COLD AND POOR: An analysis of the link between fuel poverty and low income

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and Peter Kenway
Cold and Poor: An Analysis of The Link between Fuel Poverty and Low Income
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INTRODUCTION

This report has been written by the New Policy Institute for the Eaga Partnership Charitable Trust. Its main objectives are:

1. To analyse the extent of the overlap between fuel poverty, income poverty and other forms of deprivation.
2. To analyse how the risks of fuel poverty (both overall and for those in income poverty) vary for different groups of the population and what factors account for these differing risks.
3. To identify the policy implications arising and to challenge policy makers, campaigners and others to consider how the policies they promote or pursue may impact upon those in fuel poverty.

The bulk of the report focuses on the first two objectives above. This summary presents the key findings on these issues together with a brief discussion of the policy implications arising.

The report is based on analysis of the latest official data and it aims to cover the whole of the United Kingdom. There are, however, three complications:

- Although the concept of fuel poverty is UK-wide, the actual data is country-specific and the data for Scotland, Wales and Northern Ireland is, in several ways, less comprehensive than that for England. As a result, the quantitative analysis is actually based on England data, with comments about the applicability of the findings to the other countries being made where appropriate. Furthermore, although the published statistics on fuel poverty purport to be comparable between the countries, our analysis casts severe doubt on whether this is, in fact, the case.

- The latest official data is for 2005 but, because of energy price rises since then, the situation is now likely to be substantially different. In reaction, we have developed a 2007 version of the 2005 data which incorporates the price rises. This is then used to analyses overlaps and risks for 2007 as well as for 2005.

- Household incomes do not provide a direct measure of income poverty because they do not reflect the impact of differing household sizes and compositions. For example, a family of four requires a higher household income to enjoy the same standard of living as a single person but, because of economies of scale, it does not need four times as much. In reaction, when looking at income poverty, we have adjusted the household income using internationally agreed procedures for so doing. These procedures are, for example, the same as those used by the government in its income poverty calculations.

This is a report based on analysis of official government fuel poverty datasets. It takes as given the official definitions of income poverty, fuel poverty, treatment of fuel costs, etc. It also takes as given the official calculations in the detailed survey data of estimated required fuel costs, household income, and whether or not particular households are in fuel poverty. Unless otherwise stated, all fuel poverty statistics in the report relate to the ‘full income definition’ of fuel poverty and all income poverty statistics relate to the ‘before deducting housing costs’ measure of income poverty.
THE OVERLAP BETWEEN FUEL POVERTY AND OTHER FORMS OF DEPRIVATION

Income poverty

In 2005 in England, most of the 1.5 million households in fuel poverty were also in income poverty. This means that policies to reduce income poverty would have had a direct impact on most households in fuel poverty. To illustrate the scale of this potential impact, we estimate that if income poverty had been eradicated by 2005 then the number of households in fuel poverty could have been as low as 0.5 million.

By 2007, however, the situation is likely to have changed considerably. We estimate that the rises in energy prices roughly doubled the number of households in fuel poverty, from 1.5 million in 2005 to 3.0 million in 2007. Many of the households moving into fuel poverty during this period will not have been in income poverty and, as a result, the overlap between fuel poverty and income poverty has become less strong.1

This in turn means that policies to reduce income poverty now have less proportional impact on fuel poverty. We estimate that if income poverty had been eradicated by 2007 then the number of households in fuel poverty would still have been at least 1.6 million. In other words, even if income poverty had been completely eradicated between 2005 and 2007 (which would have been an incredible achievement) then the number of households in fuel poverty in 2007 would still have been higher than it was in 2005.

These calculations show how important fuel prices are to the scale of fuel poverty: the increase of gas prices by around a third between 2005 and 2007, plus the increase in electricity prices by around a quarter, has doubled the numbers in fuel poverty.

Deprivation of area

Households in deprived areas in England are more likely to be in fuel poverty than households in other areas but the differences are only slight (in 2005,2 8% in deprived areas compared with 7% in areas of average deprivation) and the vast majority of households in deprived areas are not in fuel poverty. Furthermore, among those in income poverty, those living in deprived areas are actually less likely to be in fuel poverty than those living in other areas (in 2005, 24% in deprived areas compared with 34% in areas of average deprivation). Our analysis suggests that a major reason for this is that they tend to live in either smaller or more energy-efficient properties than their counterparts in other areas. This is, in turn, likely to relate to the greater prevalence of social rented properties in deprived areas.

The policy implication is that any policies to regenerate deprived areas will only have a relatively minor effect on fuel poverty and that any policies to combat fuel poverty which are focussed on areas of high deprivation will only reach a small proportion of those in fuel poverty.

‘Vulnerable’ households

The fuel poverty strategy in England uses a very broad definition of ‘vulnerability’, namely any household with a child, an older person or someone receiving state benefits. This means that around three-quarters of all households are defined as being ‘vulnerable’. Given this, it is not surprising that most households in fuel poverty are also classified as ‘vulnerable’.

But the risks of fuel poverty are broadly similar between the ‘vulnerable’ and ‘not vulnerable’ (in 2005, 7% compared with 5%). And, among those in income poverty, ‘vulnerable’ households
are actually much less likely to be in fuel poverty than ‘non-vulnerable’ households (in 2005, 27% compared with 42%). The basic explanation for this is the high rates of fuel poverty among single-person households of working age, a group who are not counted as vulnerable (discussed in more detail later).

