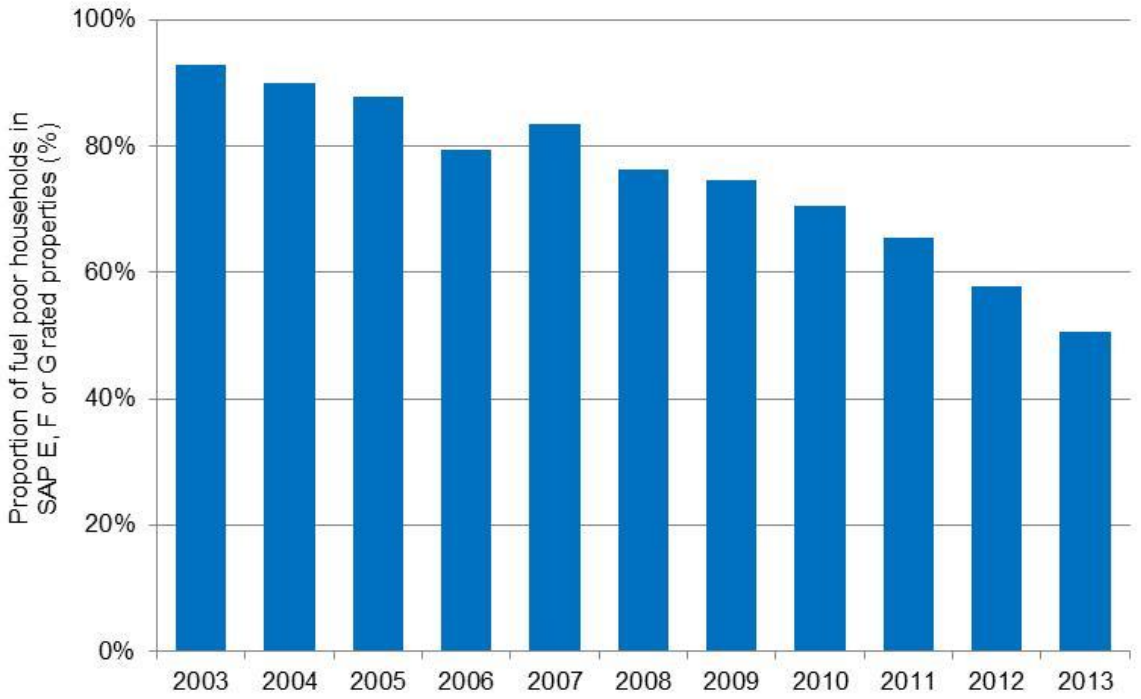
	Disability benefits included (main LIHC) indicator	LIHC calculated with disability benefits excluded	% Difference
Fuel poor households (millions)	2.35	2.37	1%
Aggregate fuel poverty gap (£million)	877	883	1%
Average fuel poverty gap (£)	374	372	0%

2.5.3 Energy efficiency and fuel poverty

The first of the energy efficiency supplementary indicators focuses on the proportion of fuel poor households living in properties with SAP (12) 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 2.13 below shows there has been a notable reduction in the number of fuel poor households, with low incomes and high costs, 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 46 percentage points – with around 50 per cent of all fuel poor households living in such properties in 2013.

Chart 2.13: Proportion of fuel poor households in SAP 12 E, F or G rated properties, 2003 – 2013



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 2.9 shows that the average SAP rating in 2013 for fuel poor households was 51.8, while the average rating for non-fuel poor households was 60.9. A SAP score of 50 equates to a SAP band of E.

Table 2.9: Average SAP 12 ratings of fuel poor and non-fuel poor households, 2003 – 2013

Year	Fuel poor households	Non-fuel poor hoseholds	All households
2003	38.7	49.2	48.0
2010	46.7	56.9	55.7
2011	48.2	58.1	57.0
2012	50.3	59.7	58.7
2013	51.8	60.9	60.0

A range of supplementary indicators are shown in Table 2.10. Indicators one to four show how fuel poor households have become more energy efficient. Since 2003 there has been a substantial reduction in the proportion of fuel poor households with no central heating and with inefficient non-condensing boilers, and a big increase in the proportion of households with cavity and loft insulation. Indicator five and six focus on other aspects of fuel poverty. Indicator five shows that there has been an increase in the fuel poverty gap for households not on mains gas. These households

have to use more expensive fuels, and therefore also have a higher than average fuel poverty gap. Finally indicator six shows the rise in the number of children living in fuel poor households.

Table 2.10 Additional Indicators

Fuel poverty indicator	1. % of fuel poor households with no central heating (/ storage heaters)	2. % of fuel poor households with non-condensing boilers	3. % of fuel poor households with cavity walls that are insulated	4. % of fuel poor households with a loft that has 125mm of insulation or more	5. Average fuel poverty gap for households not using mains gas (£ 2013 real terms)	6. Number of households with children in fuel poverty (millions)
2003	13.5	97.1	25.0	27.9	394	0.93
2010	6.0	78.8	39.1	39.9	577	0.99
2011	4.9	73.0	43.3	41.5	655	1.03
2012	5.1	69.0	43.9	48.7	672	1.10
2013	5.1	63.1	45.3	53.3	643	1.06
Change 2003-2013	-8 ppts	-34 ppts	20 ppts	25 ppts	63%	14%
Change 2010-2013	-1 ppts	-16 ppts	6 ppts	13 ppts	11%	7%

Chapter 3: Analysis of fuel poverty in England

This chapter describes how the level of fuel poverty in England varies by a number of key household and dwelling characteristics. Many of these characteristics are inter-related (for example, low income households are more likely to have pre-payment meters), and assigning causality to any one factor alone is not possible. A number of interesting patterns, however, can be seen.

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

https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2013

3.1 Energy efficiency and dwelling characteristics.

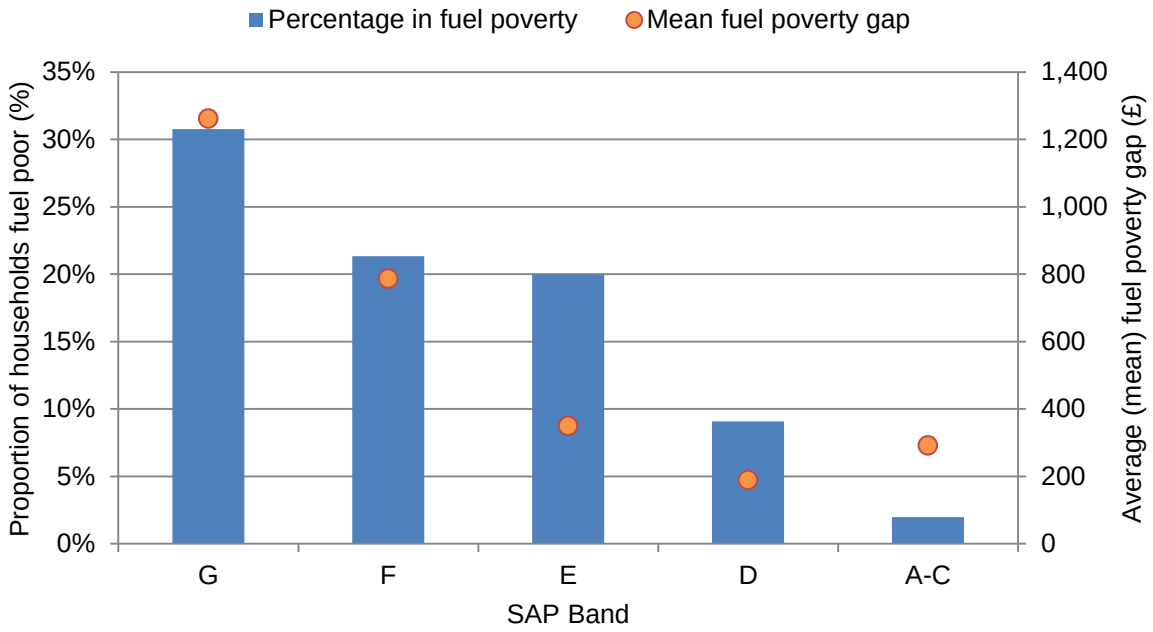
3.1.1 SAP

One of the most interesting ways to consider the fuel poor group is by the overall level of energy efficiency of the dwelling. This is described using Government's Standard Assessment Procedure (SAP) for the Energy Rating of Dwellings[12]. The fuel costs used in the measurement of fuel poverty and those used in SAP are related but crucial differences exist. Most notably SAP does not include any costs for appliances or cooking, and is independent of the number of people in the dwelling and the dwelling's location in the country. SAP also always assumes all areas of the dwelling are heated.

Notwithstanding these differences, fuel poverty and energy efficiency are closely linked. As shown in Chart 3.1 a household is much more likely to be in fuel poverty if it is in the lowest SAP bands (E-G), than in the highest bands (A-C). The average fuel poverty gaps of households in the lowest bands are also considerably higher. In 2013, 31 per cent of households living in G rated properties were fuel poor, compared to only two per cent and nine per cent of A-C and D rated properties, respectively. Similarly, the mean fuel poverty gap was much higher (£1274) in the lowest rated properties (G) compared to those rated A-C (£370), and D (£209).

[12] It is based up on the predicted running costs of a dwelling per square metre of floor area (independent of occupancy) under a defined set of conditions. SAP ratings run from 1 (lowest level of energy cost efficiency) to 100 (highest level). These ratings can also be banded into A to G bands (with A being the highest).

Chart 3.1: Fuel poverty by SAP band, 2013



This correlation between SAP and fuel poverty is to be expected. Both are based on the running costs of the property, and a property with a high running cost under the fuel poverty methodology is highly likely to have a high running cost under SAP. SAP ratings, however, are based on the fuel costs per square metre of floor area, whereas the fuel poverty methodology uses the total running cost of the property across the whole floor area. This helps to explain how a property can have a high SAP rating but still be considered fuel poor. For example, a large, but otherwise energy efficient dwelling may have a good SAP rating because the fuel costs are considered per square metre, but may still have higher than median fuel poverty fuel costs because of the overall size of the dwelling.

This can be seen in Table 3.1 which shows the median floor area for dwellings in each of the SAP energy efficiency bands, split by fuel poverty status. It can be seen that, in the higher bands, the mean floor area is greater for fuel poor households than households that are not fuel poor.

Table 3.1: Median floor area (m^2) by SAP band and fuel poverty status

Fuel poverty status	SAP band: Median floor area (m^2) of household				
	G	F	E	D	A-C
Not in fuel poverty	86	99	91	81	75
In fuel poverty	83	78	83	94	156

The difference in floor areas is also reflected in the fuel bill for all households, with fuel poor households in the higher bands having higher fuel bills than non-fuel poor households in these bands (Table 3.2). It is apparent that at the lowest levels of

energy efficiency there is relatively little difference between the median fuel costs of those in fuel poverty and those not in fuel poverty. At the highest levels of energy efficiency, however, a much larger difference can be seen.

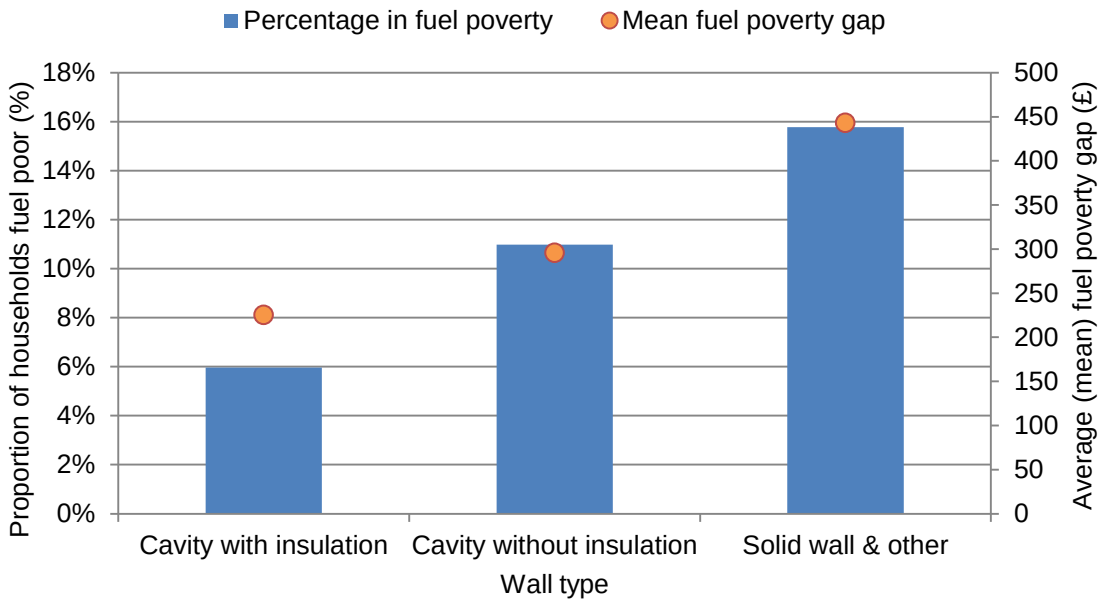
Table 3.2: Median equivalised fuel costs (£) by SAP band and fuel poverty status

Fuel poverty status	SAP band: Median equivalised fuel cost (£)				
	G	F	E	D	A-C
Not in fuel poverty	2561	2067	1545	1200	961
In fuel poverty	2649	2039	1543	1370	1354

3.1.2 Wall type

It is also interesting to consider how fuel poverty varies by the energy efficiency of dwelling elements, such as wall type. In the EHS, walls are generally classified into three types: cavity walls with insulation, cavity walls without insulation and solid walls (this group also includes a small number of other wall types). It can be seen in Chart 3.2 that the incidence of fuel poverty is lowest for households living in dwellings with the most energy efficient walls: cavity walls with insulation (6%). The highest incidence of fuel poverty is found in dwellings with solid walls (16%), with uninsulated cavity walls in between them both (11%). The average fuel poverty gap follows the same pattern, with those with insulated cavity walls with the lowest average fuel poverty gap and those with solid walls with the highest average gap. This reflects that insulated cavity walls are generally assumed to have the best performance, and uninsulated solid walls the worst.

Chart 3.2: Fuel poverty by wall type



3.1.3 Floor area

Chart 3.3 shows the proportion of households which are fuel poor increases as dwellings increase in size. Approximately five per cent of the smallest dwellings (less than 50 square metres floor area) are in fuel poverty, compared to 12 per cent of those with a floor area greater than 90m^2. This reflects the nature of the LIHC indicator, as households living in these larger properties tend to also have higher incomes (Table 3.3). However, fuel poor households in larger homes tend to be deeper in fuel poverty: the mean fuel poverty gap is around £300 in the smallest homes, compared to approximately £570 in the largest.

Chart 3.3: Fuel poverty by floor area

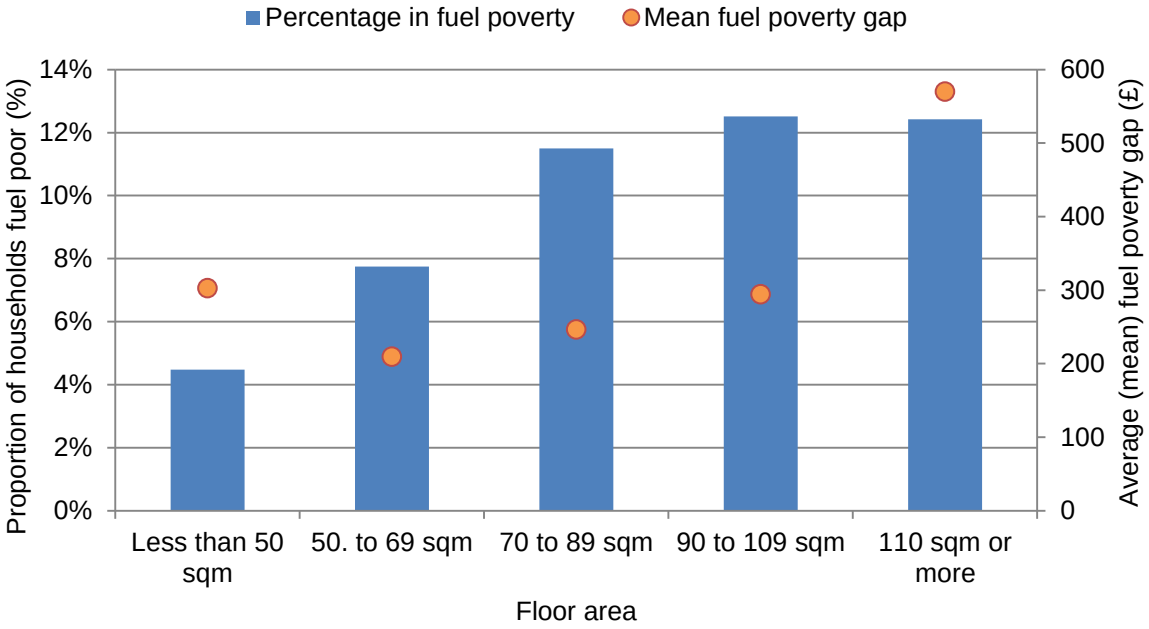


Table 3.3: Median equivalised AHC income by floor area

	Floor area (m^2)				
	Less than 50 m^2	50-69 m^2	70 - 89m^2	90 - 109 m^2	110 m^2 or more
Median equivalised AHC income (£)	15791	17568	18687	21735	27538

3.1.4 Dwelling age

Dwelling age is closely related to both the energy efficiency of the dwelling, and the floor area. Older properties tend to be less energy efficient and larger. We would, therefore, expect them to have higher fuel costs and be more likely to be fuel poor. Indeed, this relationship is shown in Chart 3.4 below, which shows households living in the oldest properties (those built before 1919) are more likely to be fuel poor than those living in more recent properties. As we consider households living in

progressively newer homes we see the proportion in fuel poverty decrease from 19 per cent in pre-1919 homes to three per cent in post-1990 homes. A similar pattern is seen in the fuel poverty gap which decreases from approximately £500 in pre-1919 homes to £250 in homes built after 1945. The energy efficiency (SAP rating) and fuel costs of dwellings of different ages are also shown in Table 3.4**.** It can be seen that the more recent dwellings are more energy efficient, and have lower running costs. This helps to protect households living in these properties from fuel poverty.

Chart 3.4: Fuel poverty by dwelling age

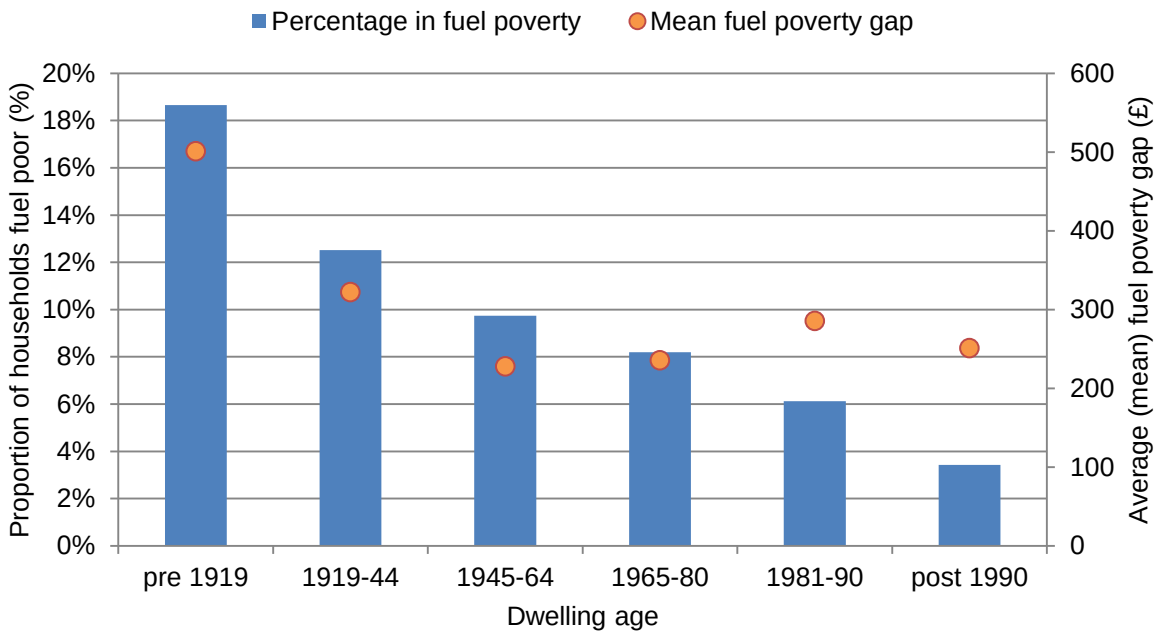


Table 3.4: Mean SAP rating and median equivalised fuel costs by dwelling age

	Dwelling age					
	pre 1919	1919-44	1945-64	1965-80	1981-90	post 1990
Mean SAP rating	50	56	61	62	64	70
Median equivalised total fuel costs (£)	1489	1344	1217	1211	1110	1024

3.1.5 Tenure

There are clear patterns of fuel poverty by tenure that reflect both the nature of the dwelling stock in each tenure, and household characteristics such as income. Chart 3.5 shows the proportion of fuel poor households in each tenure and Table 3.5 shows the average SAP rating and income of each tenure. It can be seen that the level of fuel poverty is considerably higher in the private rented sector (19 per cent of all households in this tenure are fuel poor). This tenure is also associated with

relatively poor energy efficiency ratings (a mean SAP of 59) and relatively low incomes (median equivalised AHC income of £15,074) which are likely to be key drivers of the level of fuel poverty.

Owner occupied households have equivalent levels of energy efficiency to the private rented sector (a mean SAP rating of 59) but higher average incomes (median equivalised AHC income of £24,657). The higher incomes in this group acts to reduce the level of fuel poverty in this group, to less than half that seen in the private rented sector (approximately eight per cent of owner occupied households are fuel poor).

Around one in ten households in the social rented tenures are fuel poor – both local authority homes and Registered Social Landlord (RSL) homes show similar levels of fuel poverty (12% in local authority properties and 10% in RSL properties). This is despite the low incomes of households in the social sector (median equivalised AHC incomes of £13,662 in local authority homes and £13,344 in RSL homes). This can be explained by the relatively high energy efficiency of these properties and smaller floor areas, both of which act to reduce the fuel costs protecting many households from fuel poverty. These factors also act to reduce the depth of fuel poverty for those households in the social rented tenures that are fuel poor.

Chart 3.5: Fuel poverty by tenure

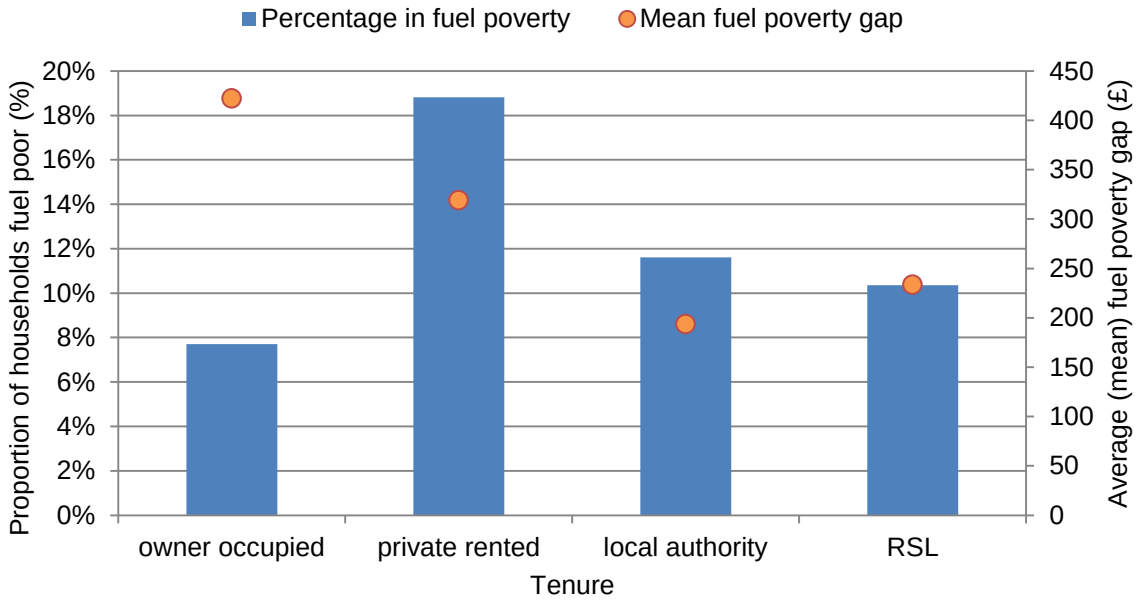


Table 3.5: Mean SAP rating and median equivalised AHC income by tenure

	Tenure			
	owner occupied	private rented	local authority	RSL
Mean SAP rating	59	59	65	66
Median equivalised AHC income (£)	24657	15074	13662	13345

3.1.6 Gas network

Mains gas is, typically, one of the cheapest fuels for providing heat to a home. Dwellings not connected to the gas network generally use more expensive alternatives such as fuel oil or electricity. As a result we see a higher proportion of households in fuel poverty in dwellings off the gas network than on it, as seen in Chart 3.6. Approximately 14 per cent of those off the gas network are fuel poor, compared to 10 per cent of those on it. Table 3.6 suggests that the incomes of these two groups are relatively close, but the SAP ratings are substantially different (a mean of 51 off the gas network, compared to 61 on the gas network). It is likely, therefore, that it is energy cost differences that are principally behind the different levels of fuel poverty in the two groups.

Chart 3.6: Fuel poverty by connection to mains gas

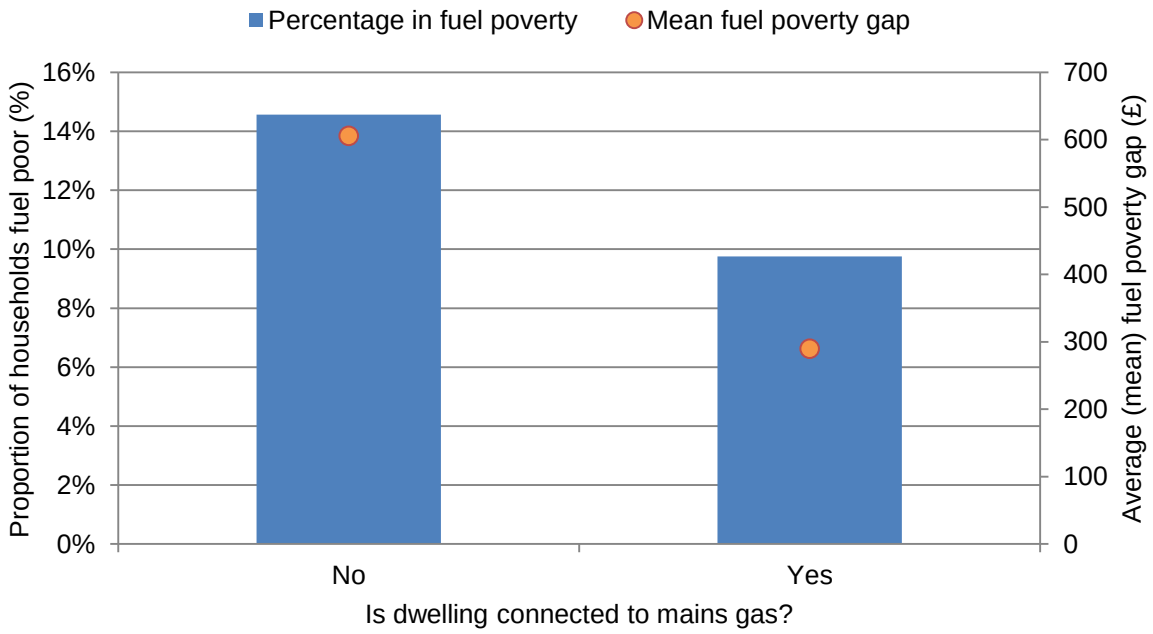


Table 3.6: Mean SAP and median equivalised AHC income by whether dwelling connected to mains gas.

	Is dwelling connected to mains gas?	
	No	Yes
Mean SAP rating	52	61
Median equivalised AHC income (£)	20150	20389

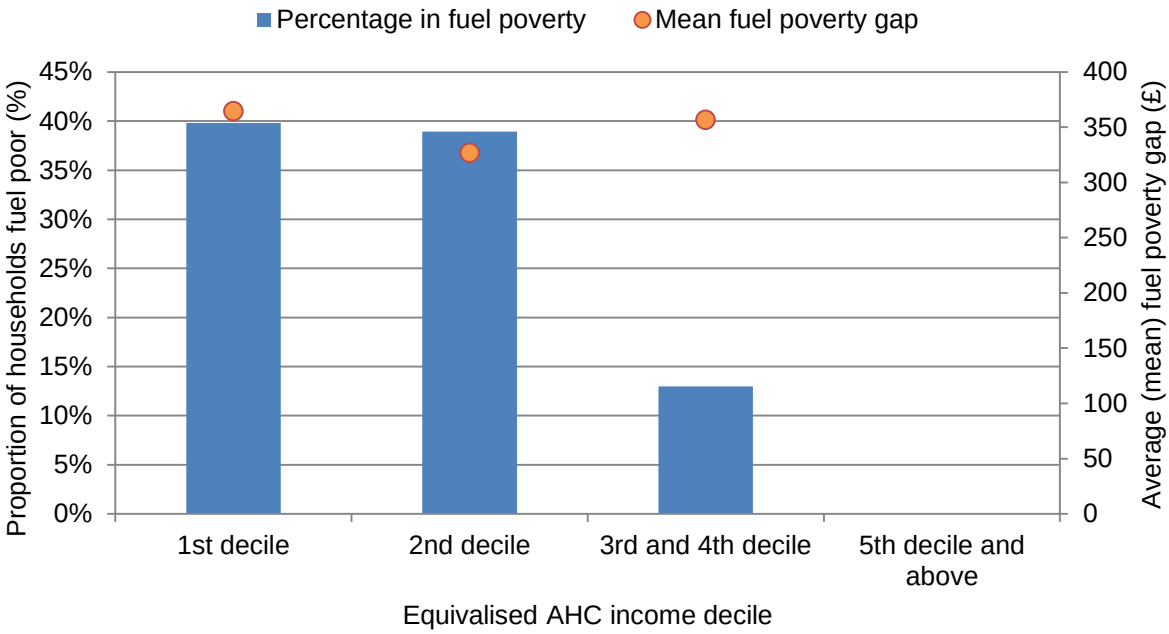
3.2 Household income

3.2.1 Equivalised household income

Household incomes (after housing costs) are used to delineate the income threshold under the LIHC definition and so households classed as fuel poor will only be from the lower end of the income spectrum.

Chart 3.7 shows that fuel poverty is highest in the lowest income decile, with 40 per cent of these households being fuel poor. A similar proportion of the second decile (39%) are fuel poor, and 13 per cent of the 3rd and 4th deciles are fuel poor (no households in the 5th decile and above are fuel poor). The mean fuel poverty gap is approximately the same across all deciles (around £350).

Chart 3.7: Fuel poverty by equivalised AHC income



3.2.2 Working status

Chart 3.8 shows there is a large difference in the incidence of fuel poor between those that are unemployed and those that are working: 32 per cent of the unemployed group are fuel poor compared to approximately 10 per cent of working and other inactive households. These patterns can be understood by considering Table 3.7. The AHC incomes of the inactive group (primarily pensioners) are, in fact much higher than the unemployed group (and much closer to the working group). This is likely to be partially due to low or zero housing costs of many older households who have small mortgages, or own their homes outright. It is likely that this level of income is able to protect this group from fuel poverty to a large extent. The depth of fuel poverty, however, of the unemployed group is slightly lower than

fuel poor working or inactive households which may reflect the smaller properties which tend to be occupied by households with this working status.

Chart 3.8: Fuel poverty by employment status

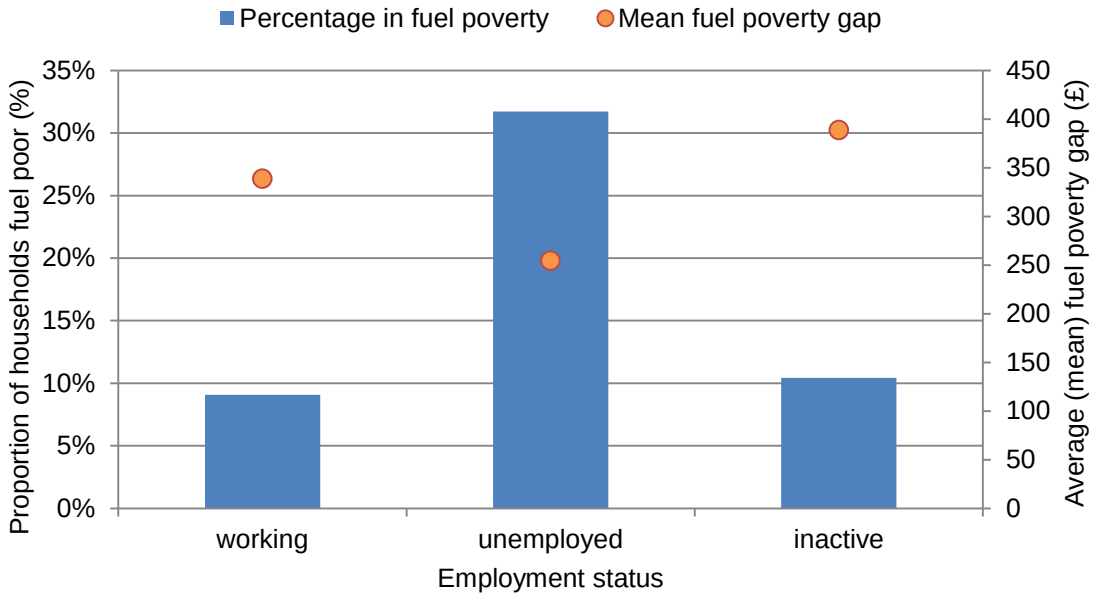


Table 3.7: Median equivalised AHC income (£) by working status

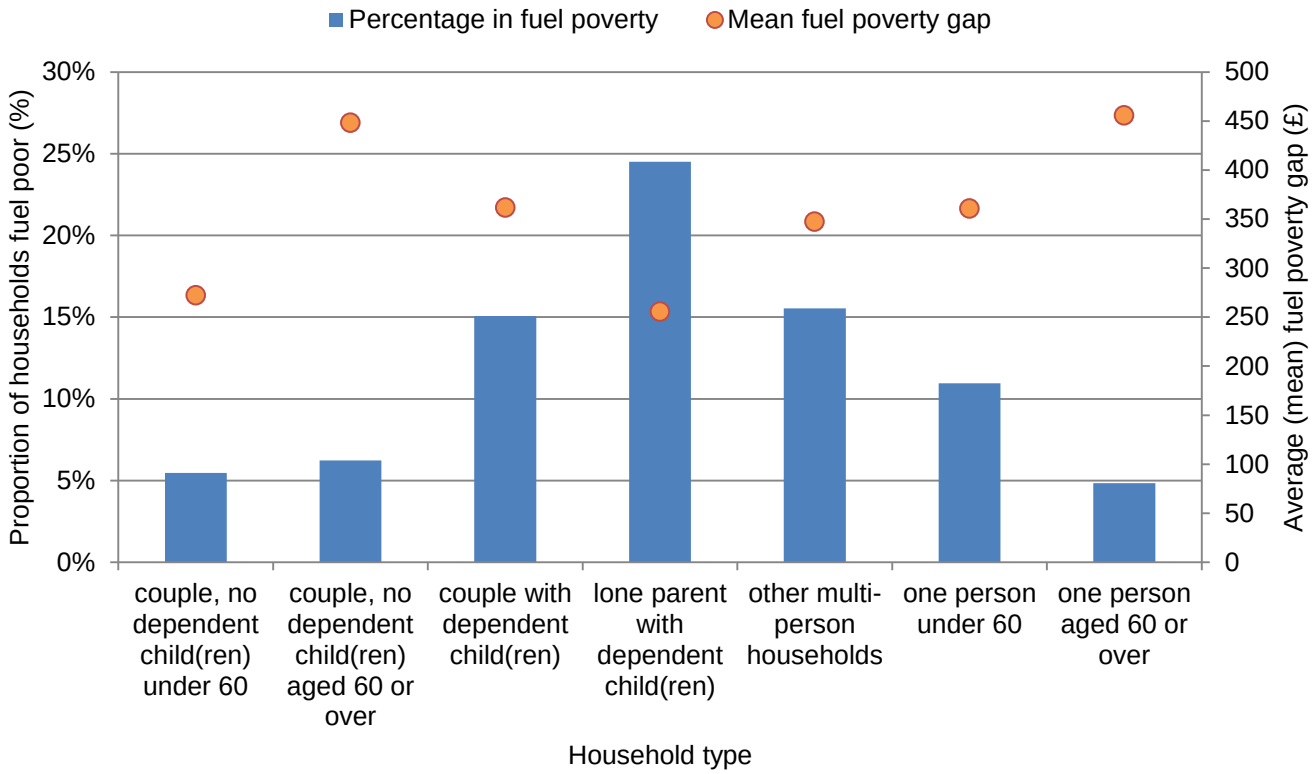
	Working status of HRP		
	working	unemployed	inactive
Median equivalised AHC income (£)	22826	7901	18784

3.3 Household characteristics

3.3.1 Household type

Fuel poverty rates vary by household composition as shown in Chart 3.9. Lone parent households are the most likely to be in fuel poverty (25% of this group) with couples without dependent children (of all ages) and single elderly households the least likely groups to be fuel poor (approximately five per cent of these groups).

Chart 3.9: Fuel poverty by household type



Despite a large proportion of the lone parent group being fuel poor, the average fuel poverty gap for this group is the lowest. This reflects the fact lone parents are likely to have a low AHC equivalised income (pushing up the number of households in fuel poverty), but occupy dwellings which tend to be smaller, and more likely to be in the (energy efficient) social sector. Both of these factors will result in reduced fuel bills and relatively smaller fuel poverty gaps.

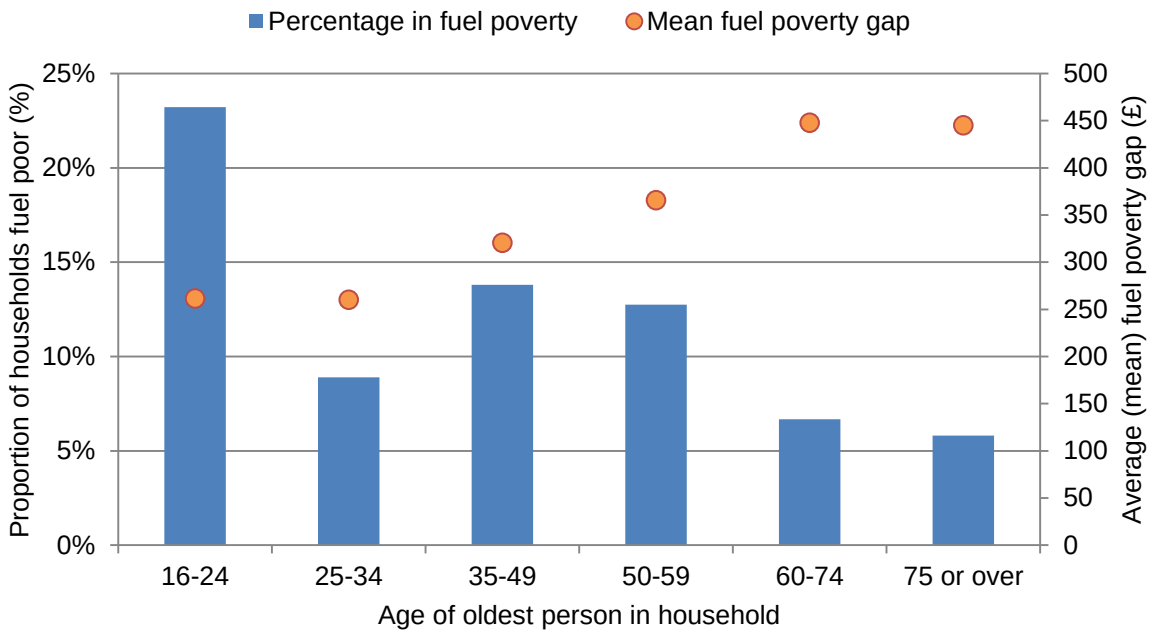
3.3.2 Age.

Chart 3.10 shows the breakdown of fuel poverty by the age of the oldest person in the household. Those households where the oldest person is younger than 25 are the most likely to be in fuel poverty (23%), but also have a relatively small average fuel poverty gap. The high proportion of these households that are fuel poor reflects the relatively low incomes of this group.

There is no clear pattern in the proportion of households which are fuel poor in progressively older occupants. There is, however, a clear pattern of increasing depth of fuel poverty in older households. Those where the oldest occupant is aged less 34, for example, have a mean fuel poverty gap of approximately £260, whereas those aged over 60 have a gap of around £450. This may reflect the longer heating requirement for older households who are more likely to be at home in the week, and

therefore considered to be heating for longer periods under the fuel poverty methodology.

Chart 3.10: Fuel poverty by age of oldest person in household



3.3.3 Household size

The rate of fuel poverty is higher in larger households than in smaller households. This effect can be seen in Chart 3.11. The proportion of fuel poor households is highest in households, with five or more persons (26%), and lowest in those with two persons (7%). In single person households the level of fuel poverty (8%) is slightly higher than for two person households. This may be because of the lower incomes of this group (Table 3.8).

Chart 3.11: Fuel poverty by number of persons in household

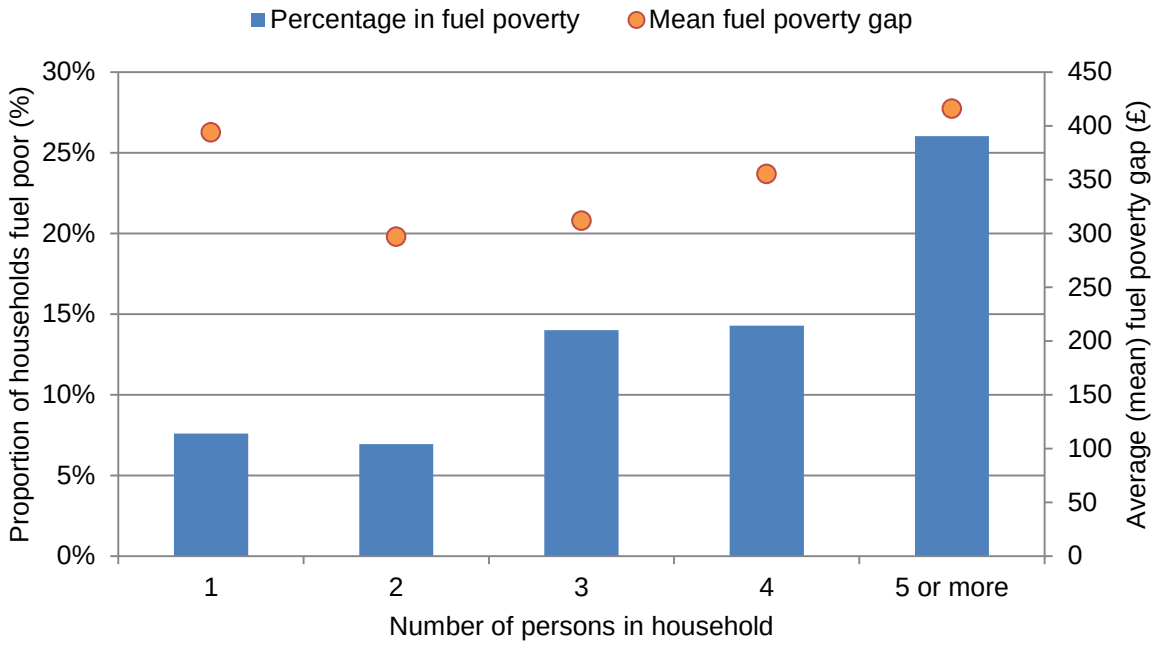


Table 3.8: Median equivalised AHC income by number of persons in household

	Number of persons in household				
	1	2	3	4	5 or more
Median equivalised AHC income (£)	20123	23465	19232	18042	13440

3.4 Fuel payment type

3.4.1 Method of payment for gas.

Expenditure on heating is a key element of household energy use, and gas is the main fuel used for heating in England. Chart 3.12 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.

Households who pay for their gas by direct debit have the lowest fuel poverty rate (6%). Those paying by standard credit have a higher incidence (16%), whereas those paying by pre-payment have the highest incidence (21%). These differences, to an extent, reflect genuine differences in the tariffs assigned. The method of payment, however, reflects many other characteristics of the property including tenure and income. The median AHC income for households paying by each method of payment is shown in Table 3.9 for comparison with Chart 3.12. The fuel poverty gap is, however, relatively similar for all households. This may reflect that

the households paying by pre-payment are more likely to be in smaller housing, and energy efficient social housing which restrict the depth of fuel poverty in many cases.

Chart 3.12: Fuel poverty by method of payment for gas

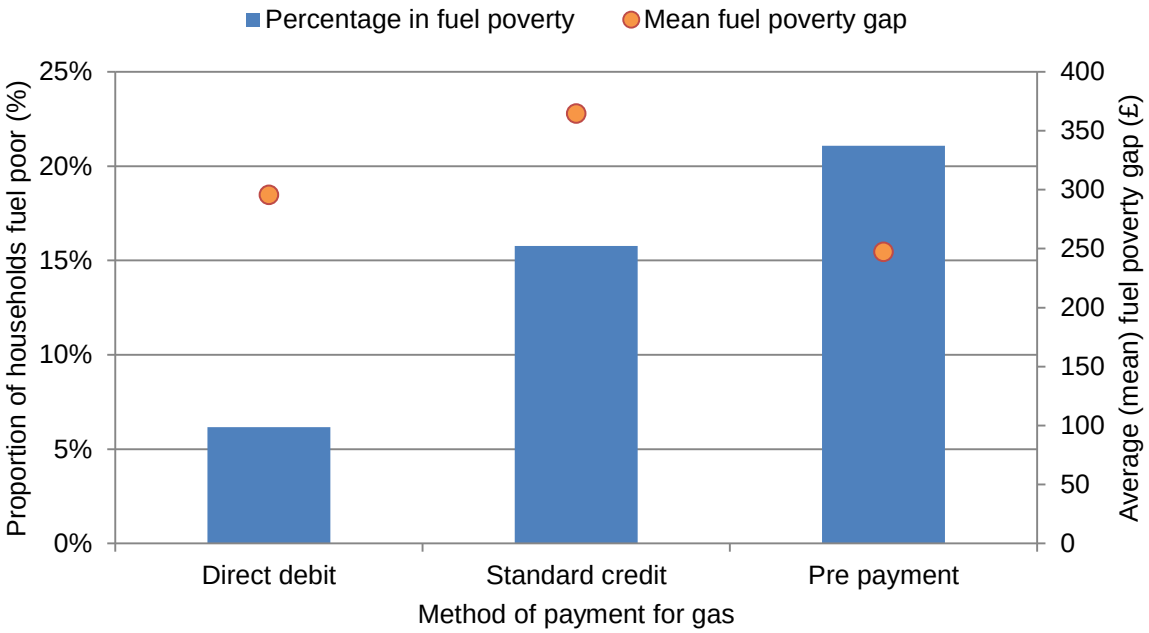


Table 3.9: Median equivalised AHC income split by method of payment for gas

	Gas method of payment		
	Direct debit	Standard credit	Pre-payment
Median equivalised AHC income (£)	23494	17983	12134

3.4.2 Method of payment for electricity.

A similar pattern for electricity is shown in Chart 3.13. Households who pay for their electricity by direct debit have the lowest incidence of fuel poverty (7%). Those paying by standard credit have a higher incidence (15%), whereas those paying by pre-payment have the highest incidence (22%).

The same reasons for patterns apply as for gas, namely that there are differences in the levels of the tariffs for each method of payment, but also that the method of payment acts as proxy for income and other factors, with pre-payment households tending to be in low income groups. The median equivalised AHC income for households paying by each method of payment category is shown in Table 3.10.

Chart 3.13: Fuel poverty by method of payment for electricity

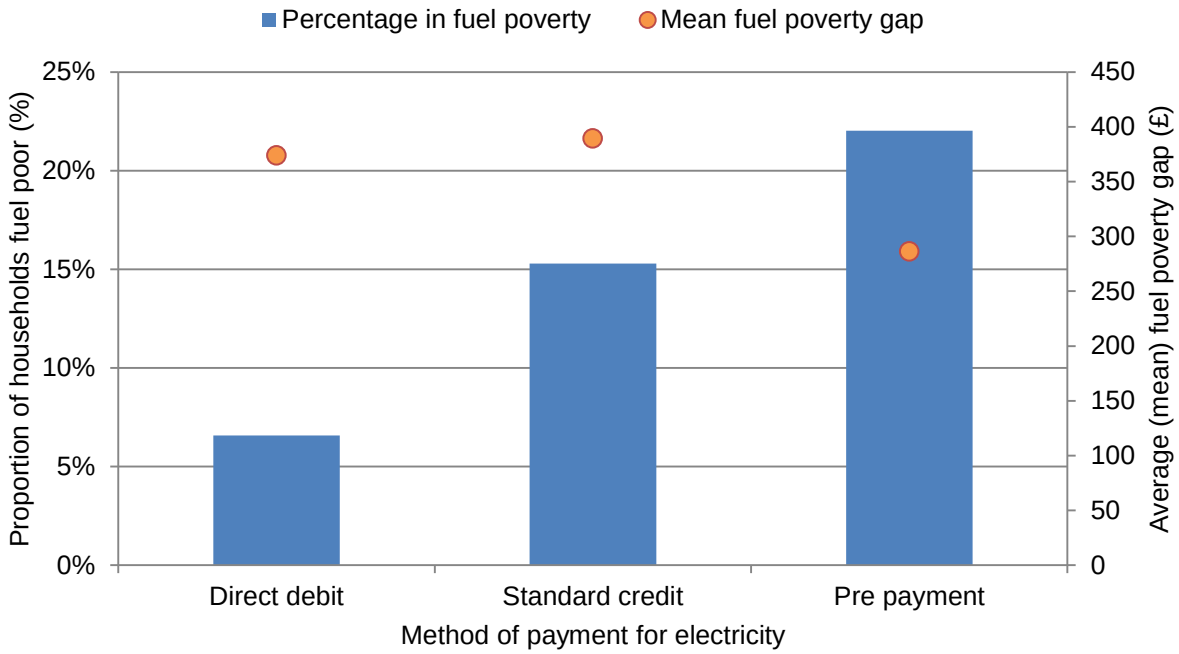


Table 3.10: Median equivalised AHC income split by electricity method of payment

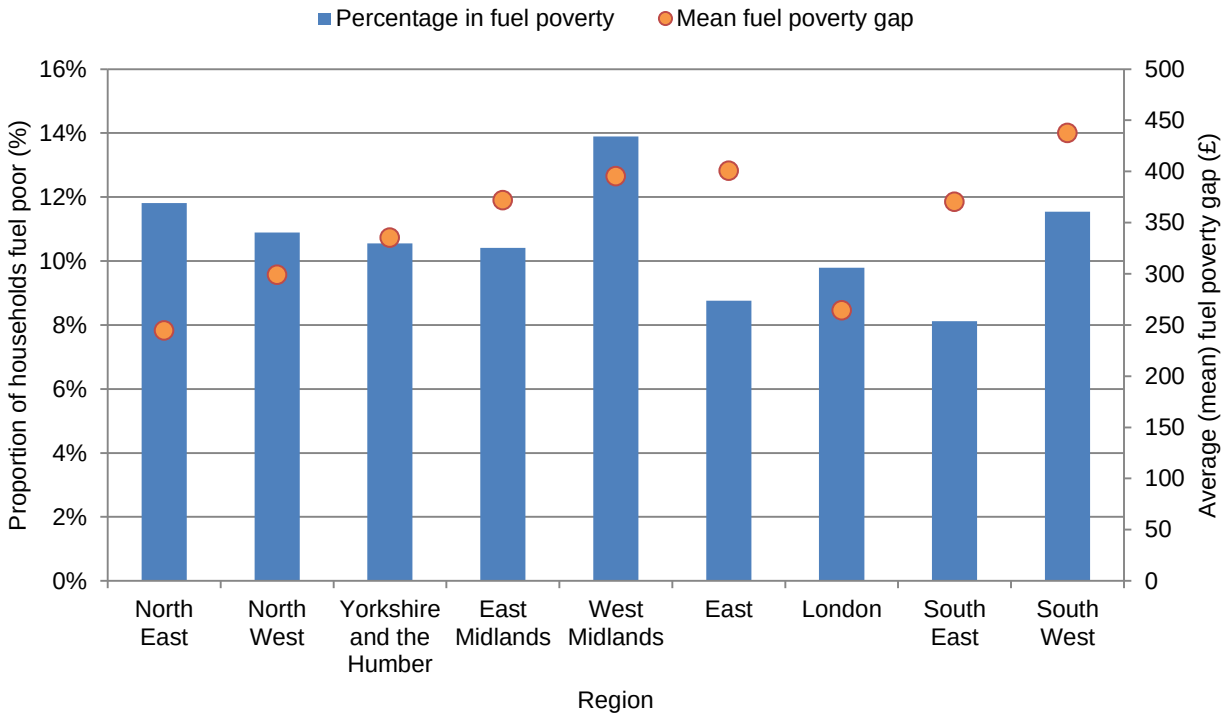
	Electricity method of payment		
	Direct debit	Standard credit	Pre-payment
Median equivalised AHC income (£)	23455	17986	12366

3.5 Regional fuel poverty

When fuel poverty is considered regionally a number of differences become apparent. These differences tend to reflect the age of the stock, the climatic conditions and relative income levels across the country.

As shown in Chart 3.14, households in the West Midlands have the highest incidence of fuel poverty of all regions in England (14%). Households in the South East have the lowest incidence (8%). The West Midlands tends to have relatively old, relatively inefficient housing and relatively low household incomes, whereas in the South East, there are more modern households and also more households with higher than average incomes.

Chart 3.14: Fuel poverty by region



Chapter 4: Trends in Fuel Poverty, 2003 to 2013

This chapter considers some of the key changes in fuel poverty between 2003 and 2013 in England under the Low Income High Cost (LIHC) indicator. These figures have been recalculated based on the latest version of the energy model (see section 1.5.1). Changes in household characteristics and energy efficiency are explored in detail.

Detailed analysis of trends in fuel poverty can be useful in identifying factors that have a large effect on the number of households in fuel poverty, and the fuel poverty gap. However, there are limitations to this analysis. In particular, interaction effects between variables may exist, where the correlation of variables could impact the fuel poverty statistics. As well as this, the reduction in the number of cases that are produced as a result of the variable splits, and difficulty in performing further statistical analysis, mean that results are descriptive and for guidance only.

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 2013, 2.35 million households were in fuel poverty compared with 2.36 million households in 2012, representing a reduction of 0.5 per cent. Discussion of the reasons behind this change can be found in Chapter 2.

There has, overall, been a small fall in both the total number and percentage of fuel poor households between 2003 (2.4 million households, 11.7 per cent of all households) and 2013 (2.3 million households, 10.6 per cent of all households).

4.1 Dwelling characteristics

4.1.1 SAP

The SAP rating is used to measure the energy efficiency of a property and so is closely related to fuel poverty. Households are more likely to be in fuel poor if they live in properties with a low SAP bands - this trend is apparent from 2003 to 2013.

When considering how the relationship between SAP and fuel poverty may have changed, it is important to understand how SAP has altered more generally over time. Chart 4.1 shows the proportion of all households in each of the SAP bands, from 2003 to 2013. The proportion of properties in SAP bands A-D has increased from just over a third, to three quarters of the housing stock, leading to a corresponding decrease in properties in the E-G SAP bands.

Chart 4.2 shows the proportion of households, in each SAP band, that are in fuel poverty. In 2013, the SAP bands F/G have the largest proportion of fuel poor households at more than 20 per cent. This band has had a fairly consistent level of fuel poverty since

2003. The proportion of fuel poor households in SAP bands A-D has increased from 2003 to 2013. This reflects the shift of households in this band from the lower bands, and the increasing proximity of this band to the fuel cost median threshold under the LIHC indicator, thereby reflecting an improvement in energy efficiency in the housing stock in general.

Chart 4.1: Percentage of all households in each SAP band, 2003 - 2013

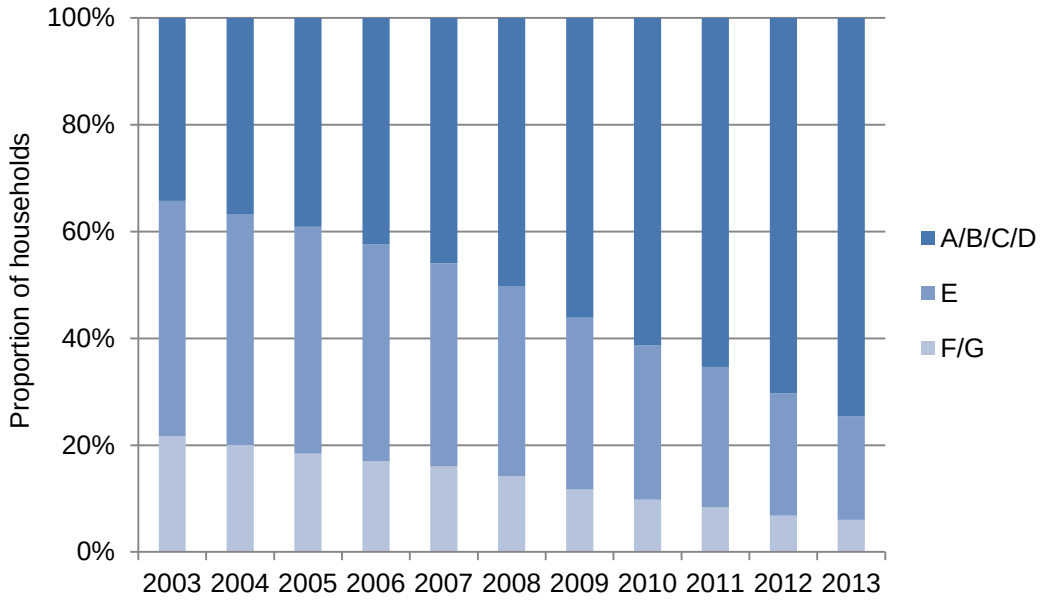
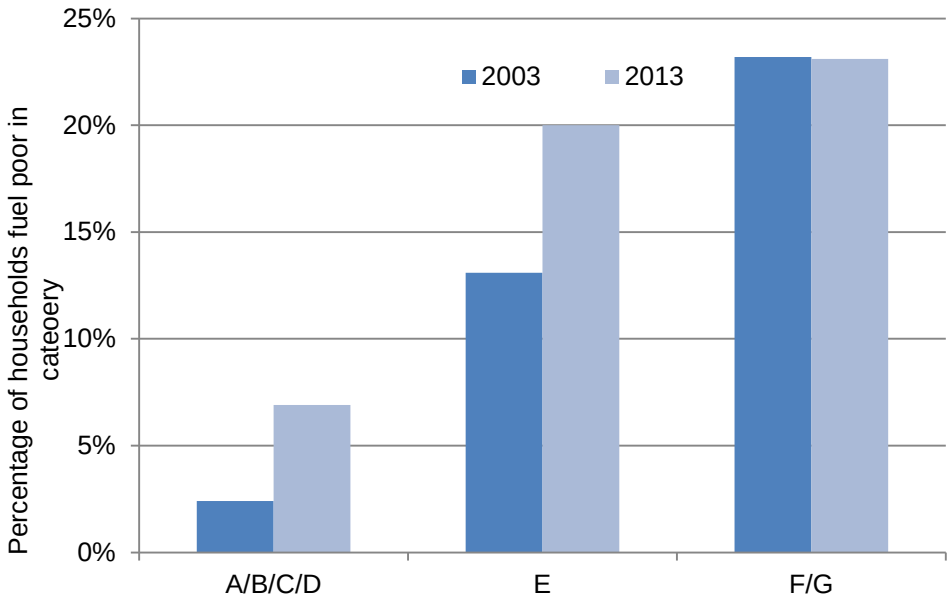


Chart 4.2: Percentage of all fuel poor households in different SAP bands, 2003 and 2013



The fuel poverty gap has increased significantly for all fuel poor households, but particularly so for those with the poorest levels of energy efficiency, classified within the E, F and G SAP band (Table 4.1). This is likely to be due to rising fuel costs which will affect those most with a greater requirement for fuel, because of low levels of energy efficiency.

Table 4.1: Average fuel poverty gap, by SAP band, 2003 - 2013

	SAP rating: Average fuel poverty gap (£) in real terms		
	A/B/C/D	E	F/G
2003	120	123	372
2004	113	129	398
2005	112	159	444
2006	130	245	576
2007	125	207	631
2008	145	265	649
2009	164	283	709
2010	161	289	749
2011	186	340	849
2012	226	360	916
2013	224	377	919

4.1.2 Tenure

As described in Chapter 3, of the different tenure groups, households who are privately renting have had the highest rates of fuel poverty, whilst owner occupied households have had the lowest rates of fuel poverty, and this trend has remained since 2003. The largest change in the proportion of households who were fuel poor between 2003 and 2013 was seen in households living in local authority tenure, falling from 21 per cent in 2003 to 12 per cent in 2013.

The SAP rating for households from 2003 and 2013 is shown in Table 4.2, with higher SAP ratings found in the local authority and housing association tenures. In addition to efficiency improvements, greater income rises (after housing costs) can be observed in housing association and local authority households, compared with privately rented households.

Table 4.2: Average SAP rating for households by tenure and fuel poverty, 2003 and 2013

		Tenure: Mean SAP rating			
		Local authority	Owner occupied	Private rented	Housing association
2003	Fuel poor	41	39	34	42
	Not fuel poor	55	48	49	59
2013	Fuel poor	55	52	50	54
	Not fuel poor	66	59	61	68

Since 2003, households living in all tenure types saw an increase in the fuel poverty gap. The largest increase was seen in owner-occupied dwellings, where the average fuel poverty gap almost doubled between 2003 and 2013 in real terms. The smallest increase was seen in households living in local authority dwellings, where the fuel poverty gap increased by less than 20 per cent. These changes may reflect the improvements in energy efficiency in local authority dwellings over this time and differences in the size of dwellings and therefore fuel costs.

4.1.3 Wall type

There has been an increase in the number of households with cavity wall insulation, from 2003 to 2013, increasing from 25 per cent to 42 per cent of the household stock, as improvements have been made to improve the efficiency of households across the country (Chart 4.3). Of all fuel poor households in 2013 over 30 per cent live in houses with "other" types of wall, primarily uninsulated solid walls, while only 24 per cent have cavity wall insulation. However, the proportion of fuel poor households with cavity wall insulation has increased over time. This pattern has remained since 2003, as shown in Chart 4.4.

Chart 4.3 – Percentage of all households in dwellings of different wall types, 2003 – 2013

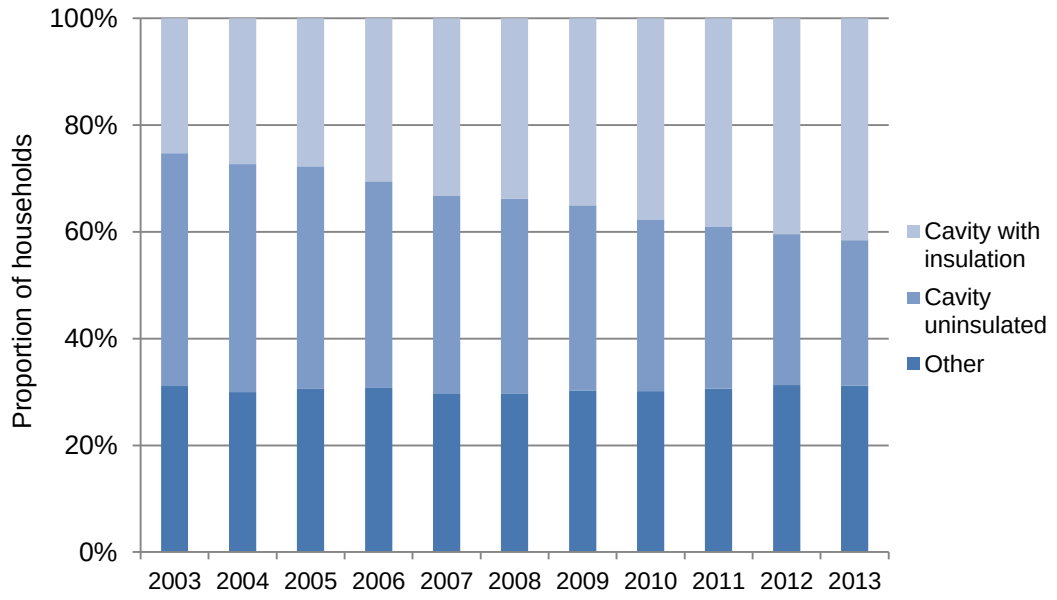


Chart 4.4 – Proportion of all fuel poor households by wall type, 2003 – 2013

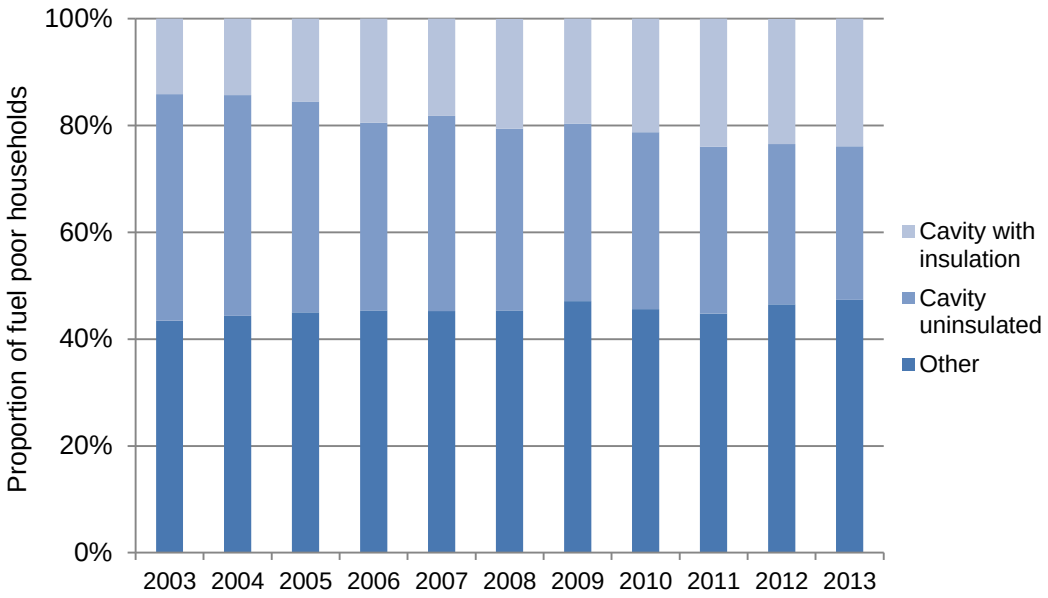


Table 4.3 shows the fuel poverty gap from 2003 to 2013, in real terms, for households of differing wall type. The fuel poverty gap is largest for households with "other" wall types (dominated by uninsulated solid walls), where the fuel poverty gap has increased by almost £200 in real terms, from 2003 to 2013. This group of households showed the largest increase in fuel costs since 2003, compared to households with cavity walls, which is reflected in this large fuel poverty gap.

Table 4.3 – Average fuel poverty gap, by wall type, 2003 - 2013

	Wall type: Average fuel poverty gap (£) in real terms		
	Cavity with insulation	Cavity uninsulated	Other
2003	181	198	279
2004	144	200	298
2005	139	213	330
2006	179	303	409
2007	178	284	418
2008	200	291	439
2009	225	341	419
2010	226	323	425
2011	235	336	489
2012	242	326	496
2013	246	310	477

4.1.4 Loft insulation

Similar to the long term trends of fuel poverty with wall type, the proportion of all households with thicker loft insulation (>125 mm) has increased from 2003 to 2013 (Chart 4.5), and this trend was mirrored by households who are fuel poor (Chart 4.6). For all of the years, households without any loft insulation are over-represented among the fuel poor group.

Chart 4.5: Percentage of all households with loft insulation, 2003 - 2013

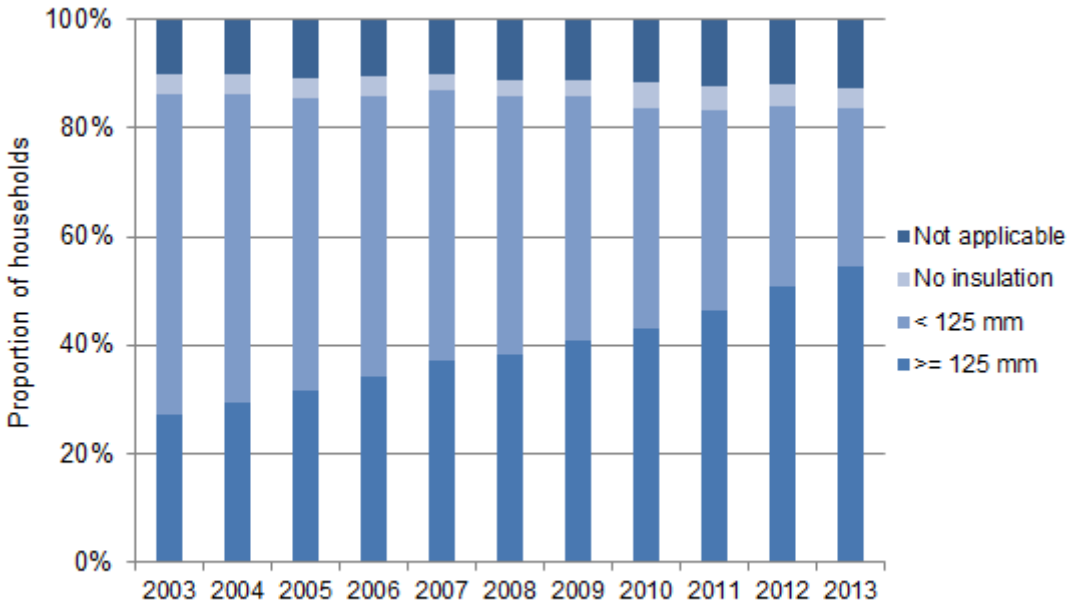
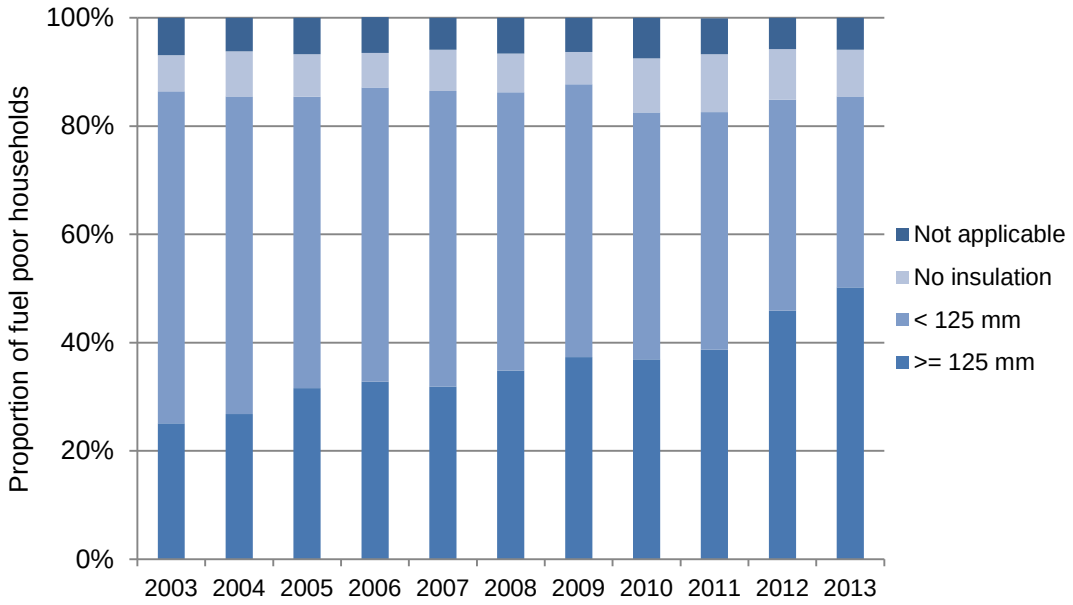


Chart 4.6: Percentage of fuel poor households with loft insulation, 2003 – 2013



The fuel poverty gap in households with no loft insulation was also the largest value in real terms, due to higher fuel costs associated with heating these homes. They also showed the largest rise in fuel costs and therefore also the greatest change in the fuel poverty gap, from 2003 to 2013.

4.1.5 Boiler type

Changes in the proportion of fuel poor households by boiler type reflect changes in the types of systems in use across all households.

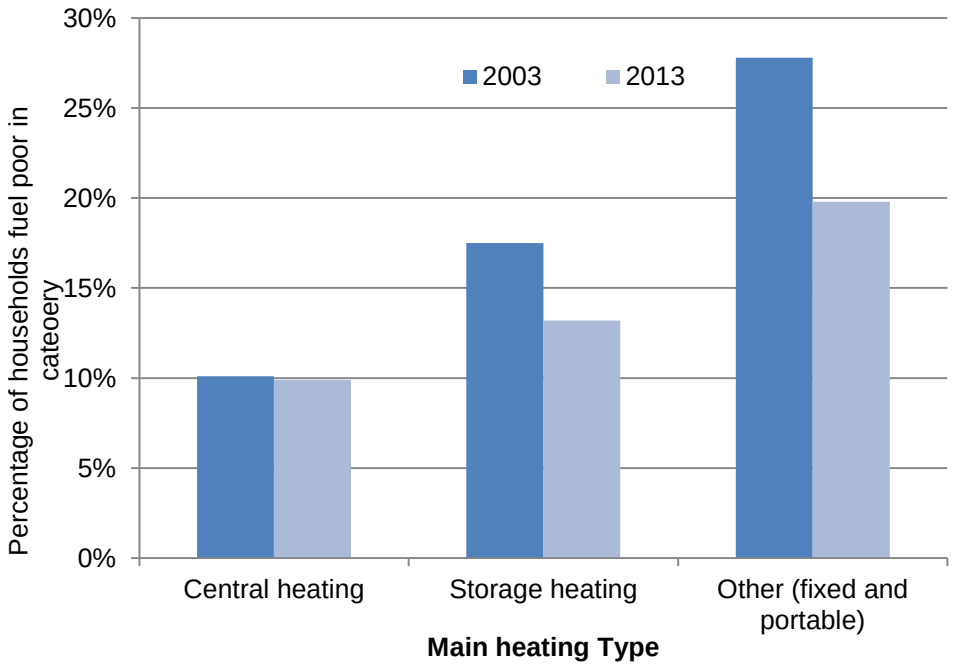
The most significant change in boiler type has been an increasing trend for condensing boilers, replacing non-condensing boilers in households since 2005, partially as a result of a change in building regulations. In 2013, across all households, condensing systems can now be found in approximately 50 per cent of all homes (Chart 4.7). Over 60 per cent of the fuel poor, however, are still using non-condensing boilers or systems without a boiler (e.g. storage radiators or fixed heater systems). The high proportion of fuel poor households in this group reflects the relatively high costs of these systems, which also contribute to a greater fuel poverty gap among households with these systems.

Chart 4.7: Percentage of all households with different boiler type, 2003 – 2013

4.1.6 Main heating type

The proportion of households that have central heating and are in fuel poverty has remained at a similar level since 2003. For those with other types of systems, the proportion of fuel poor households have decreased across this time period (Chart 4.8).

Chart 4.8: Percentage of households with different types of main heating type that are fuel poor, 2003 and 2013



The fuel poverty gap has increased for all households with different heating types. Those with fixed or portable heater systems saw the largest rise in the fuel poverty gap.

4.2 Household working status

4.2.1 Employment status

In this analysis, employment is defined as the employment status of the household reference person (HRP) 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 and fewer than 10 per cent of working households in fuel poverty over this time (Chart 4.9). 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 or inactive households who are fuel poor has fallen by approximately eight per cent.

Inactive households make up a larger proportion of all households, at almost 40 per cent, whereas unemployed households make up fewer than five per cent. The decreasing proportion of households who are fuel poor and inactive can be explained by the reduction in the number of elderly and vulnerable households from fuel poverty. After Housing Costs (AHC) incomes have also risen considerably (by almost fifty per cent) for all inactive households (Table 4.4), which is likely to have lifted many of these households out of fuel poverty.

Chart 4.9: Percentage of households of different working status of the HRP that are fuel poor, 2003 and 2013

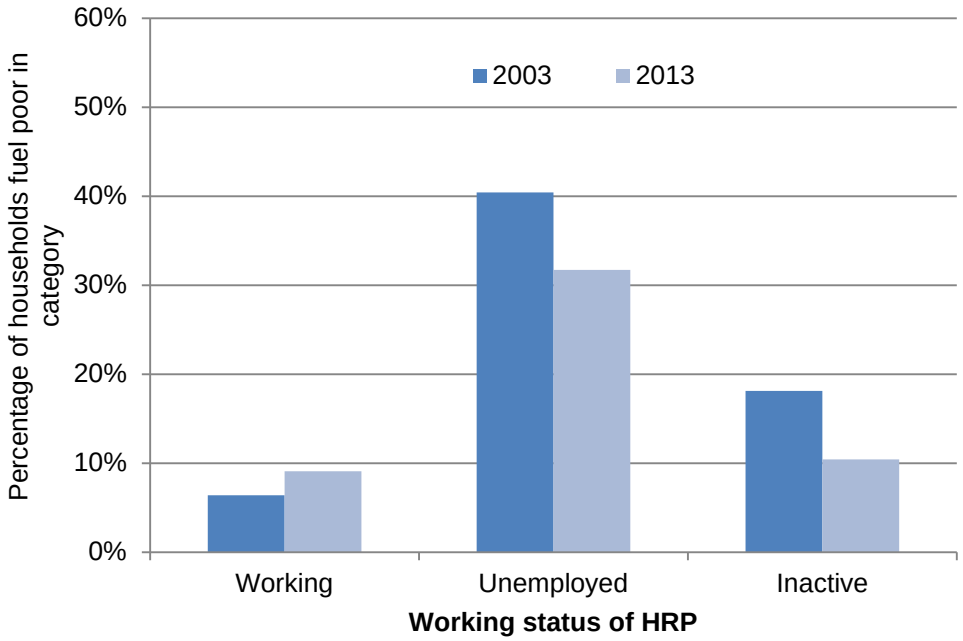


Table 4.4: Average equivalised after housing costs income for households by employment status and fuel poverty, 2003 and 2013

		Employment status: Mean equivalised after housing costs annual income (£)		
		Employed	Unemployed	Inactive
2003	Fuel poor	6692	4942	7118
	Not fuel poor	23222	7447	15282
2013	Fuel poor	8694	6102	9042
	Not fuel poor	29432	8908	22769

The largest increases in the fuel poverty gap between 2003 and 2013 are seen in working and inactive households, where the average fuel poverty gap increased by more than half. Unemployed households saw the smallest increase in the fuel poverty gap between these periods (£21, approximately 9%). In every year since 2003, with the exception of 2013, the working group has had the largest fuel poverty gap.

4.3 Household characteristics

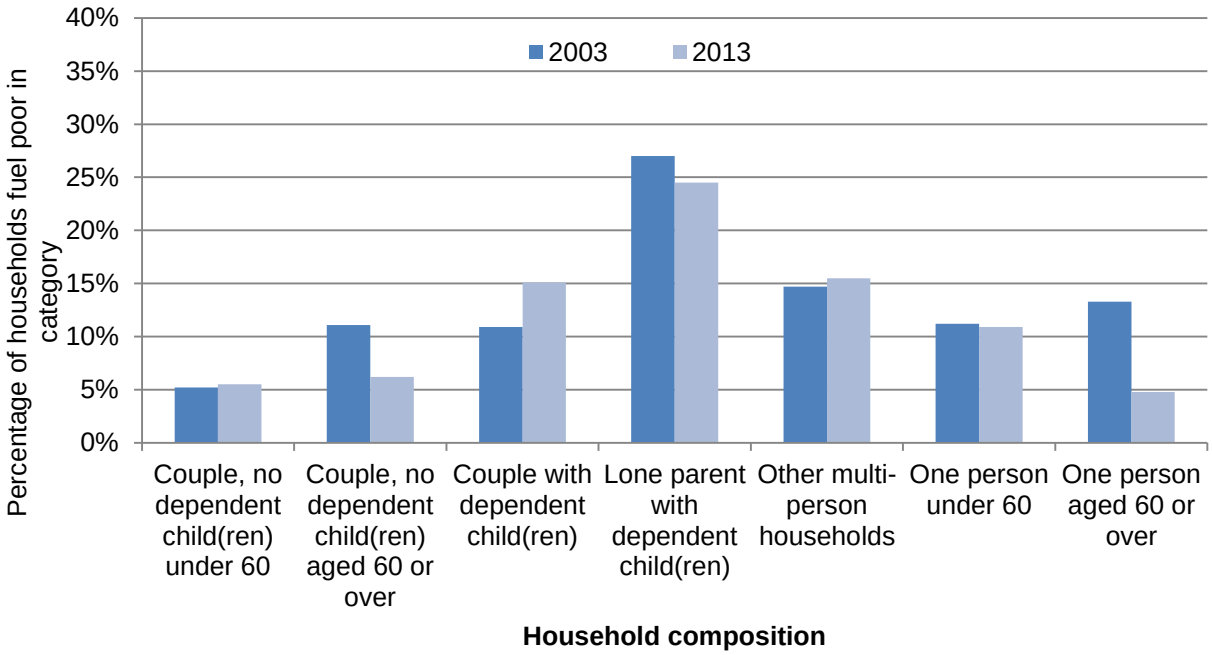
4.3.1 Household composition

A number of the household composition groups saw a decrease in the proportion of households that are in fuel poverty between 2003 and 2013 (Chart 4.10). Single person households with occupants aged over 60, and couples with no dependent children saw a particularly large reduction in fuel poverty. The rise in income was very large for

occupants older than 60, helping to account for the decrease in fuel poverty in this household type.

Couples with dependent children saw the largest increase in the proportion of fuel poor, from 11 to over 15 per cent. However, the highest proportion of fuel poverty is among lone parents with dependent children - on average more than a quarter of households in this group are fuel poor, since 2003.

Chart 4.10: Percentage of households of different compositions that are fuel poor, 2003 and 2013



The average fuel poverty gap has increased in all types of household. Despite the households with older occupants showing the largest fall in fuel poverty rates, the depth of fuel poverty is greater for those older households who remain in fuel poverty.

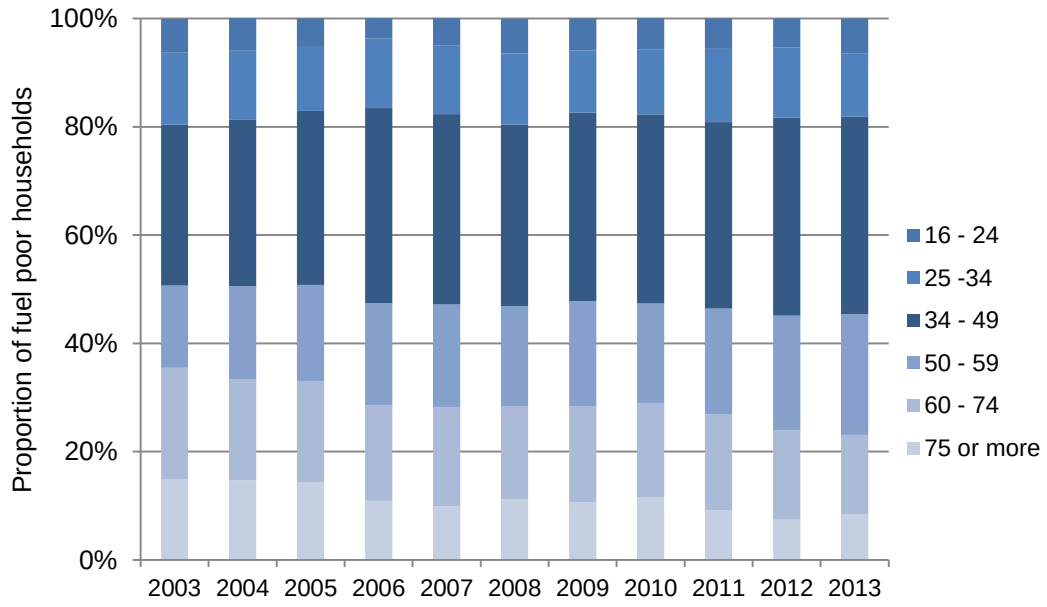
4.3.2 Age of oldest occupant

Households where the oldest occupant is within the age group 16-24 had the highest rates of fuel poverty in 2003 and 2013, with more than 20 per cent of this age group in fuel poverty.

The percentage of fuel poor households with someone over the age of 60 has fallen from more than 35 per cent in 2003 to 23 per cent in 2013 (Chart 4.11). These older households have been replaced by households where the oldest occupant is aged between 34 and 60. The fall in fuel poverty among older households, despite an increase overall in the proportion of these households in the stock, is likely due to rising

incomes in this age band as well as energy efficiency and other policies (e.g. the Warm Homes Discount) targeting this group.

Chart 4.11: Percentage of all fuel poor households by age of the oldest occupant, 2003 – 2013

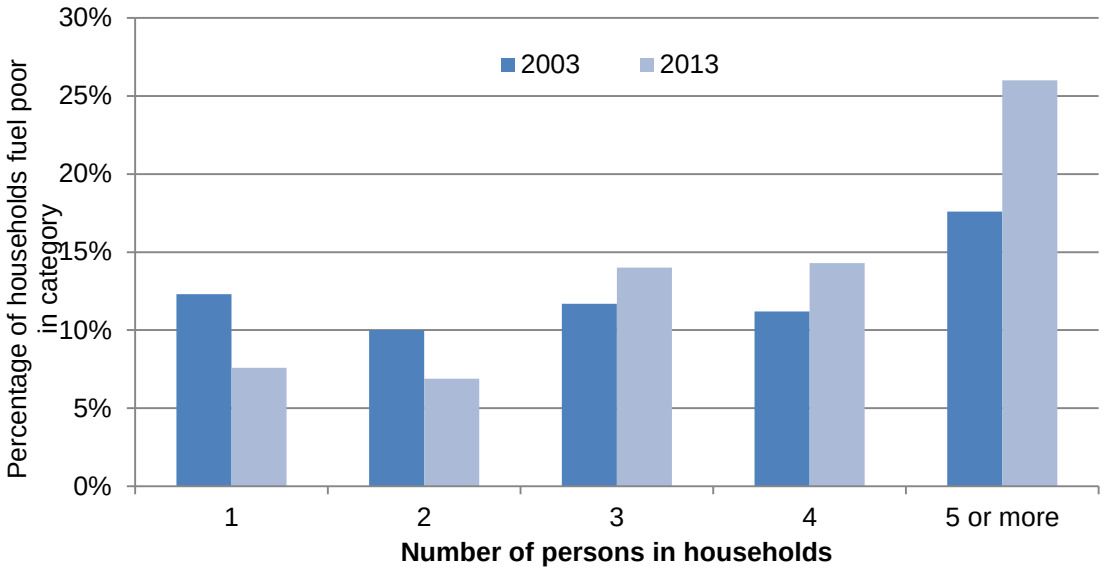


As with household composition, the average fuel poverty gap has increased for all age groups. The smallest proportionate increase was observed in the 16-24 age group, which increased by just over a quarter, whilst the largest proportionate increase was seen in households where the oldest person is aged 60 and over. The average fuel poverty gap for the latter groups has more than doubled in size since 2003.

4.3.3 Household size

The proportion of households of five or more occupants that are fuel poor increased from 2003 to 2013, rising from 18 per cent to more than a quarter of households in this group (Chart 4.12). Households with one or two occupants however, show decreasing levels of fuel poverty. In 2013, approximately seven per cent of two person households are fuel poor, a drop from 10 per cent in 2003. For single person households the change is larger, with approximately seven per cent of this group being fuel poor in 2013, compared to 12 per cent in 2003. This may reflect the age of these households: the average age of HRP has increased for one to two occupant households, and incomes have also risen for those who are not in fuel poverty and are in smaller households (i.e. one or two occupants).

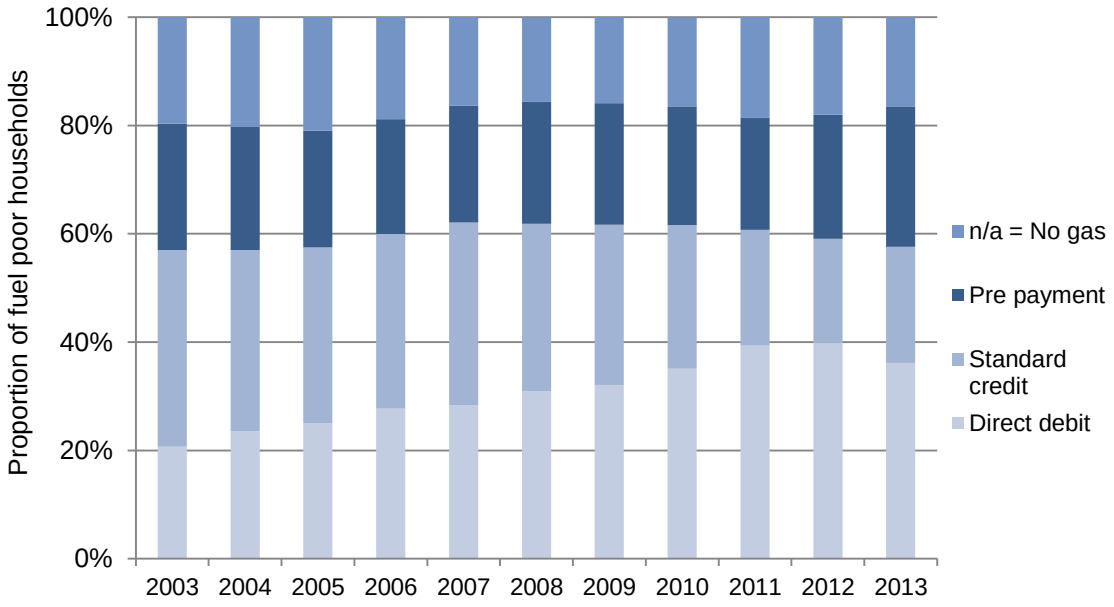
Chart 4.12: Percentage of households of different sizes that are fuel poor, 2003 and 2013



4.3.4 Method of payment – gas

The method of payment for gas in all households across the stock has changed over time from 2003 to 2013, with an increasing proportion of households paying by direct debit, and a decreasing proportion of payments made by standard credit. This trend is mirrored among fuel poor households (Chart 4.13), however, a greater proportion of fuel poor households pay by standard credit and pre-payment methods, in comparison to all households.

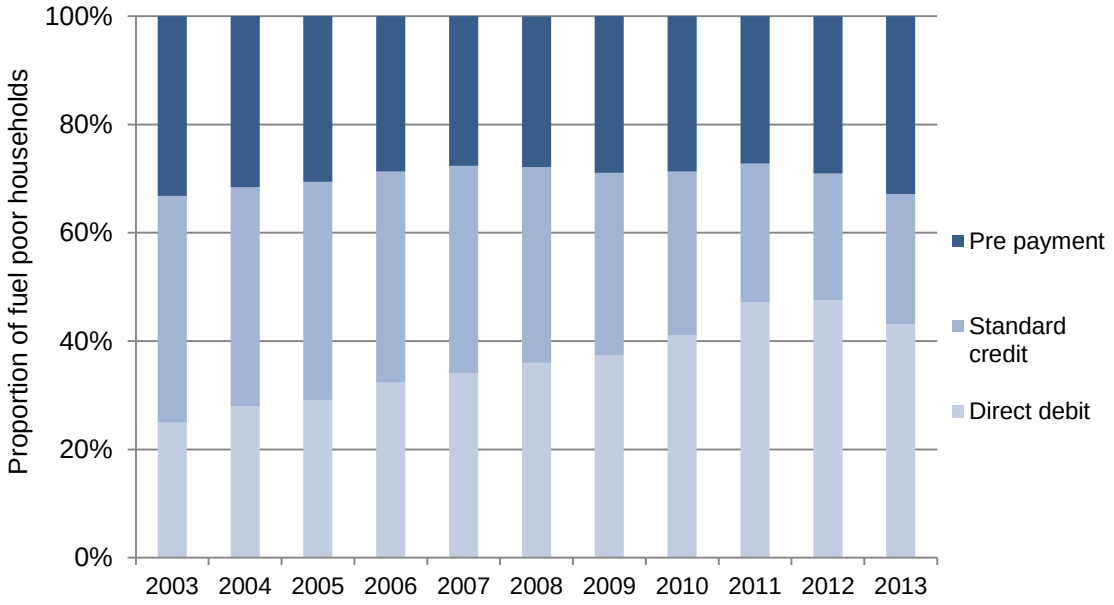
Chart 4.13: Percentage of all fuel poor household using different methods of payment for gas, 2003 – 2013



4.3.5 Method of payment – electricity

The trends for the electricity method of payment show similar patterns to the gas method of payment. It is apparent that the proportion of fuel poor households with pre-payment meters fell until approximately 2011, but has increased slightly since this time (Chart 4.14).

Chart 4.14: Percentage of all fuel poor households using different methods of payment for electricity, 2003 – 2013



4.4 Region

There has been little change in the overall proportion of households in different regions of the country, from 2003 to 2013. However, there has been a slight increase in the proportion of fuel poor households in the South of the country, and a decrease in the North (Chart 4.15). Just over half of all regions saw a decrease in the proportion of households classified as fuel poor in 2013 compared with 2003.

This is especially apparent for households situated in the North East, and Yorkshire and the Humber, which both show a decrease of more than 5 per cent of the fuel poor in each of these groups. As mentioned previously in Chapter 3, regional fuel poverty is likely to be affected by a number of factors, including but not limited to: the dwelling age, the climate conditions, fuel costs and the relative income. Therefore, the reason for the fall in fuel poverty, especially in the North (North East, Yorkshire and the Humber, North West) may be due to a combination of these factors.

The average fuel poverty gap in real terms by region is shown in Table 4.5. In both 2003 and 2013, the North East had the lowest average fuel poverty gap, although it had the highest rate of fuel poverty in 2003, and the second highest rate of fuel poverty in 2013 of all the regions.

The East and West Midlands saw the greatest rise in the fuel poverty gap between 2003 and 2013, which doubled over this period. This is likely to be due to increased fuel bills, as a result of increased fuel costs and lower energy efficiency (SAP ratings) of homes in

these regions. The smallest change in the fuel poverty gap was in the North of the country.

Chart 4.15: Percentage of all fuel poor households in each region, 2003 and 2013

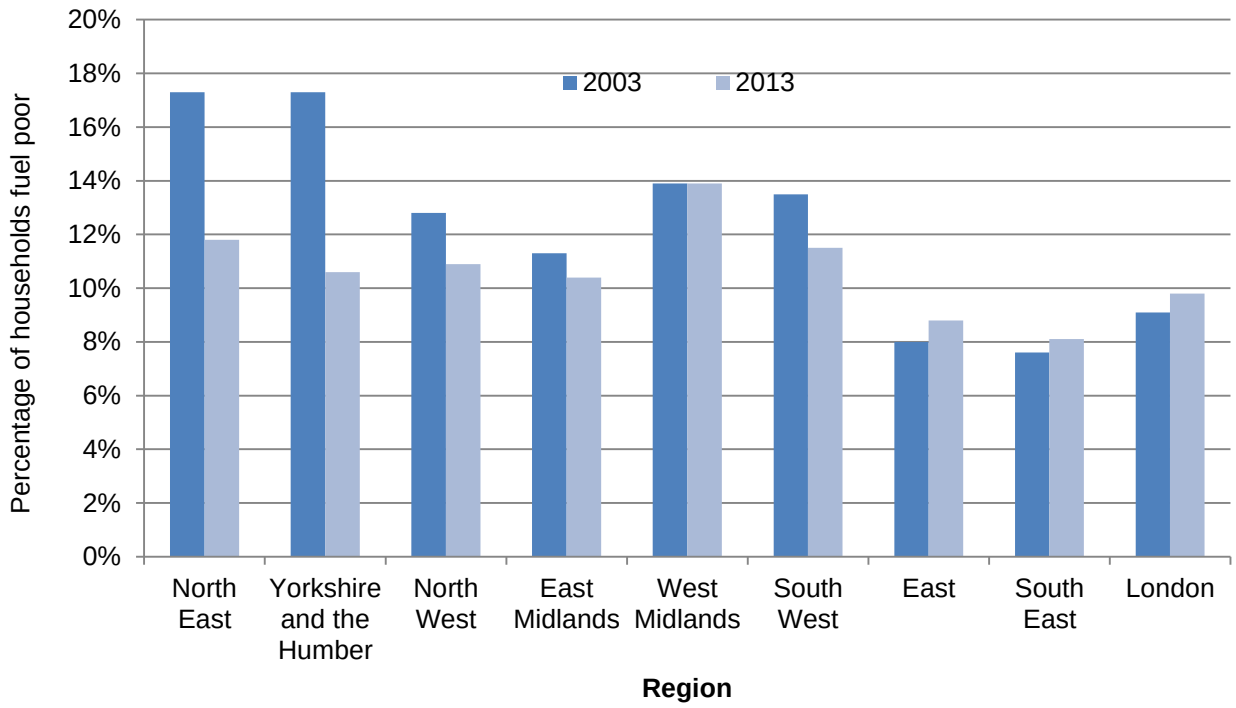


Table 4.5 – Average fuel poverty gap, by region, 2003 - 2013

	Region: Average fuel poverty gap (£) in real terms								
	North East	Yorkshire and the Humber	North West	East Midlands	West Midlands	South West	East	South East	London
2003	169	260	203	231	217	291	219	263	199
2004	152	215	223	215	260	325	277	238	196
2005	192	236	217	314	264	315	295	275	202
2006	288	313	360	371	309	391	265	359	268
2007	304	280	324	301	360	402	246	364	317
2008	326	299	287	354	329	449	354	364	320
2009	361	356	325	352	322	472	392	362	300
2010	324	344	337	370	312	447	370	365	296
2011	266	364	472	397	333	472	320	411	317
2012	269	364	437	380	404	419	371	435	309
2013	255	359	312	401	427	447	436	395	304

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Chapter 5: Sub-regional fuel poverty in 2013

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 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. Estimates of fuel poverty at Lower Super Output Area (LSOA) 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/collections/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 12,000 households in the combined 2013 dataset), 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 benchmarked to reflect the 2013 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, and East of the Country generally have lower fuel poverty levels, whilst the West Midlands and North East have the highest rates of fuel poverty. This data is consistent with the regional data shown in Chart 3.14, which shows the West Midlands have the highest fuel poverty rates (14%) and the South East the lowest (8%). The rate of fuel poverty was the lowest in the City of London where less than four per cent of households were fuel

poor. Birmingham has the highest fuel poverty levels of any the large local authorities with nearly 19 per cent in fuel poverty (see Annex C).

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

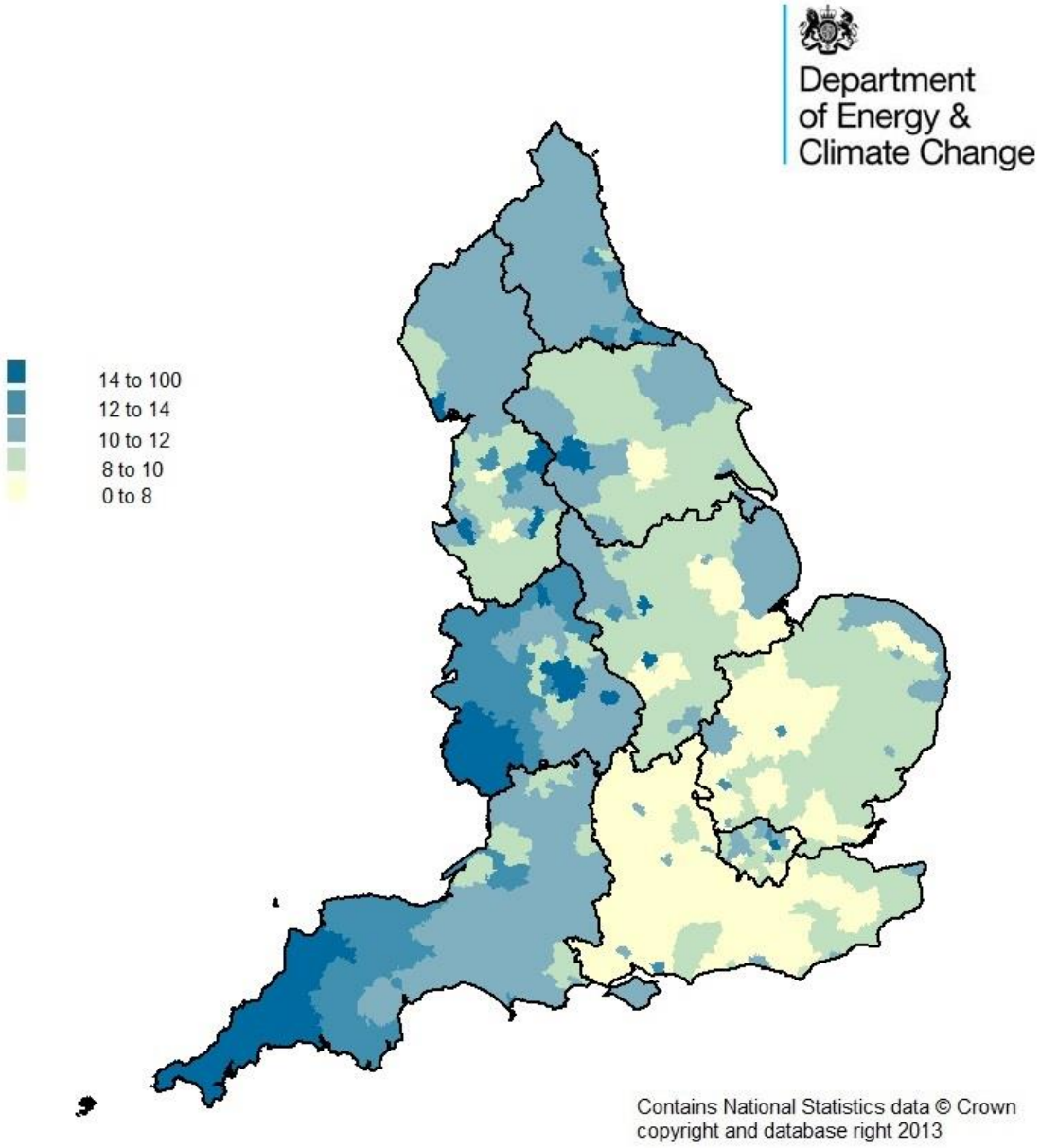
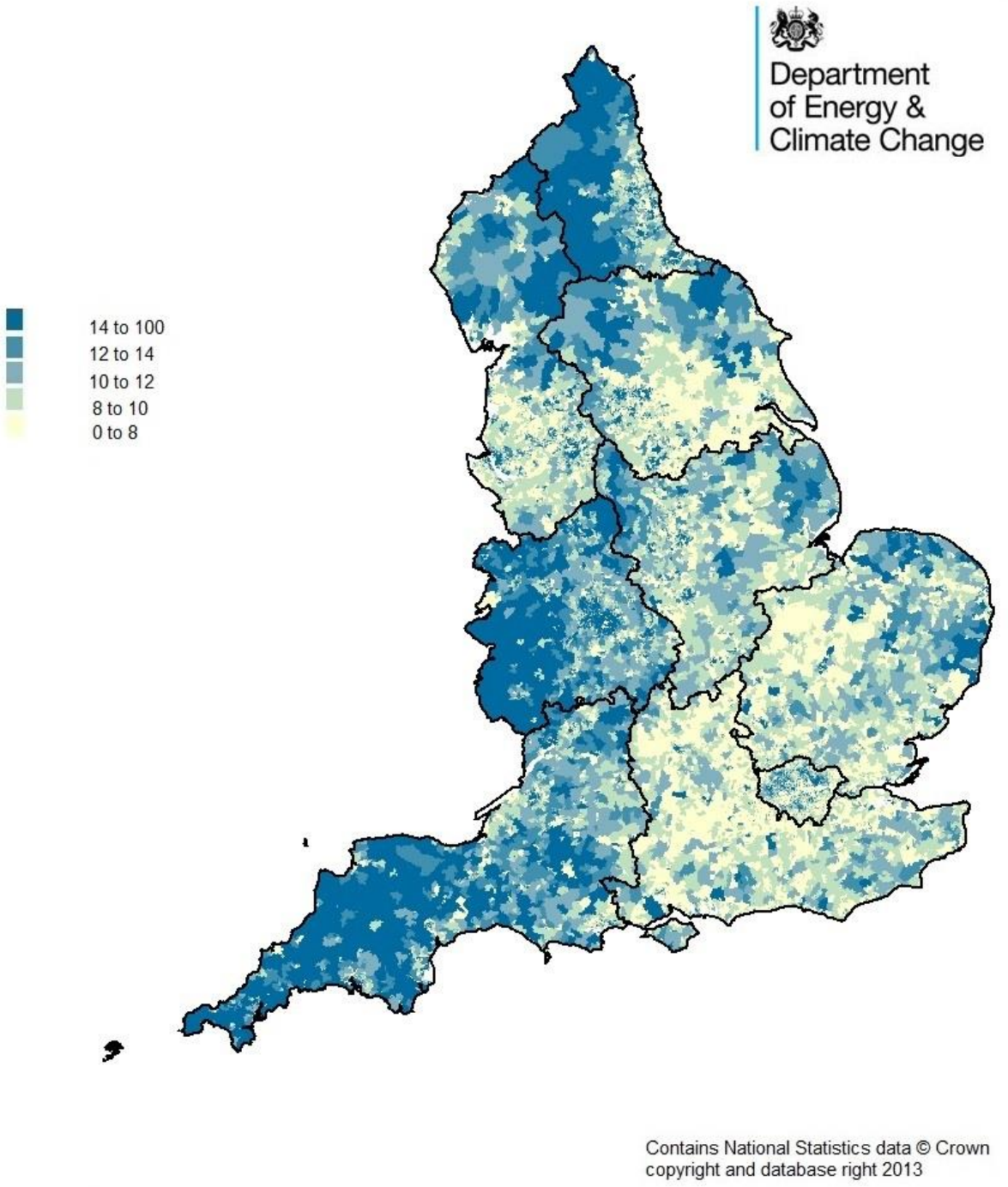


Figure 5.2 Percentage of households in fuel poverty under the Low Income High Costs indicator, by Lower Super Output Area



5.4 Comparisons with 2012 Data

In 2013, 30 per cent of local authorities (97) saw a decrease in the number of fuel poor households. Another 30 per cent (97) saw an increase in the percentage of fuel poor households compared to 2012. The percentage of fuel poor households remained the same in 40 per cent (132) of local authorities. The changes observed in local authorities in the rates of fuel poverty are in line with regional changes.

The East Midlands saw the largest decrease in the proportion of fuel poor households between 2012 and 2013. This decrease brings fuel poverty in the East Midlands to the same as national levels at 10.4 per cent. The largest increase was in the South West, taking them above the national average .Caution should be exercised when looking at year on year changes for individual local authorities, as changes observed may be due to uncertainty in the data unless they are very large.

Chapter 6: Projections

This chapter presents projections of fuel poverty for 2014 and 2015 based on the LIHC measure of fuel poverty. The figures presented here indicate how fuel poverty levels have changed between the latest official figures for 2013 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*[13].

The projection model uses the 2013 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)[14], in order that we can compare with the actual outturn next year.

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

[14] See the charts and tables in the OBR fiscal outlook: http://budgetresponsibility.org.uk/economic-fiscal-outlook-march-2015/

Table 6.1: Projecting the different components of income

Type	Method of projection
Earnings	Percentage change in nominal earnings from OBR (2015)
Investment and savings	The percentage change in GDP from OBR (2015) 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 2014 projections, published price data is available, and this is applied to the 2013 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. [15] For the 2015 projections, published CPI data for January – March is combined with estimated changes in fuel prices for the rest of 2015. 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.[16]

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.

[15] https://www.gov.uk/government/collections/domestic-energy-prices
[16] 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[17]. See Tables 6.2 and 6.3 for details of the measures estimated to be delivered under these policies in 2014 and 2015.

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, 2014

2014	Loft	CWI	SWI	Replacement boiler	Renewable heat	Solar PV	Bill Rebates	Condensing boilers
Green Deal and Carbon ECO	44,000	104,000	9,000					
ECO Carbon Saving Communities	24,000	71,000	2,000					
ECO Affordable Warmth	8,000	66,000		68,000				
RHI					26,000			
FiTs						109,000		
WHD							2,071,000	
Building Regulations								1,072,000

Table 6.3: Estimated uptake of insulation and heating measures ('000s) from government policies in England, 2015

2015	Loft	CWI	SWI	Replacement Boiler	Renewable Heat	Solar PV	Bill Rebates	Condensing Boilers
Green Deal and Carbon ECO	87,000	222,000	20,000					
ECO Carbon Saving Communities	51,000	148,000	7,000					
ECO Affordable Warmth	11,000	113,000		138,000				
RHI					33,000			
FITs						133,000		
WHD							2,070,000	
Building Regulations								2,129,000

Also includes the impact of the £12 electricity rebate in both years, which was delivered to 95% of domestic customers.

[17] 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 polices with partial delivery data the projected update 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 2013, 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.

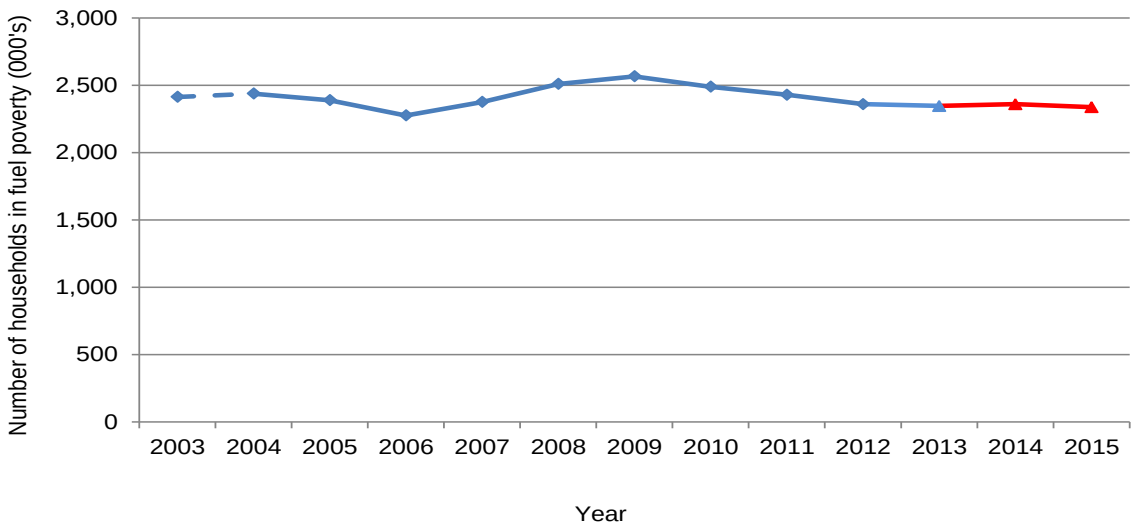
Income for each household is also up-rated to the year of projection, using the methodology described in Section 6.2. A new energy threshold and median income are then calculated for each projection year. It is then possible to calculate the number of households in fuel poverty and the fuel poverty gap.

6.3 Projected levels of fuel poverty in England, 2014 and 2015

Chart 6.1 shows the projected number of households in fuel poverty in 2014 and 2015. The number of households in fuel poverty is projected to remain broadly flat,

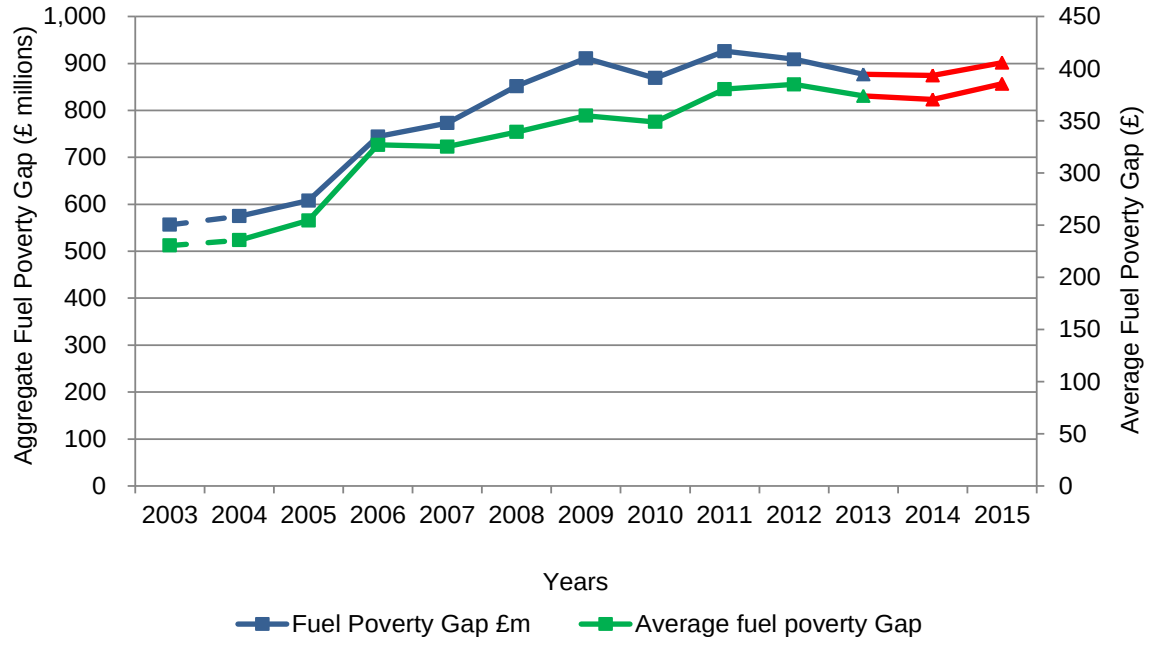
rising from 2.35 million in 2013 to 2.36 million in 2014, before decreasing to 2.34 million in 2015.

Chart 6.1 Number of households in fuel poverty 2003 to 2013, and projections for 2014 and 2015.



The aggregate and average fuel poverty gap is projected to remain flat in 2014, before a small increase in 2015. Chart 6.2 shows the projected changes in cash terms. The aggregate gap is projected to increase from £877 million in 2013, to £902 million in 2015, and the average gap is projected to increase from £374 in 2013 to £386 in 2015.

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 2015 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 March 2015. 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 2014 and 2015 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 2015);
- 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.

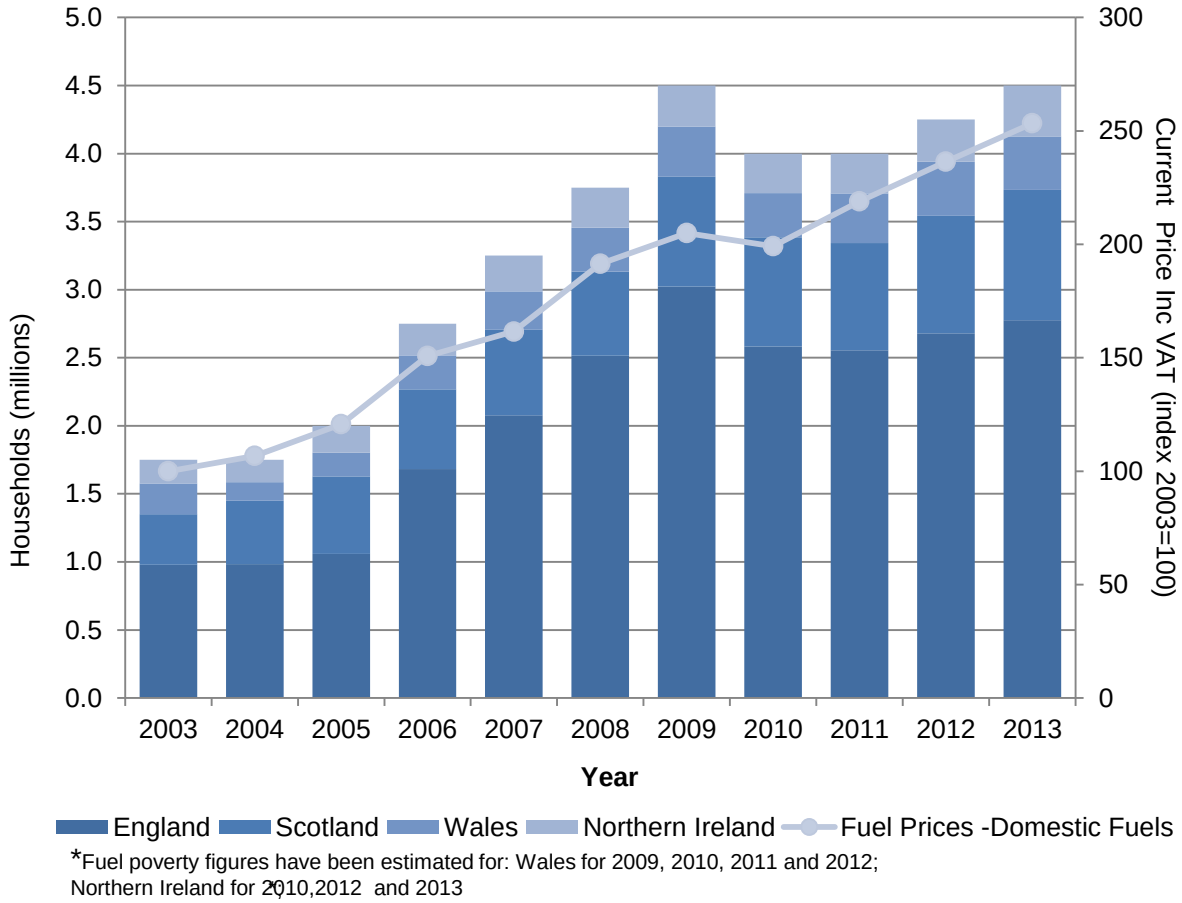
For the reasons above, care should be taken when interpreting the projections of fuel poverty presented here.

Chapter 7: Fuel Poverty in the UK, 2013

7.1 Fuel Poverty in the UK

This chapter covers the trend in fuel poverty in the UK from 2003 to 2013. 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.[18]

Chart 7.1 – Fuel poverty and energy prices in each country in the UK, 2003 – 2013[19]



*Fuel poverty figures have been estimated for: Wales for 2009, 2010, 2011 and 2012; Northern Ireland for 2010,2012 and 2013

In 2013, the number of fuel poor households in the UK was estimated at around 4.5 million representing 17 per cent of all UK households. This is a small increase from 2012 levels of one percentage point. Chart 7.1 shows the overall trend and

[18] Typically defined as 21 degrees for the main living area, and 18 degrees for other occupied rooms. Scotland have an additional heating regime for vulnerable people this is defined as 23 degrees for living rooms 18 degrees for other rooms.

[19] All fuel poverty estimates for each year have been revised in line with BREDEM 2012 version 1.1.

breakdown of fuel poverty in the UK. It should be noted, the 2009 to 2013 fuel poverty figures for Wales as well as the 2010, 2012 and 2013 Northern Ireland figures are based on estimates.[20]

Generally, the fuel poverty level in each country follows a similar trend to the overall pattern observed in the UK, with fuel poverty tracking fuel prices. Between 2004 and 2009, energy prices increased: domestic electricity prices rose by over 50 per cent, and gas prices increased by over 90 per cent.[21] 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.

In 2010 fuel poverty fell for the first time since 2003, due to rising energy efficiency standards (particularly among lower income households) and a fall in fuel prices**.** However, in 2011 fuel prices began to rise again and by 2013 fuel poverty had increased to around 4.5 million households.

Table 7.1 shows the official fuel poverty estimates for each country in the UK, where available.

Table 7.1 – Number and proportion of fuel poor households by nation for 2013[22]

Country	Number of fuel poor households (millions)		Proportion of the population fuel poor (%)	
	2012	2013	2012	2013
England	2.61	2.73	12%	12%
Scotland	0.84	0.94	35%	39%
Wales	0.39	*	30%	*
Northern Ireland (2011)	0.29	*	42%	*

***no estimate available**

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.

[20] The Wales estimates for 2009 to 2012 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 2013 were not available and so 2012 has been used. Estimates for Northern Ireland in 2010 were provided by the Northern Ireland Housing Executive. For the purpose of the chart, estimates for 2012 and 2013 were produced by DECC.
[21] Quarterly Energy Prices, table 2.1.2, Consumer Prices Index: fuel components https://www.gov.uk/government/statistical-data-sets/monthly-domestic-energy-price-stastics

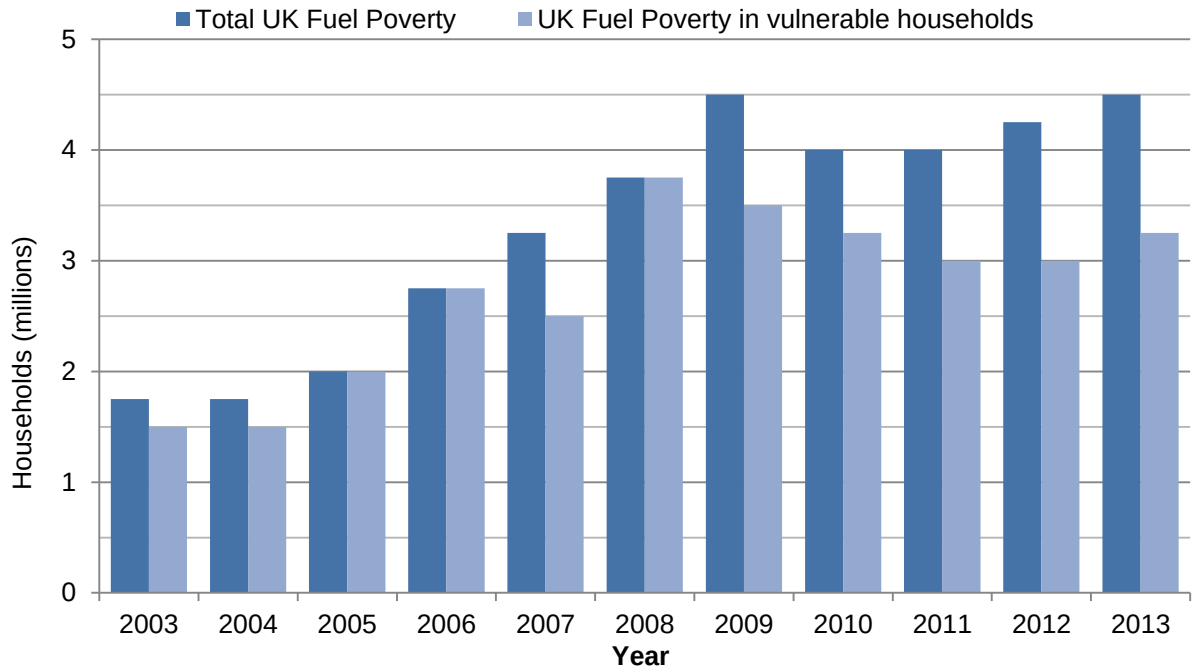
[22] Scotland figures sourced from the Scottish Housing Condition Survey 2013 http://www.gov.scot/Publications/2014/12/6903. Wales figures sourced from the Wales Fuel Poverty projection tool: 2011/2012 report. Northern Ireland figures
Sourced from Northern Ireland House Condition Survey 2011.

Table 7.1 shows the proportions of fuel poverty for each of the four devolved nations using the last available estimate produced by each nation. Of the four UK nations, Northern Ireland has the greatest proportion of fuel poor households, followed by Scotland, then Wales 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 rely on more expensive fuels such as heating oils[23]) and lower income households.

The fuel poverty rate stayed the same in England (Table 7.1) between 2012 and 2013, and increased in Scotland by four percentage points. The increase in Scotland is a result of increases in fuel prices, and had it not been for improvements in income and energy efficiency then the increase would have been larger.

Chart 7.2 shows the trend in fuel poverty amongst vulnerable [24] households in the UK. In 2013, around 3.3 million vulnerable households in the UK were fuel poor, which is a small rise on 2012 levels. Overall around 70 per cent of households were classified as vulnerable in 2013 in the UK.

Chart 7.2 – Fuel poverty in the UK in vulnerable households, 2003 – 2013



[23] Northern Ireland Housing Statistics Table 2.1
http://www.dsdni.gov.uk/northern_ireland_housing_statistics_2012-13.pdf

[24] In England a vulnerable household is one that contains the elderly, children or someone who is disabled or has a long term illness. Scotland uses a different definition, which includes the elderly or someone who is disabled or has a long term illness but does not include children. Figures rounded to nearest 0.25 million.

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).

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

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. All fuel poverty estimates for each year have been revised in line with BREDEM 2012 version 1.1.

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 different definition of vulnerable households, which includes the elderly and infirm but not households with children. The Scottish component in Chart 7.2 are consistent with this definition.
- The heating regime for these vulnerable households specifies a higher temperature, leading to higher running costs.
- Where the dwelling is under-occupied, the heating regime is not reduced.

The methodology used to produce the Scottish fuel poverty estimates was updated in 2014, to be based on BREDEM 2012. The Scottish fuel poverty numbers have been revised back to 2010.

Scotland publishes its own report on their national level of fuel poverty. The latest report was published in December 2014 and relates to fuel poverty in 2013. The report is available at:

http://www.gov.scot/Publications/2014/12/6903

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 2011, 2012 and 2013 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 2014, based on projections, will be available later in 2015.

Chapter 8: 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 Fuel Poverty Monitoring Indicators):

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

8.1 Expenditure on fuel

The fuel poverty methodology models the amount of energy each household needs to consume to achieve an adequate standard of warmth[25], 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 and each individual aged over 16 is asked to keep a diary of expenditure over a two week period. Table 8.1 below compares the average annual actual expenditure on fuel in 2013 (excluding petrol and diesel used for transport purposes) from the LCFS [26] with the average annual modelled expenditure on fuel in 2013, 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.

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

[26] 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 8.1.

Table 8.1 – Actual and modelled household annual spend on fuel, 2013[27]

Income decile group	Average actual annual expenditure on fuel (£)	Modelled average annual spend on fuel (£)	Percentage difference
1st (lowest)	1,050	1,092	4%
2nd	1,170	1,104	-6%
3rd	1,212	1,205	-1%
4th	1,248	1,241	-1%
5th	1,331	1,328	0%
6th	1,357	1,334	-2%
7th	1,430	1,423	-1%
8th	1,472	1,495	2%
9th	1,607	1,501	-7%
10th (highest)	1,934	1,727	-12%
All households	1,378	1,345	-2%

In 2013 there were some methodological changes made to the LCFS. Information on actual expenditure on gas and electricity is now captured in a questionnaire rather than as done previously in a diary. This has led to a marked increase in the reported expenditure for both gas and electricity than in previous years, particularly for households using pre-payment meters. Pre-payment meters are used disproportionately by the low income deciles, and as such this change has had a bigger effect on the low income deciles than the higher income deciles.

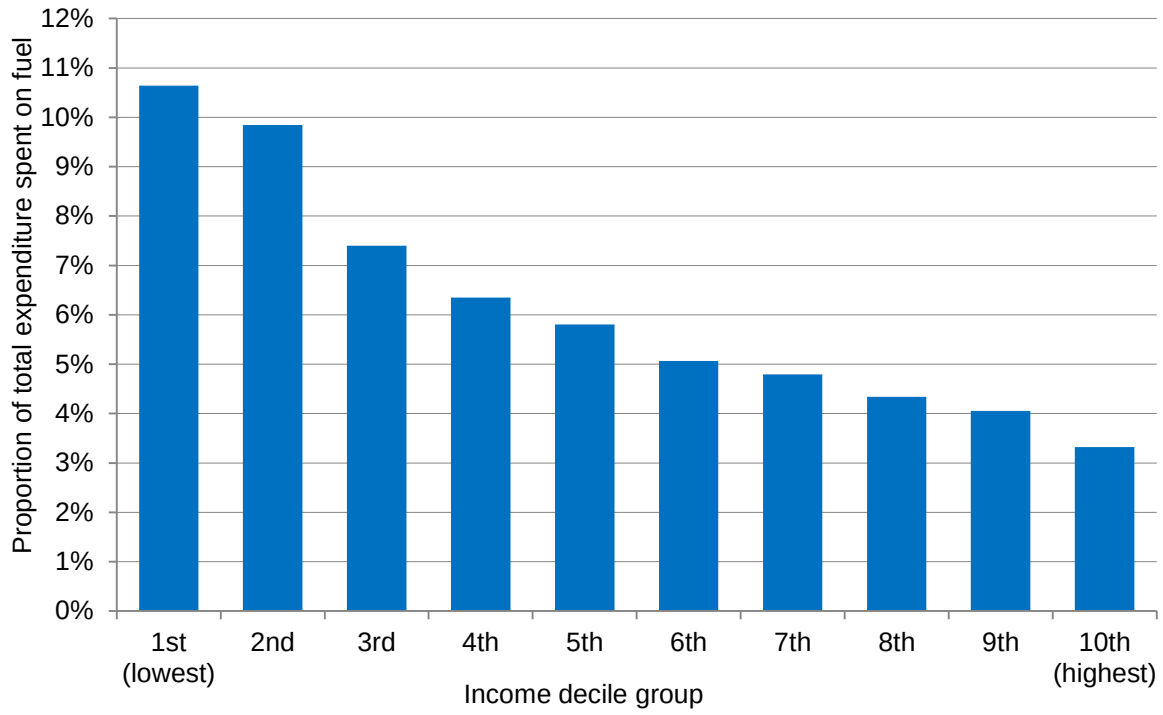
In previous years the modelled spend was higher than actual spend for all income decile groups, leading to the conclusion that the heating regimes applied in the fuel poverty model were aspirational rather than a reflection of actual use. However, the change in recording for the LCFS brings the actual spend in line with the modelled spend. This suggests that the modelled spend is much more reflective of the actual spend than previously thought, and that people across the income deciles are heating their homes to adequate levels. Unsurprisingly, households with higher incomes tend to have a higher actual spend on fuel than those with low incomes. As Table 8.1 shows the lowest income decile still spend the least amount on fuel, with an average spend of £1050. There is a steady increase through each income decile up to the top decile which has an average expenditure on fuel of £1934. The likelihood is households in the top deciles live in larger dwellings, which cost relatively more to heat and light than smaller dwellings. Although the changes in LCFS reporting has meant a reduction in the gap between actual and modelled spend, the lowest income decile still have the biggest difference between actual and

[27] The LCFS data used in this table is made available in the Office for National Statistics publication, Family Spending 2014, at the following link (see table A6)
http://www.ons.gov.uk/ons/rel/family-spending/family-spending/2014-edition/index.html

modelled spend, by four per cent. The highest income group have an actual spend in excess of their modelled spend, by 12 per cent. It is difficult to say whether this change is due to limitations in the modelling or whether the higher income decile groups are more willing to heat their homes to temperatures above or for longer than what is considered 'adequate'. Further work is currently being undertaken in this area looking into the temperatures households actually heat their homes to.

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. Just under 11 per cent of total expenditure in the lowest income decile group is on domestic fuels, compared to just over three per cent in the highest income decile group (see Chart 8.1).

Chart 8.1 – Proportion of total expenditure spent on fuel, by gross income decile group, 2013



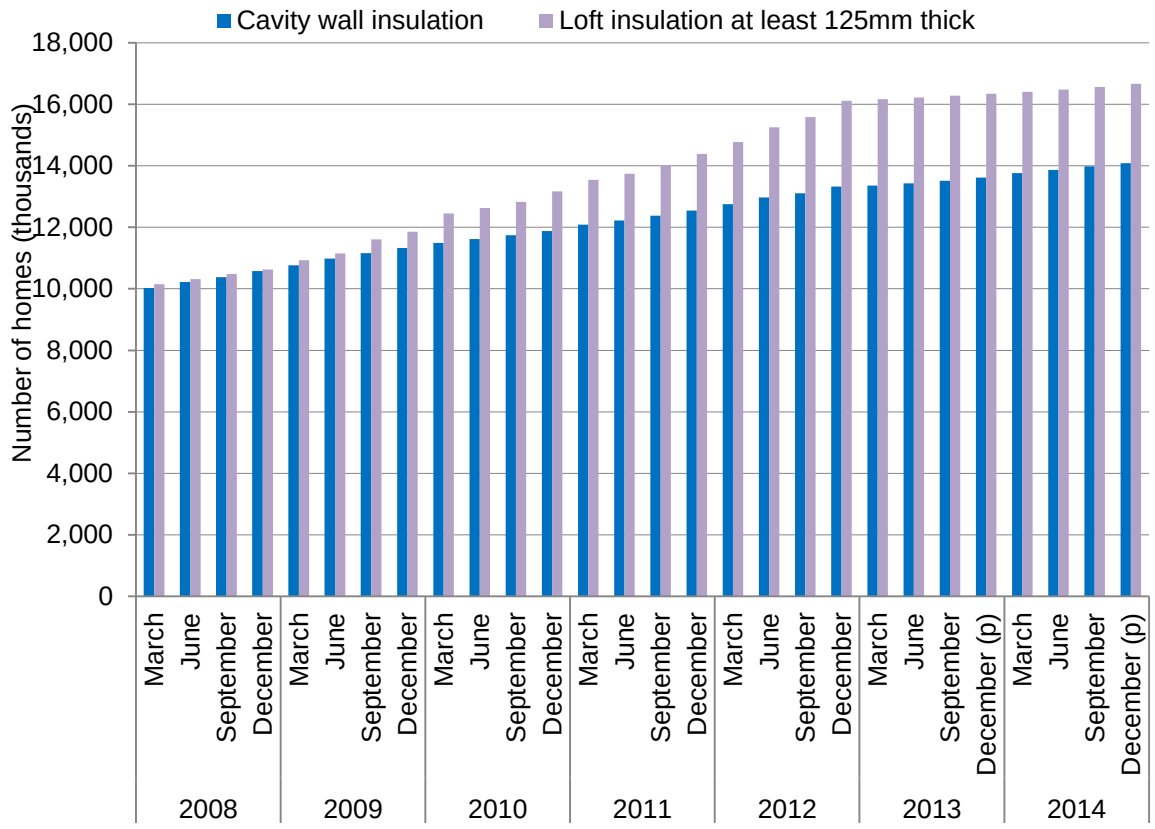
Source: Living Costs and Food Survey, ONS

8.2 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 2013. DECC publishes estimates of home insulation levels in

Great Britain on a quarterly basis. Chart 8.2 below shows the number of homes with cavity wall insulation and loft insulation (where loft insulation levels are greater than 125mm in thickness).

Chart 8.2 – Number of homes with cavity wall insulation and loft insulation in Great Britain, March 2008 to December 2014[28]



At the end of December 2014, there were around 27 million homes in total in Great Britain, of which 23.9 million have lofts. Between March 2008 and December 2014, the number of homes with loft insulation with thickness greater than 125mm increased from 10.2 million to 16.7 million, a rise of 64 per cent. Therefore, by end December 2014, around 70 per cent of homes with lofts had loft insulation thicker than 125mm.

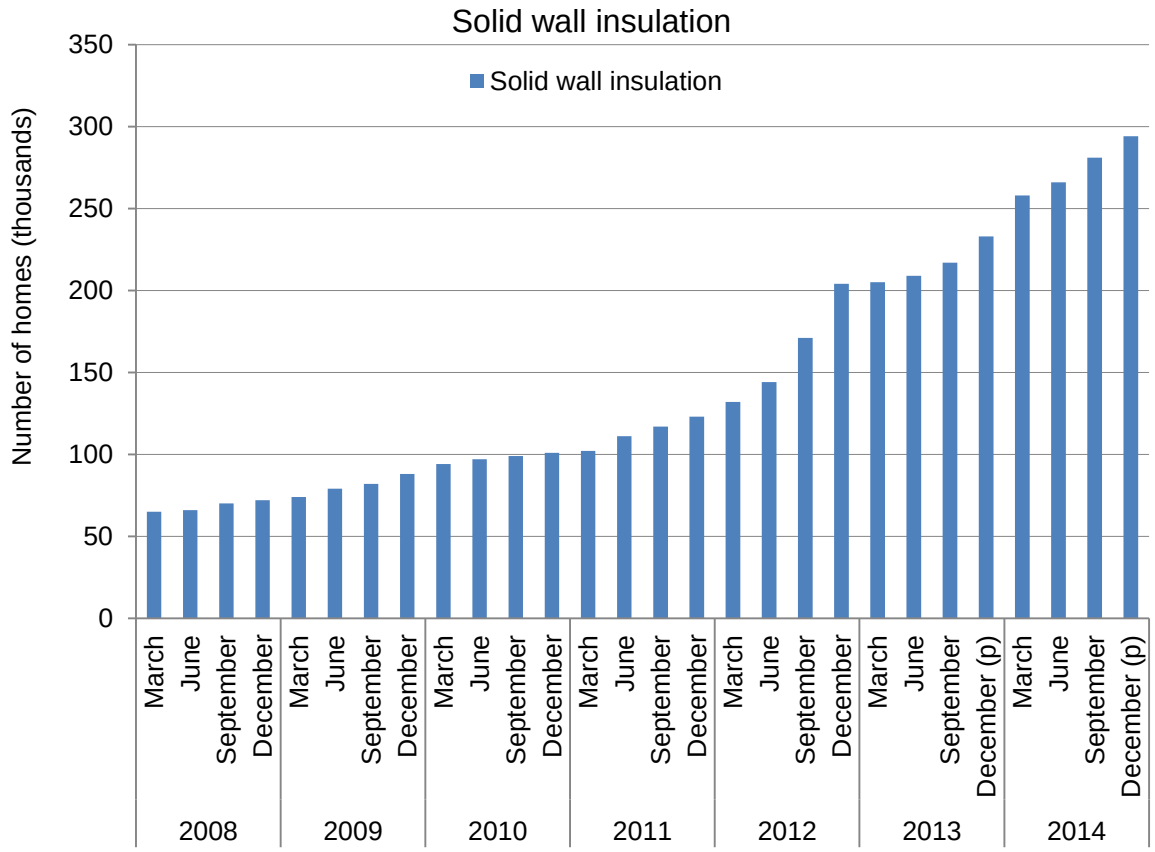
Since March 2008, the number of homes with cavity wall insulation increased from around 10.0 million to around 14.1 million in December 2014, a rise of 40 per cent. In

[28] The figures from June 2013 to December 2014 are 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

December 2014 there were around 19.4 million homes with cavity walls, and therefore around 73 per cent of homes with wall cavities had cavity wall insulation.

Chart 8.3 below shows the number of homes with solid wall insulation.

Chart 8.3 – Number of homes with solid wall insulation in Great Britain, March 2008 to December 2013[29]



Between March 2008 and December 2014, the number of homes with solid wall insulation has increased from 65,000 to 294,000, more than tripling the level of uptake. In December 2014, there were 8.0 million homes with solid walls, of which around 3.7 per cent had solid wall insulation[30].

[29] The figures from June 2013 to December 2014 are 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

[30] 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.

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

8.3 Household income distribution

The Department of Work and Pensions (DWP) 'Households Below Average Income' (HBAI) publication will be released in July 2015, and will provide statistics on income up to the end of the financial year 2013/14.

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

Chapter 9: The impact of weather on fuel poverty

This chapter explores some additional analysis which was undertaken on the 2012 and 2013 fuel poverty datasets looking at the impact of using actual external temperatures in the modelling of fuel poverty statistics. Each dataset covers two survey years, with the 2012 dataset made up of EHS data from April 2011 to March 2013 whilst the 2013 dataset runs from April 2012 to March 2014. Initial investigations were performed using the 2012 dataset and the method was subsequently applied to the 2013 dataset.

9.1 Background

Fuel poverty modelling uses average external temperatures based over a 20 year period (1992 – 2011). This has the effect of reducing fluctuations in the data caused by extreme temperature differences, and allows for the trends in fuel poverty to be assessed without the need to account for factors caused by year-on-year temperature variability. The use of a standardised set of temperatures is in line with the use of a fixed heating regime. This method is, therefore, preferred for the headline statistics, for assessing long term changes to levels of fuel poverty and for identifying where improvements can be made. However, variation in annual temperature will impact upon the way people need to heat their homes, which may, in turn, cause changes to the number of households in fuel poverty and the depth of fuel poverty. Therefore the aim of this analysis was to use actual weather data to investigate the impact of temperature changes on the fuel poverty statistics.

9.2 Methodology

For this analysis external temperatures were estimated from degree day data. For this method a base temperature (the outside temperature above which a building does not require heating) was assumed to be 15.5 $^{\circ}$C and monthly external temperatures were calculated for each region using the following formula:

External Monthly Temperature = 15.5 – (D / N)

Where D = Number of degree days in a month and N= Number of days in a month.

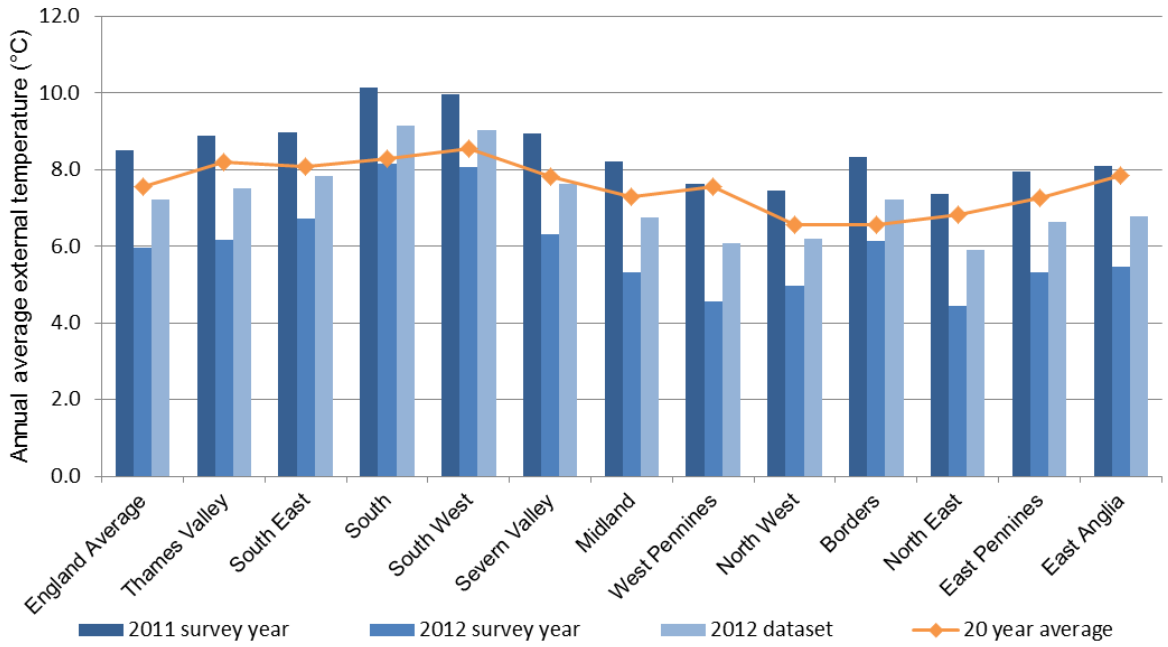
The degree day monthly temperatures for the period covered by the dataset were extracted for each region in England. These were substituted into the fuel poverty Energy Model (BREDEM 2012 v1.1) and re-run. The fuel poverty statistics were then

recalculated and compared to the 20 year average datasets to see the effect of incorporating actual temperature values on the fuel poverty statistics.

9.3 Initial investigations using 2012 dataset

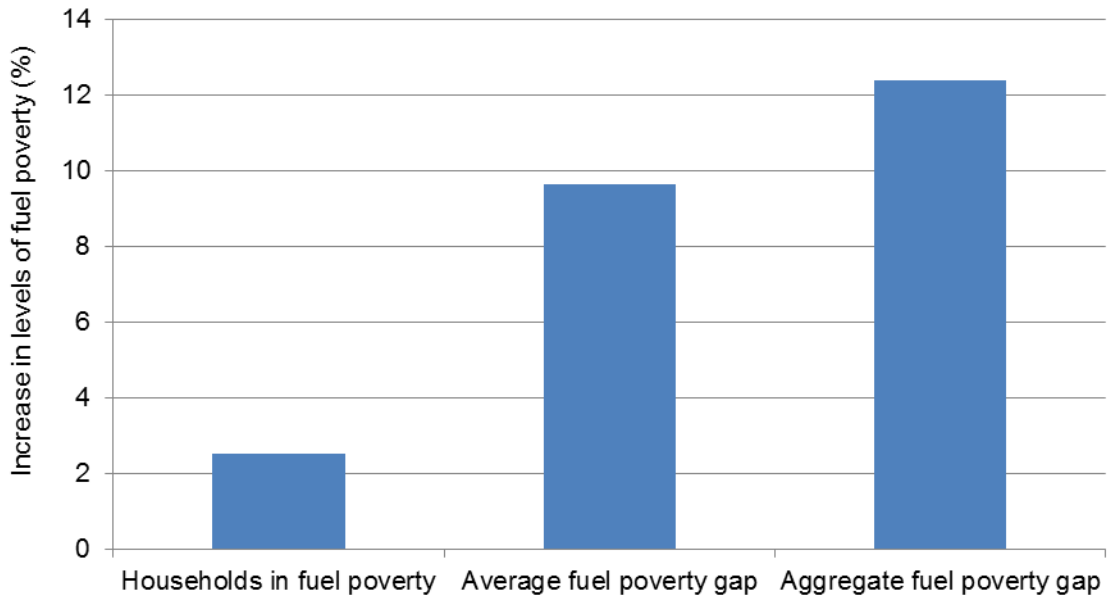
The derived external monthly temperatures during the period covered by the 2012 dataset (Tables 9.1 and 9.2) show that, overall, the weather was colder than the 20 year average external temperature. Of the two years which make up this dataset, the 2011 survey year period was warmer than average and the 2012 survey year period was particularly colder than average when looking at England as a whole (Chart 9.1). Some regions differ in their temperature more than others compared to the 20 year average. For example, despite the period covered by the 2012 dataset being colder overall, certain regions such as the South and South West are warmer than the 20 year average. There are also regions, such as the West Pennines and North East, which are particularly cold compared to the 20 year average.

Chart 9.1. Average annual temperature per region during the heating season (October to May)



The overall colder conditions covered by the 2012 dataset resulted in the average fuel consumption increasing and therefore the median fuel cost increasing accordingly. This is due to the 2012 survey year being colder compared to the 20 year average than the 2011 survey year period is warm, leading to a net increase in median fuel costs in the 2012 dataset. This resulted in the amount of households in fuel poverty increasing by 2.5 per cent compared to the 20 year average, and the mean and aggregate fuel poverty gap increasing by 9.6 and 12.4 per cent, respectively (Chart 9.2).

Chart 9.2: Percentage change in fuel poverty levels for 2012 compared to the 20 year average

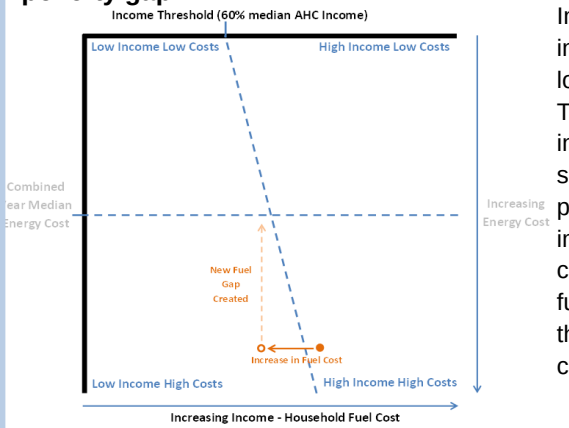


9.4 Predicting the change in fuel poverty due to temperature

9.4.1 Crossing the Income Threshold

Altering the external temperature in the fuel poverty modelling can result in households changing their fuel poverty status due to two processes. The first is a shift of households over the income threshold. As the income threshold is defined as being 60 per cent of the after housing costs income plus the individual household's fuel cost, changing a household's fuel costs without changing income will have the effect of making the household relatively more or less affluent compared to the income threshold. For example, in colder conditions, households will have more money deducted from their income due to higher fuel costs. These households will therefore have a relatively lower income and can move from High Income High Costs to Low Income High Costs (fuel poverty), increasing the number of fuel poor and the fuel poverty gap (Chart 9.3).

Chart 9.3. The effect of households moving across the income threshold on the fuel poverty gap



In colder temperatures, household fuel costs are increased, resulting in households having a relatively lower income compared to the 60% income threshold. This causes some households to move across the income threshold from HIHC into fuel poverty (LIHC). In some cases, households can bring relatively large fuel poverty gaps with them, and so have a more significant impact on the mean and aggregate fuel poverty gap compared to the households moving over the median fuel costs line. As a result the number of fuel poor and the fuel poverty gap is likely to increase when it is colder and decrease when it is warmer.

9.4.2 Crossing the Fuel Cost Threshold

The second effect of using actual temperatures is a shift of households over the median fuel cost threshold. As fuel expenditure has changed across all cases there may be the expectation that there will be little movement over the median fuel cost threshold due to household fuel costs increasing or decreasing in proportion to the median. However, regional variation in temperature causes some regions to have larger temperature deviations than others, resulting in larger changes in household fuel costs compared to the median. Households in a colder than average region will see an above average increase in fuel costs and will be more likely to move into fuel poverty, over the median fuel cost threshold, increasing the aggregate fuel poverty gap. If the region has a particularly high household density then this change in fuel poverty is magnified and will have a more prominent impact on the final statistics.

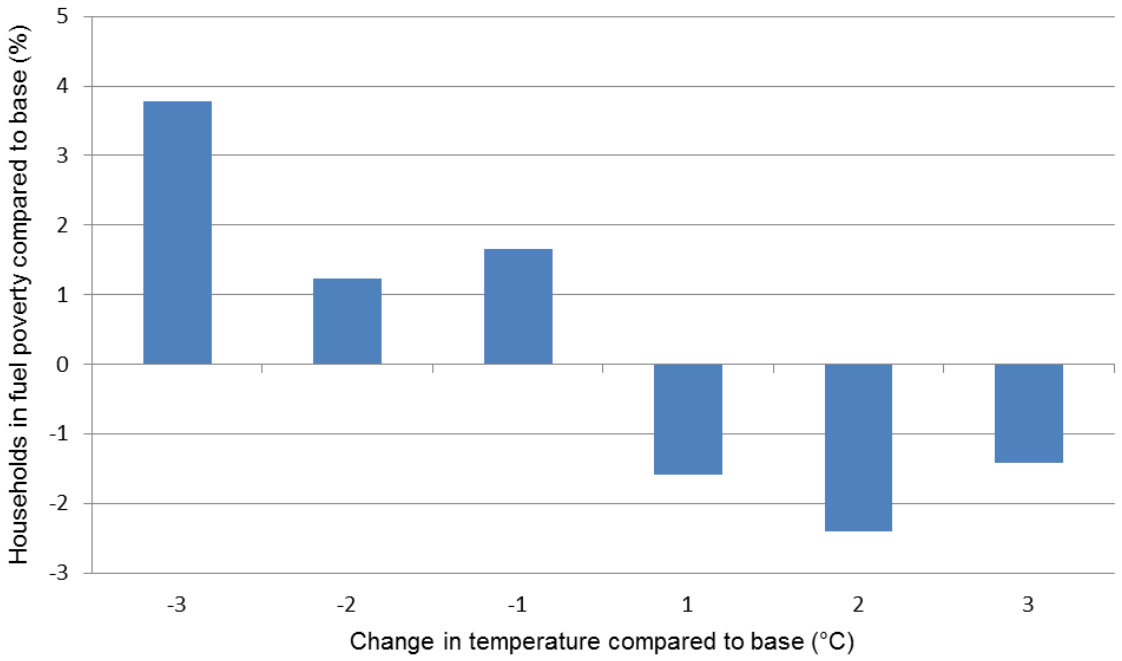
Households within regions can also differ in the magnitude of their fuel cost change due to their individual characteristics. Factors such as a household's energy efficiency rating or fuel type can influence how their fuel costs change compared to the median. For example, in colder conditions, households with more expensive main heating fuels will incur relatively higher fuel cost changes in relation to the median and will therefore have a higher likelihood of crossing the median fuel cost threshold into fuel poverty.

9.4.3 Modelling the effect of temperature excluding regional variation

Whilst the overall colder than average temperatures in the 2012 dataset resulted in an increase in the level of fuel poverty, a decrease in temperature will not necessarily always result in an overall increase in fuel poverty. While colder temperatures and higher fuel costs should result in an increase in fuel poverty as (on average) more households should cross the income threshold into fuel poverty than out of it, the movement of households across the median fuel cost threshold is more difficult to predict because of local responses to temperature change. As a result it is not always the case that lower temperatures will result in a higher level of fuel poverty. This has been examined analytically by incrementally increasing temperature uniformly across all regions using the 2012 dataset, to remove the effect of regional temperature variation, which showed that in some cases, an increase or decrease in temperature can result in an increase and decrease in fuel poverty, respectively (Chart 9.4). Although the overall pattern appears to be that higher temperatures result in lower levels of fuel poverty, it can be seen that a rise in average temperatures of two degrees actually results in a lower level of fuel poverty than a rise of three degrees, which occurs due to households differing in their individual characteristics and therefore the extent to which they are affected by temperature change, as mentioned in the above section. It should be noted that this

work has only been completed on the 2012 dataset, and other datasets are likely to show different effects. It is therefore very difficult to accurately predict a rise or fall in fuel poverty in response to external temperature alone.

Chart 9.4 Percentage change in the number of households in fuel poverty with incremental temperature change using the 2012 dataset



9.4.4 Complexity of datasets spanning two years

Predicting the effect of weather on fuel poverty is made more complex due to the two year period covered by the dataset, and the difference in temperature between the two constituent survey years. For example, the 2011 survey year actual temperatures were typically higher than the 20 year average figures, whereas the reverse situation occurs in the 2012 survey year. This has the effect of making households surveyed in the 2011 survey year have relatively cheaper fuel costs and households from the 2012 survey year have relatively more expensive fuel costs. This naturally leads to households from the 2011 survey year moving out of fuel poverty and households from 2012 survey year moving into fuel poverty when compared to the average temperature figures. Therefore, in order to determine the drivers of change in fuel poverty datasets, it is necessary to understand the different temperatures in the constituent survey years.

9.5. Analysis of 2013 dataset

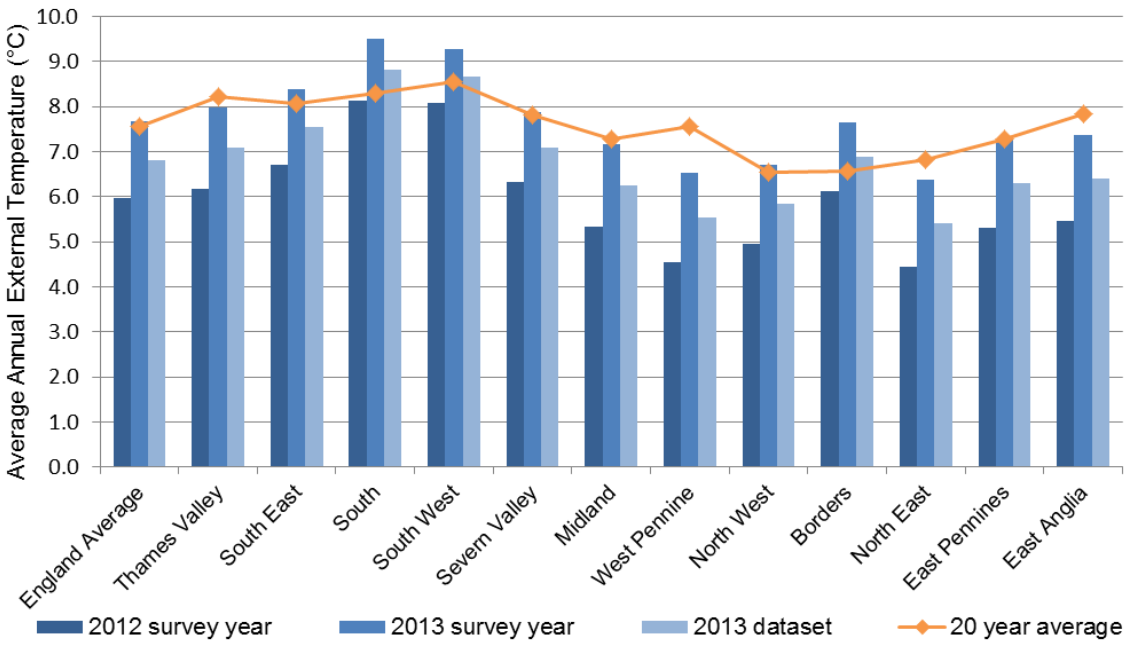
The above findings suggest that it is very difficult to accurately predict how a change in temperature will affect the change in fuel poverty statistics without modelling the specific year of interest. Therefore the analysis was repeated for the 2013 dataset using temperatures derived from degree day data. The fuel poverty statistics with actual temperatures have been calculated using the same methodology as the main

fuel poverty statistics and so the effect of weather can be directly compared to the published fuel poverty statistics.

9.5.1. Main findings

The period covered by the 2013 dataset was colder overall than the 20 year average external temperature, with the 2012 survey year being particularly colder than average and the 2013 survey year (Table 9.3) being marginally warmer than average when looking at England as a whole (Chart 9.5).

Chart 9.5 Average annual temperature per region during the heating season (October to May)



The lower than average temperatures in the 2013 dataset meant that fuel consumption increased on average and the median fuel cost of households increased correspondingly. This resulted in an increase in the number of households in fuel poverty by 3.1 per cent (Chart 9.6), from 2.35 million to 2.42 million. The increase in households in the Low Income High Cost quadrant is due to a net gain of households moving over the median fuel cost line (LILC to LIHC) that have received an above average increase in fuel costs, and a gain of households moving over the income threshold (HIHC to LIHC) that have a relatively lower income compared to the income threshold due to increased fuel costs. The mean and aggregate fuel poverty gap has also increased in the 2013 dataset compared to the 20 year average figures. The mean fuel poverty gap has increased by 9.3 per cent from £373.6 to £408.5 and the aggregate fuel gap has increased by 12.7 per cent from £876.8 million to £987.8 million (Chart 9.7).

Chart 9.6: Number of households in fuel poverty for 2013

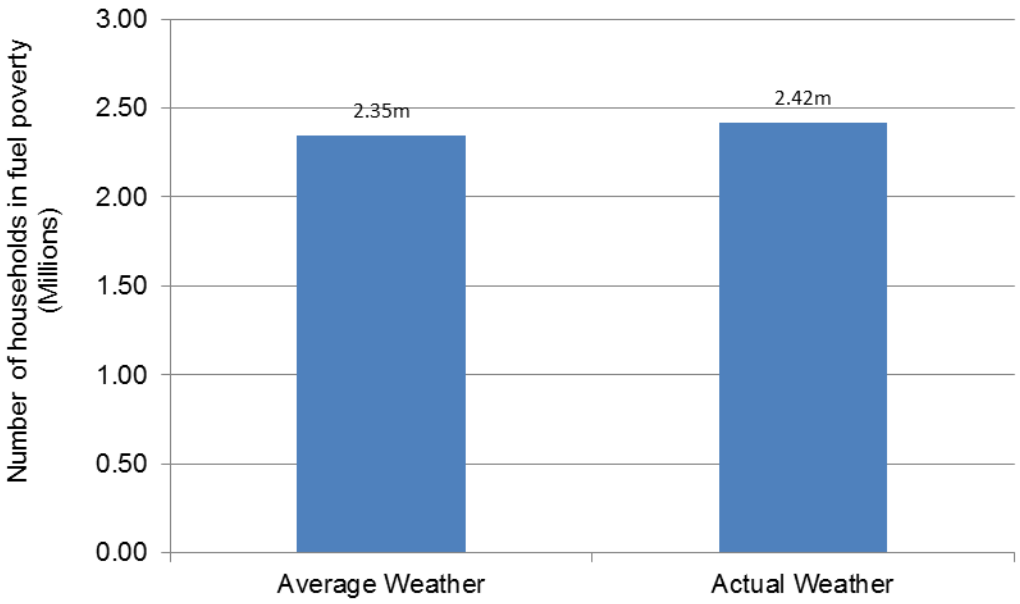
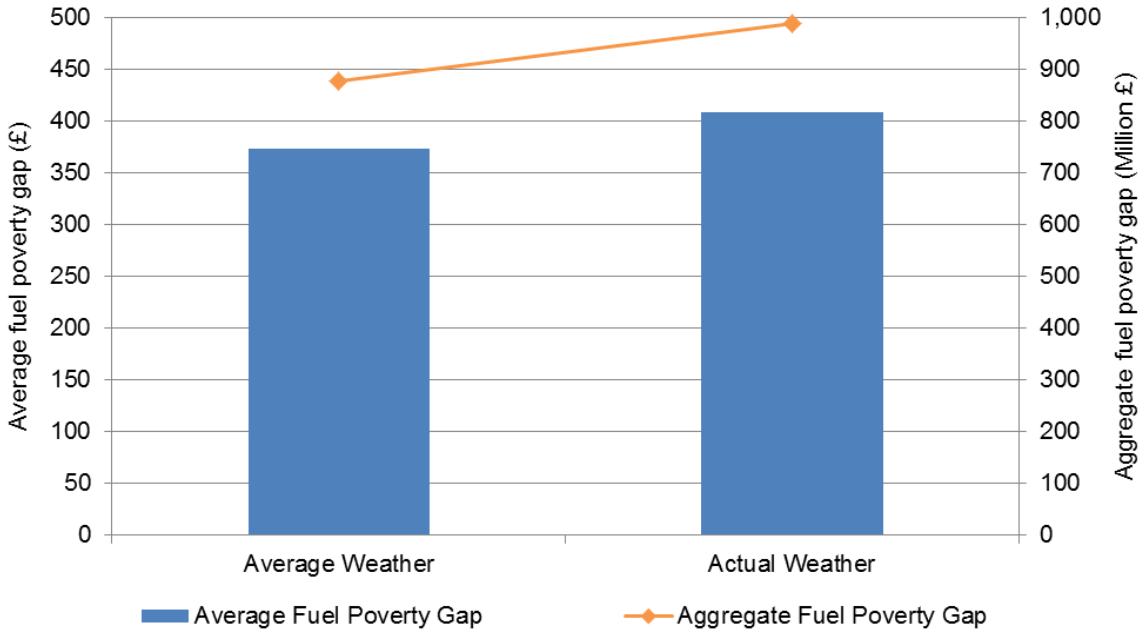


Chart 9.7: Mean and aggregate fuel gap for 2013 for average and actual temperature model runs.



9.5.2. Differences to the 2012 dataset

The 2012 and 2013 datasets are similar in that they both comprise of a colder than average period (2012 survey year) and a warmer than average period (2011 and 2013 survey years). However, where the 2011 survey year is reasonably warmer

than the 20 year average, the 2013 survey year is only marginal warmer compared to the 20 year average. There is also a substantial difference in regional temperature variation in the 2013 survey year compared to the 2011 survey year. In the 2011 survey year, every region in England was warmer, albeit by differing amounts, compared to the 20 year average (Chart 9.1). Whereas in the 2013 survey year, a few regions were very warm compared to the 20 year average but the majority of regions were colder than the average or had very small changes in temperature (Chart 9.5).

Additionally, in the 2013 survey year, the colder regions tended to have higher household densities than the warmer regions. This resulted in a higher proportion of households in regions which were colder than the 20 year average, despite the average temperature across England as a whole being warmer. Therefore, the majority of households from the 2013 survey year saw an increase in fuel costs. This is a contrast to the households in the 2011 survey year of the 2012 dataset which had lower fuel costs and more households moving out of fuel poverty.

Whilst there are differences between the warmer periods of the 2012 and 2013 datasets, they are less apparent due to the very cold 2012 survey year which is shared by both datasets. If there were two survey years with smaller changes in temperature, then differences in regional temperature variation would be more explicit and would have a greater impact on determining the levels of fuel poverty.

9.6 Conclusion

The use of a standardised set of temperatures is in line with the use of a fixed heating regime and provides clearer trends in fuel poverty. This method is, therefore, preferred for the headline statistics, for assessing long term changes to levels of fuel poverty and identifying where improvements can be made.

It is of interest, however, to model the effect of actual weather on fuel poverty and consider how this affects the statistics. In both the 2012 and 2013 datasets, a colder overall temperature compared to the 20 year average resulted in increased levels of fuel poverty and a higher mean and aggregate fuel gap. In 2013, modelling the actual temperatures led to an increase in the number of households from 2.35 million to 2.42 million. The mean fuel poverty gap increased from £373.6 to £408.5 and the aggregate fuel gap increased from £876.8 million to £987.8 million.

It is less clear how the change in weather will affect the fuel poverty status of the housing stock in other years. Whilst it is likely that a colder year will see more households move into fuel poverty and the fuel poverty gap increase, it is plausible that different regional and local temperature effects may actually lead to a small fall in fuel poverty.

Additionally, as fuel poverty datasets span two years, statistics are heavily reliant on the temperature variation between survey years, and the impact on the median fuel

cost. The skew of the median fuel cost towards a particular survey year can have an impact on how many households move into or out of fuel poverty.

9.7 Limitations of analysis

The methodology of this project is subject to limitations which should be taken into consideration when interpreting the findings. The method of calculating external temperature from degree days differs in its accuracy across regions. Whilst this method was tested by comparing the 20 year average fuel poverty statistics using the degree day method and the actual Met Office temperatures and found to have minimal difference in the statistics, it is still worth noting that the temperature of some regions may be less accurately represented than others. This study also only takes the change in external temperature into account and so this is not a true representation of the impacts of weather on fuel poverty. Other weather related variables such as wind speed and solar irradiance remain constant in the methodology, but vary in reality, and the effects of these factors are not taken into consideration. Finally, the effect of actual temperature on cold weather payments has also not yet been investigated. As cold weather payments are not based on relative fuel poverty, but on absolute temperature data, including actual temperature in this modelling may be of interest.

Table 9.1: Mean External Temperature – 2011/12 Survey Year

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
England Average	5.4	3.7	8.6	10.9	11.9	12.1	13.5	13.8	13.5	11.9	9.8	6.0
Thames Valley	5.5	4.4	8.5	10.6	11.5	11.9	13.3	13.6	13.3	11.6	9.8	6.0
South East	5.3	3.0	9.2	12.5	12.9	12.7	13.9	14.2	13.9	12.4	10.1	5.5
South	6.0	3.4	9.2	11.3	12.0	13.2	14.1	14.5	14.3	12.8	10.8	6.3
South West	7.8	5.2	9.3	11.5	12.4	13.2	14.5	14.7	14.8	13.6	12.3	9.0
Severn Valley	7.8	5.8	9.2	11.3	11.9	12.6	13.9	14.1	14.2	13.1	11.8	9.0
Midland	5.8	3.9	8.9	11.7	12.6	12.1	13.6	13.8	13.5	12.2	9.9	6.5
West Pennine	4.7	3.3	8.7	10.8	12.0	12.0	13.5	13.9	13.2	11.8	9.1	5.3
North West	4.1	3.0	7.8	10.4	11.7	11.2	12.6	13.1	12.7	10.8	8.5	4.9
Borders	4.5	3.5	7.3	9.3	9.9	10.1	12.1	12.4	12.2	10.9	8.9	5.3
North East	5.6	4.8	8.2	9.7	11.2	12.0	13.6	13.5	13.1	11.3	9.8	6.1
East Pennines	3.8	2.8	8.0	10.4	11.3	11.3	12.6	13.0	12.6	10.3	8.2	4.1
East Anglia	4.4	3.0	8.6	10.2	12.1	12.2	13.4	14.0	13.7	11.5	9.1	4.8

Table 9.2: Mean External Temperature – 2012/13 Survey Year

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
England Average	3.6	3.1	2.9	6.7	10.1	12.1	13.5	14.4	12.4	9.6	6.8	4.9
Thames Valley	3.1	2.6	3.1	7.4	11.1	12.7	13.9	14.7	12.8	10.3	7.0	4.8
South East	3.8	3.1	3.6	7.8	11.3	13.0	14.1	14.9	13.3	10.8	7.7	5.6
South	6.3	4.8	4.7	8.2	11.5	13.3	14.3	15.2	14.1	12.1	9.3	8.2
South West	6.7	5.4	4.9	7.7	11.0	12.9	14.0	14.9	13.4	11.8	8.9	8.1
Severn Valley	3.8	3.1	3.3	6.8	10.9	12.6	13.6	14.5	12.4	10.0	7.0	5.7
Midland	2.5	2.1	2.1	6.3	10.2	11.8	13.5	14.3	11.8	9.1	6.0	4.2
West Pennine	2.0	1.9	1.4	5.6	9.4	11.3	13.0	13.6	11.2	8.1	5.0	3.1
North West	3.1	2.6	1.9	5.7	8.8	11.0	12.6	13.3	11.2	8.0	5.9	3.7
Borders	4.9	4.1	3.3	6.6	8.6	11.7	13.3	14.4	12.4	9.0	7.3	5.3
North East	2.0	1.9	1.5	5.7	8.7	11.1	12.9	13.8	11.5	7.9	5.1	2.7
East Pennines	2.5	2.6	2.2	6.5	9.9	11.9	13.5	14.6	12.3	9.2	6.0	3.7
East Anglia	2.7	2.6	2.5	6.5	10.1	11.9	13.6	14.7	12.5	9.3	6.2	3.8

Table 9.3: Mean External Temperature – 2013/14 Survey Year

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
England Average	4.7	4.6	5.3	6.7	9.8	12.2	14.0	14.5	12.8	11.0	6.8	5.7
Thames Valley	4.6	4.5	5.7	7.3	10.6	12.8	14.4	14.8	13.1	11.5	6.8	5.6
South East	5.2	4.9	6.1	7.6	10.8	13.1	14.5	15.0	13.6	11.9	7.4	6.4
South	7.5	6.6	6.8	7.8	10.9	13.2	14.6	15.1	14.3	13.1	9.3	8.7
South West	7.5	6.5	6.8	7.7	10.5	13.0	14.4	15.0	13.8	12.8	9.0	8.6
Severn Valley	5.0	4.8	5.6	6.8	10.3	12.7	14.2	14.6	12.9	11.2	6.9	6.2
Midland	3.8	3.7	4.8	6.3	9.8	12.1	14.1	14.5	12.3	10.4	6.1	5.0
West Pennine	3.0	3.3	4.1	5.7	9.1	11.5	13.5	13.7	11.6	9.6	5.3	4.1
North West	4.0	3.9	4.3	5.5	8.6	11.1	13.2	13.5	11.6	9.6	5.8	5.1
Borders	5.4	5.1	5.4	6.3	8.8	11.7	13.9	14.5	12.7	10.5	7.3	6.2
North East	2.9	3.3	4.2	5.8	8.9	11.2	13.5	13.9	11.9	9.5	5.1	3.7
East Pennines	3.6	4.1	4.9	6.7	9.8	12.0	14.0	14.6	12.7	10.6	6.0	4.6
East Anglia	3.8	4.1	5.2	6.7	10.0	12.1	14.1	14.7	12.9	10.8	6.2	4.6

Annex A: Related data

This is the headline statistical report on the latest 2013 fuel poverty data. In addition, and linked to this report, the following detailed analyses are available:

Detailed tables

These tables, which are available to download as an excel spreadsheet, present the 2013 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 2013 under the LIHC indicator. The tables are a compilation of the key annual detailed tables (see above) from the past few years. The full time series has been updated to reflect changes to BREDEM (see section 1.5.1).

Monitoring 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. An additional technical annex will be published in autumn 2015.

The above publications are available at:

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

Sub-regional fuel poverty statistics

The 2013 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 autumn 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. 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 provides 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.

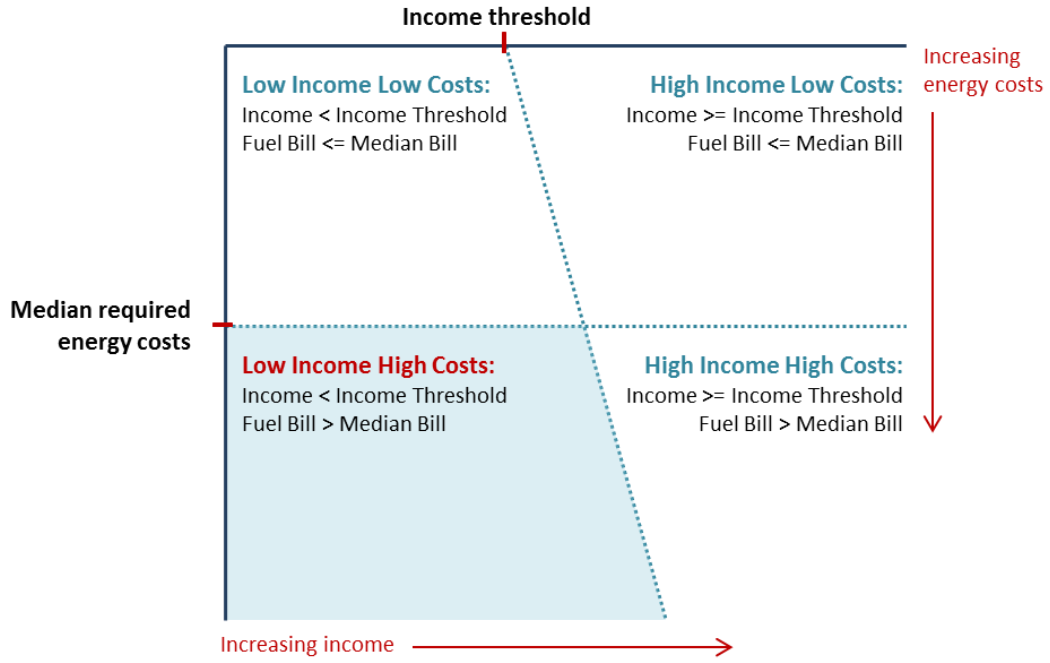
Annex B: Calculating fuel poverty under Low Income High Costs (LIHC)

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.

Household income threshold

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

1. Taking the full income 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

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 (2013)

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 : £1,601

Total income : £15,596

Housing costs : £96.92 mortgage repayments per week

Equivalised fuel costs = £1,593 / equivalisation factor (1.07)
= £1,497

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 (£1,497) > median fuel costs threshold (£1,239)
ACH equivalised income (£8,797) < income threshold (£12,212 + £1,239 = £13,451)

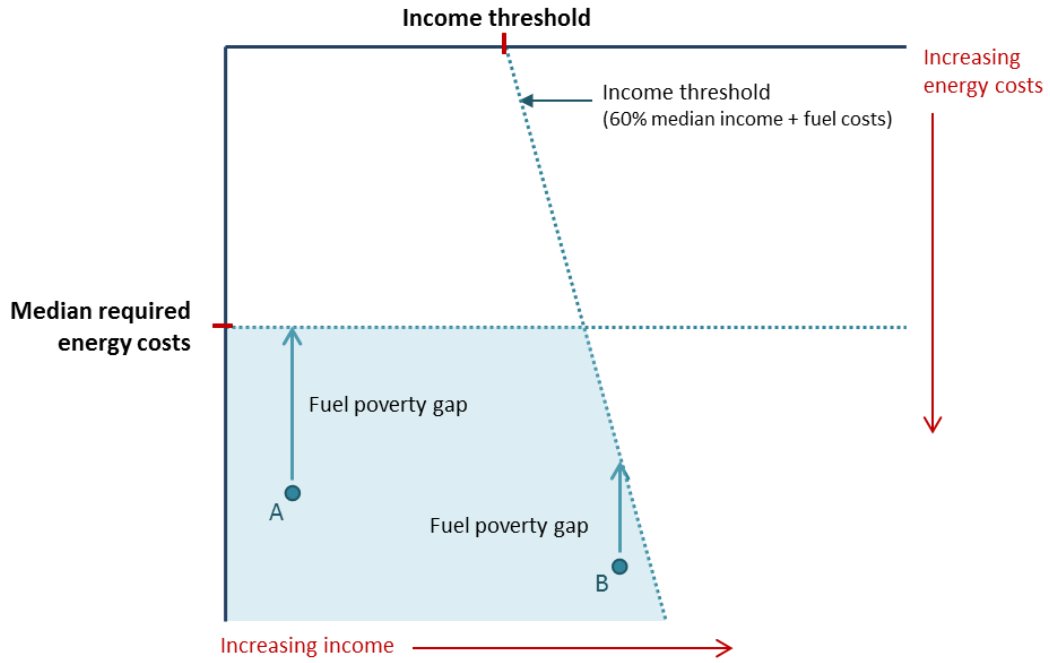
Therefore the household is considered fuel poor under the LIHC indicator

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 2013 fuel poverty dataset:

- 60% of AHC median income = £12,212
- Median required energy costs = £1,239

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 (2013)

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

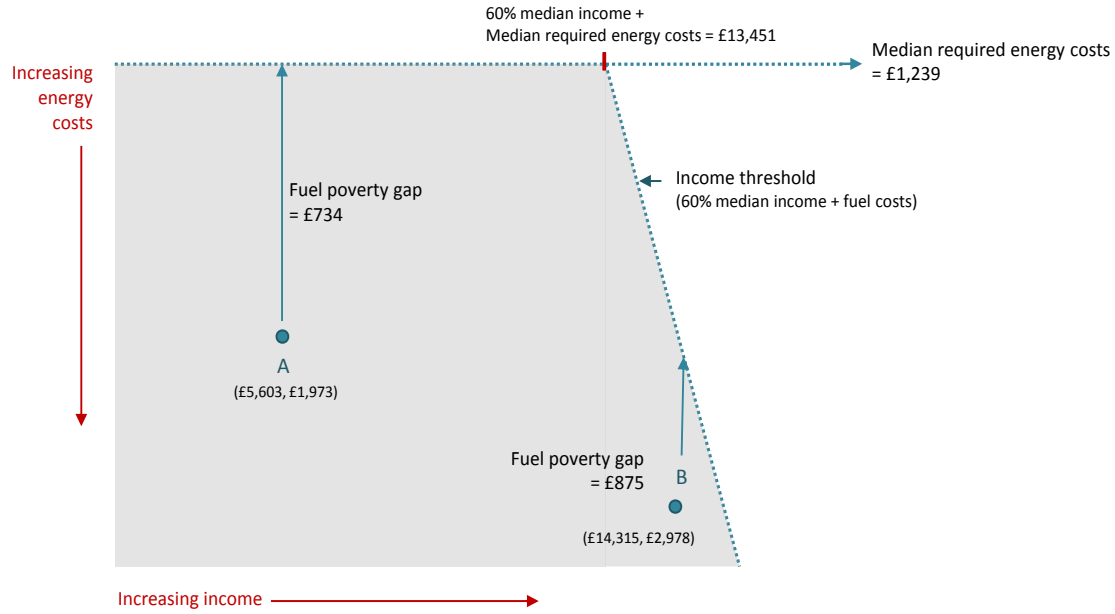
has an income level above this overall threshold. The income (x) and fuel costs (y) for each household is shown in Figure B3 below as (x, y).

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
= £1,973 - £ 1,239 = £734

$(\text{Fuel poverty gap})_B$ = 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)]
= (£2,978 - £1,239) – [£14,315 – (£12,212 + £1,239)] = £875

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 2013, regional maps

Figure C.1: Percentage of households in fuel poverty at LSOA level, London, 2013

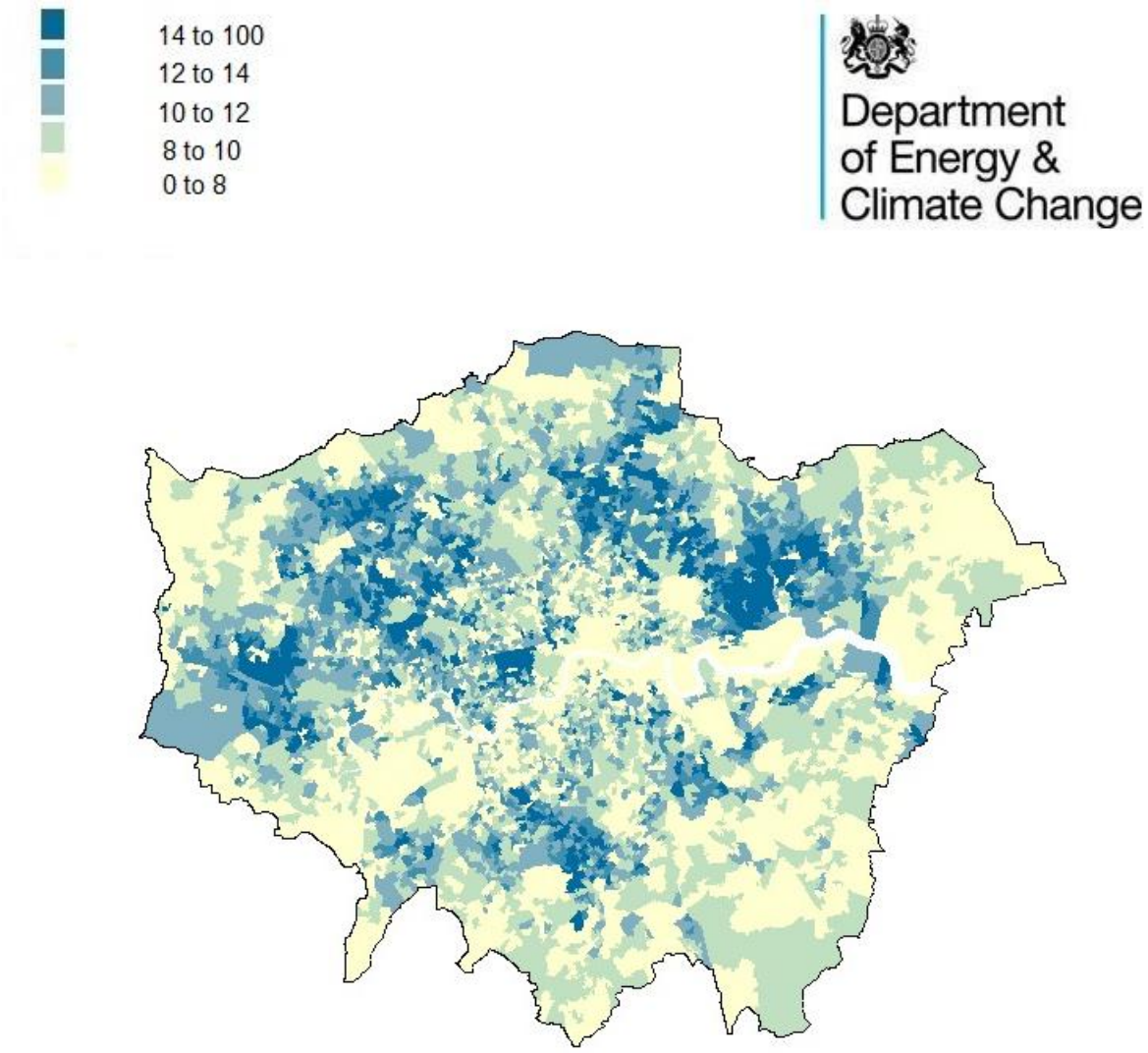


Figure C.2: Percentage of households in fuel poverty at LSOA level, South East, 2013

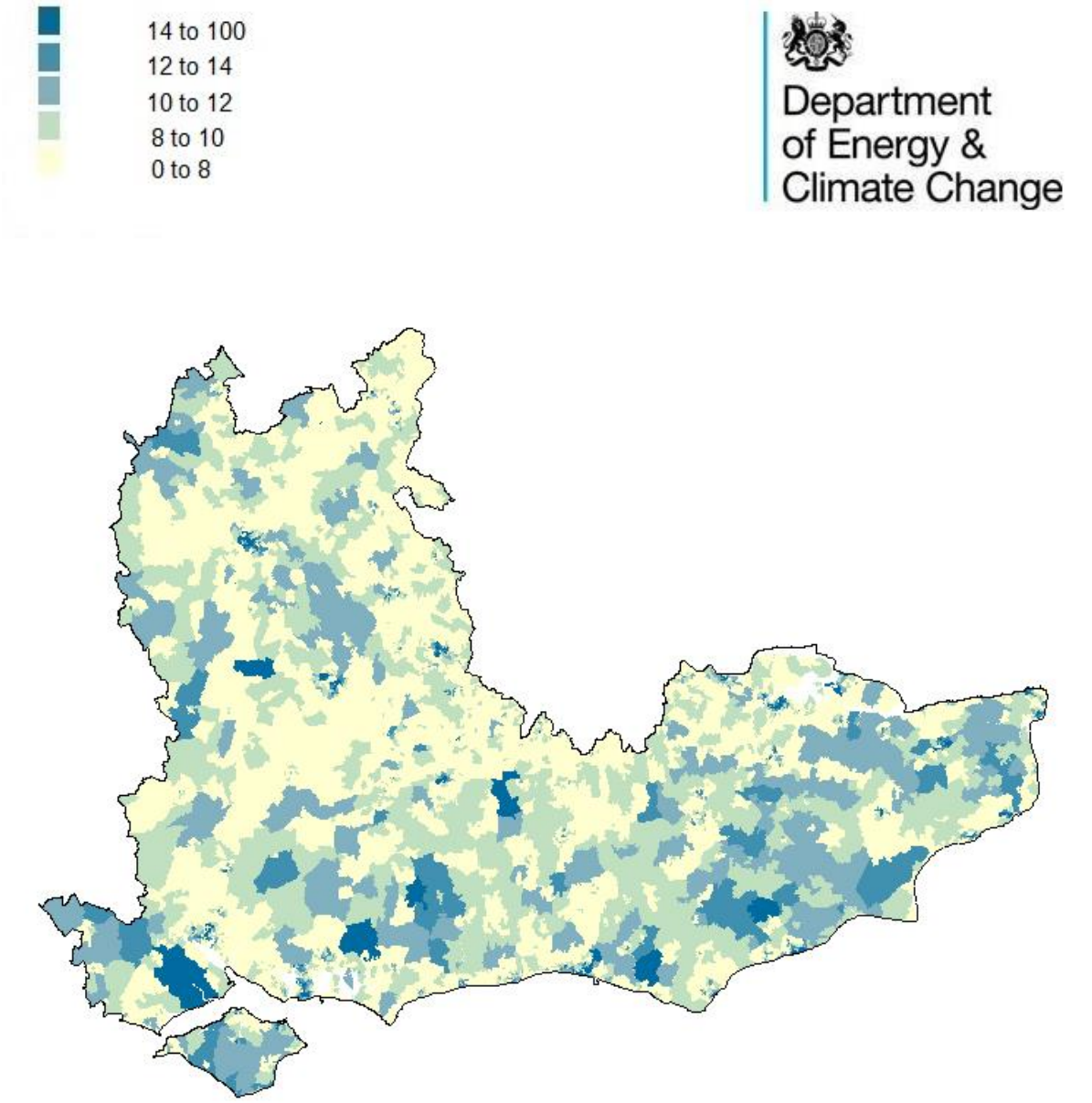


Figure C.3: Percentage of households in fuel poverty at LSOA level, South West, 2013

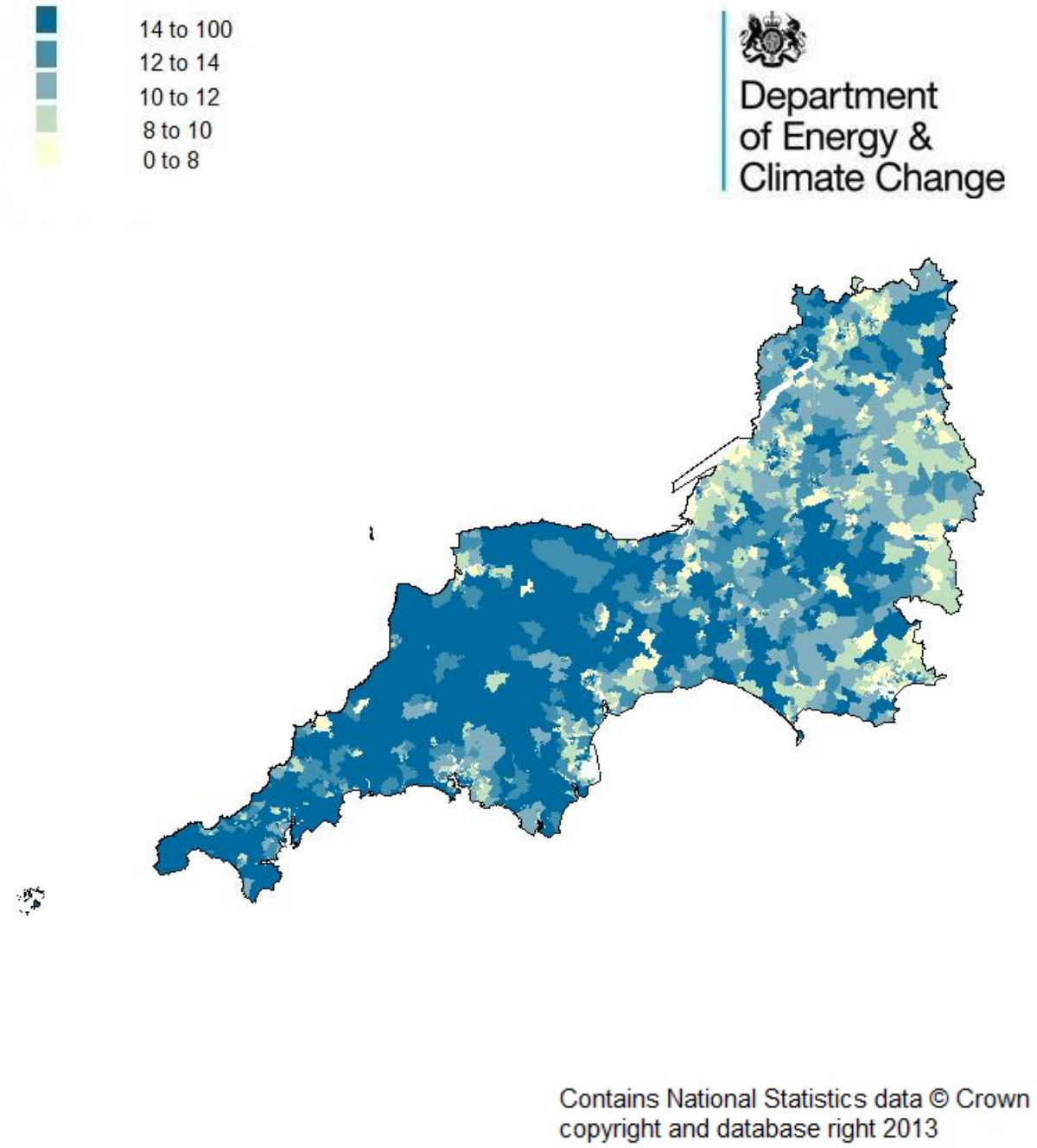


Figure C.4: Percentage of households in fuel poverty at LSOA level, East of England, 2013

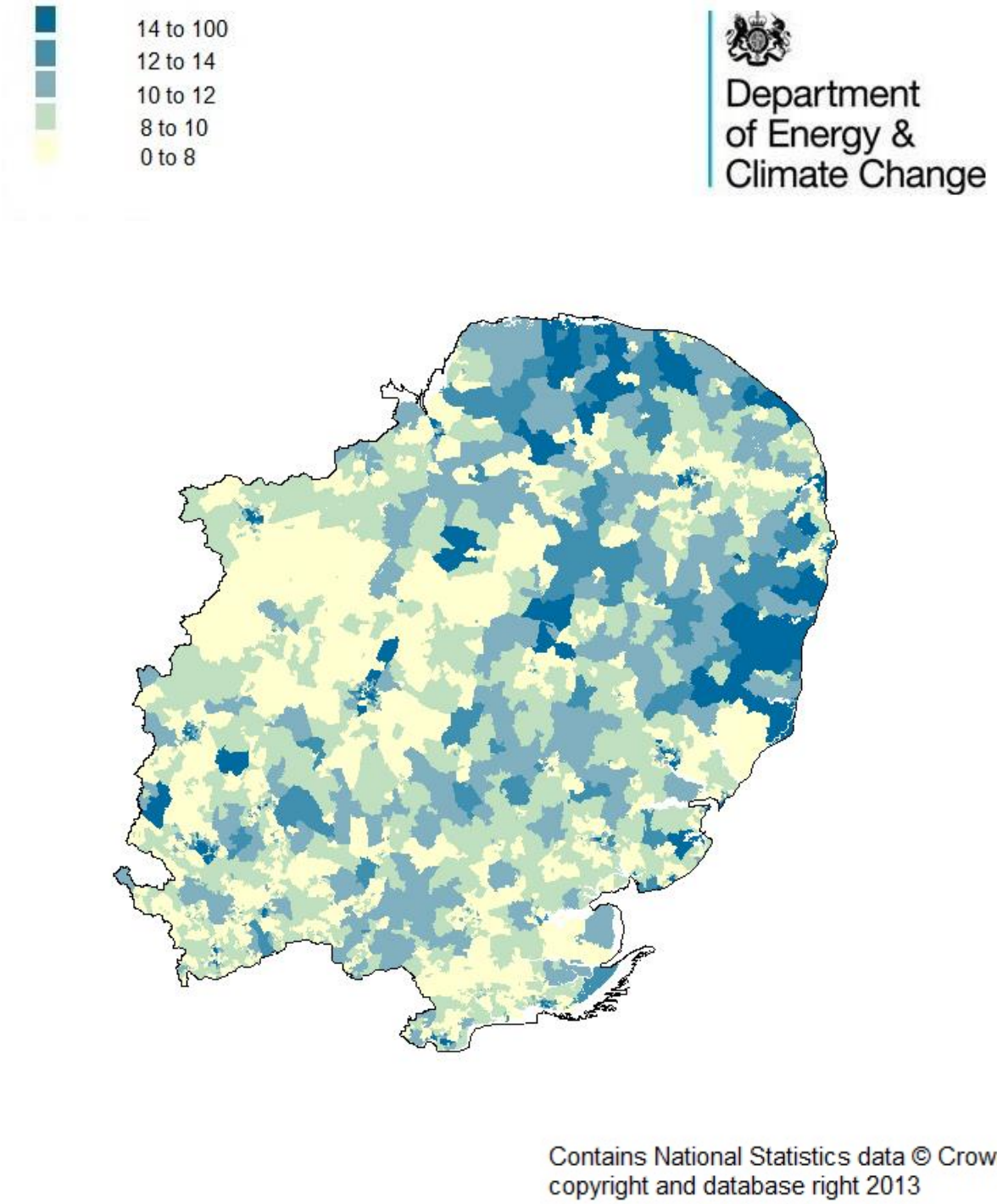


Figure C.5: Percentage of households in fuel poverty at LSOA level, East Midlands, 2013

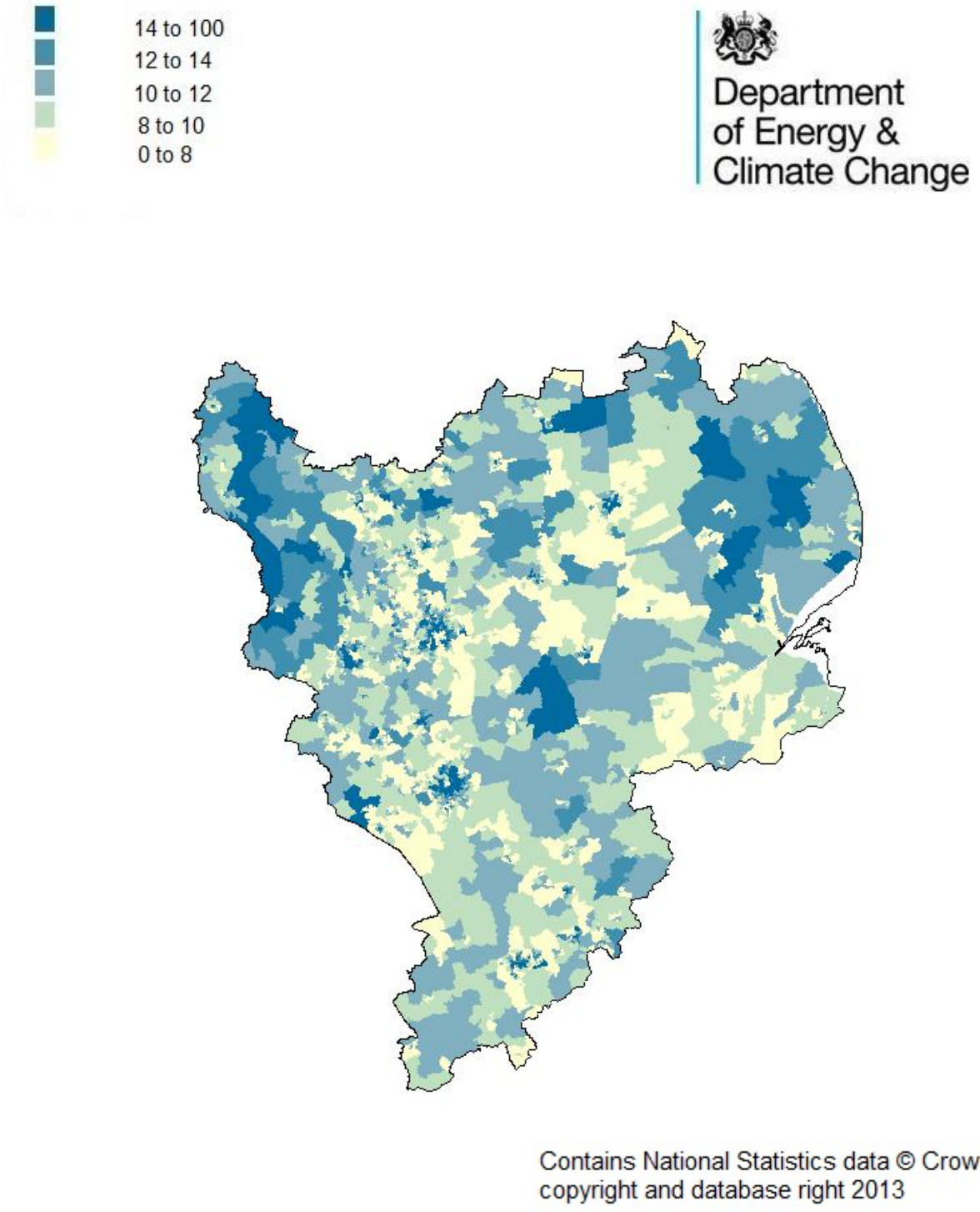


Figure C.6: Percentage of households in fuel poverty at LSOA level, West Midlands, 2013

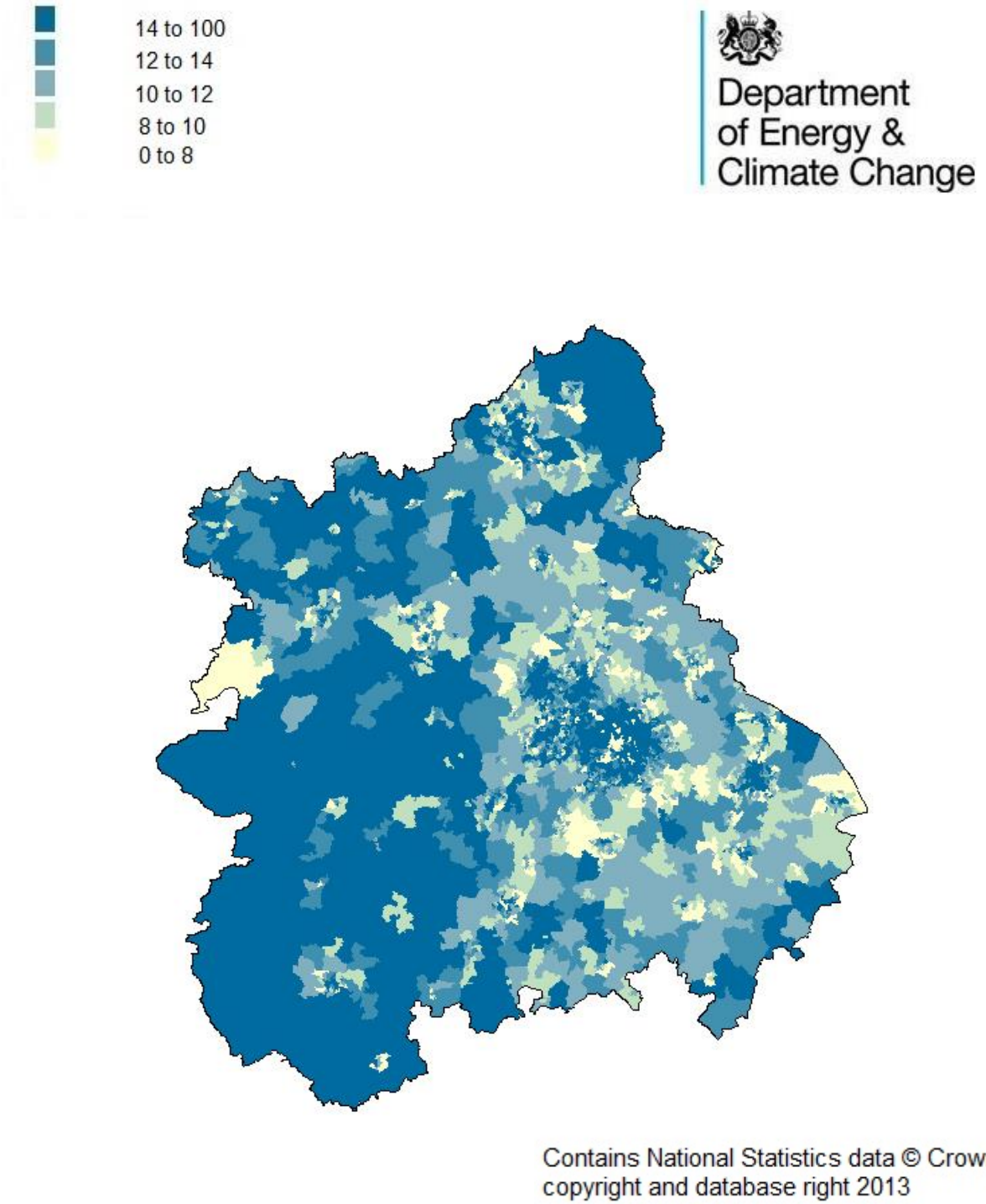


Figure C.7: Percentage of households in fuel poverty at LSOA level, Yorkshire and the Humber, 2013

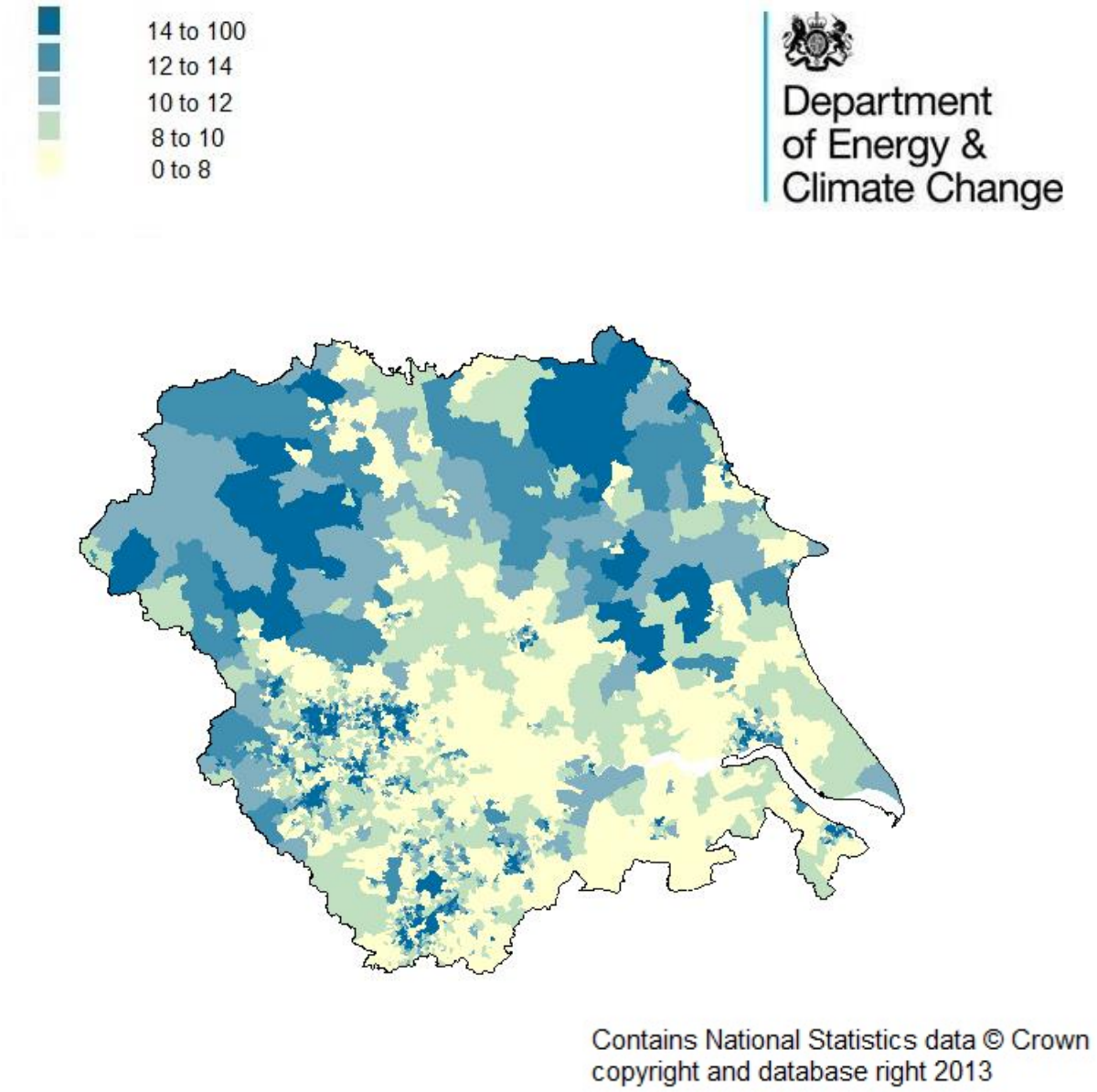


Figure C.8: Percentage of households in fuel poverty at LSOA level, North East, 2013

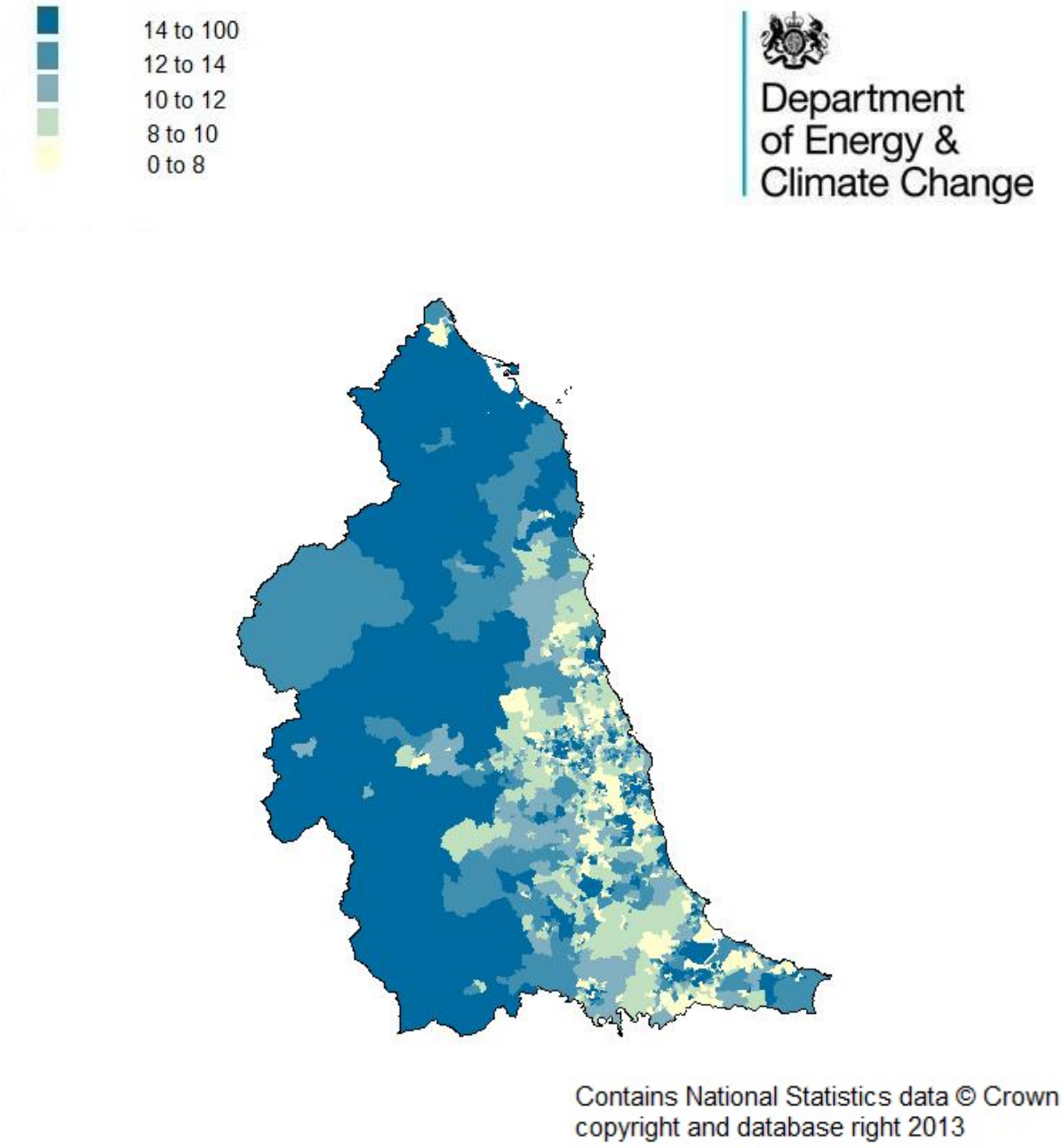
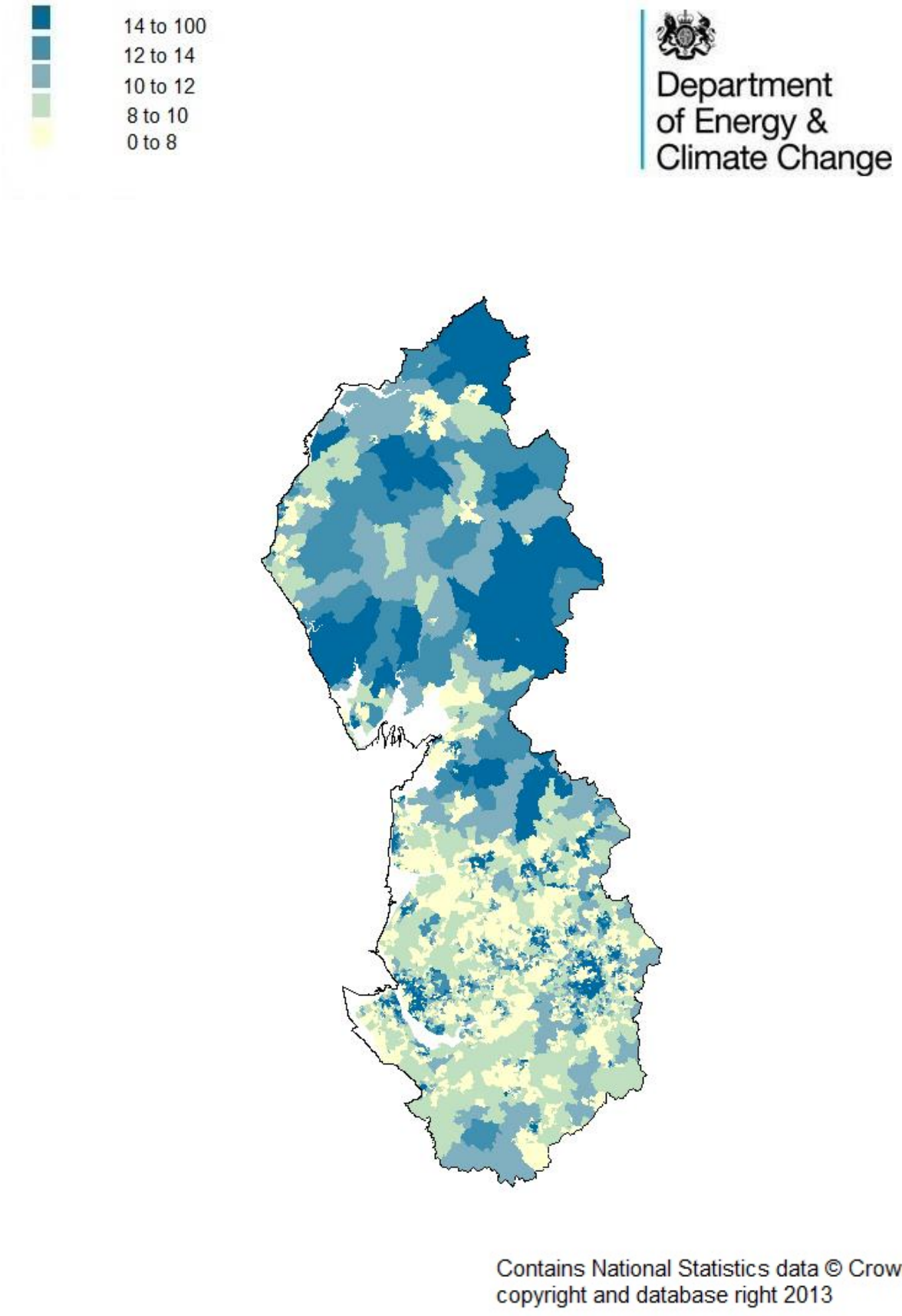


Figure C.9: Percentage of households in fuel poverty at LSOA level, North West, 2013



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