From a policy perspective, we do not see the point in using a definition of ‘vulnerability’ which covers most of the population whilst still not differentiating between high risk and low risk groups. Furthermore, it is a completely non-standard definition of ‘vulnerability’ which is not used by government anywhere else, including other parts of the Communities and Local Government department. As such, it is likely to mislead, particularly when the rest of government does use the term ‘vulnerable’ in many other policy areas for a much more limited group, namely any household where someone is receiving state benefits. Using this, much more common, definition of ‘vulnerable’ would have the added advantage of focussing on a group who are actually at relatively high risk of fuel poverty (in 2005, 13%).

DIFFERING RISKS OF FUEL POVERTY AND THE FACTORS DRIVING THESE

For each of the factors listed, the table below sets out the group at highest risk of fuel poverty, both overall and for those in income poverty.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Groups with a high risk of being in fuel poverty (average of 2003 to 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Among the total population</td>
</tr>
<tr>
<td>SAP rating</td>
<td>Under 30 (26%)</td>
</tr>
<tr>
<td>Floor space</td>
<td>All roughly equal</td>
</tr>
<tr>
<td>Household type</td>
<td>Singles – both over and under 60 (15%)</td>
</tr>
<tr>
<td>Tenure</td>
<td>Outright owners and private renters (10%)</td>
</tr>
<tr>
<td>Type of area</td>
<td>Rural, slightly (8%)</td>
</tr>
<tr>
<td>Geography (within England)</td>
<td>North East (10%)</td>
</tr>
<tr>
<td>Geography (between countries)</td>
<td>Scotland and Northern Ireland (23%)³</td>
</tr>
<tr>
<td>All</td>
<td>6%</td>
</tr>
</tbody>
</table>

The main points of interest are:

- Those factors where the risk of fuel poverty of varies markedly but where this has not been highlighted in much previous research: single-person households.
- Those factors where the variation in fuel poverty risk follows a different pattern for those in income poverty than for the population as a whole: rural households.
- The differences between England, Scotland, Wales and Northern Ireland.
Single-person households

Single-person households in England are much more likely to be in fuel poverty than couples or larger families, their risk being twice as high as the next highest household type, lone parents (in 2005, 15% compared with 7%). This applies to working-age singles as well as pensioner singles. Because of their relatively high risk, two-thirds of the households in fuel poverty in 2005 in England were single-person households even though only a quarter of all households were single-person households.

This difference is equally pronounced among those in income poverty, where more than half of all single-person households in England were in fuel poverty in 2005, rising to an estimated 80% in 2007. Again, this applies to working-age singles as well as pensioner singles.

Our analysis suggests that the reason for the high risk of fuel poverty among single-person households, both overall and among those in income poverty, is that, whereas their estimated fuel costs tend to be a bit lower than those for other household types, their household incomes tend to be a lot lower. In other words, fuel costs tend to be a bigger burden, relative to incomes, for single-person households than for larger households.

To put all this in context, our analysis suggests that ‘singleness’ is as big a factor in fuel poverty as the three other major factors, namely fuel prices, income poverty and the energy efficiency of the home.

The obvious policy implication is that any initiatives to reduce fuel poverty will have a limited impact unless they cover single-person households. This includes those of working age as well as the better known case of pensioners. In this context, it is somewhat ironic that single-person households of working age are precisely one of the main groups that the fuel poverty programme does not classify as ‘vulnerable’.

Two wider points about single-person households of working age are also worth noting. First, one of the most notable features of the government’s general anti-poverty strategy is its lack of concern about them. Unlike children and older people, their means-tested state benefits have remained frozen in real terms for at least the last decade and they form only a small minority of those eligible for tax credits. As a result, unlike children and older people, they have not seen a reduction in income poverty rates over the last decade.

Second, the issues facing them are often wider than just fuel poverty. They also face higher relative housing costs than other family types and are more susceptible to adverse events, such as illness or unemployment. And they are a growing group in the population – there are now almost 4 million single people of working age living alone compared to just 1 million in 1971.

Rural households

The conclusions here depend on the view taken about ‘how rural is rural’. Households in ‘remote rural’ areas in England are much more likely to be in fuel poverty than households in other areas, their risk being twice as high as the next highest area type (‘village centres’). But most households whom the government classifies as ‘rural’ do not live in these remote areas and, taking all types of rural area as a whole, the overall risk of fuel poverty is only a bit higher than in urban or suburban areas (in 2005, 8% in rural compared with 5% in suburban and 7% in urban). Our analysis suggests that a major reason for this is that, whilst rural households as a whole tend to live in larger and less energy-efficient properties, their incomes also tend to be higher.
Among those in income poverty, however, those in rural areas (taken as a whole) are much more likely to be in fuel poverty than those in either urban or suburban areas (in 2005, 44% in rural compared with 28% in suburban and 26% in urban). Our analysis suggests that the reason for this is that, whilst (like rural households as a whole) they tend to live in larger and less energy-efficient properties, there is (unlike rural households as a whole) no offsetting factor in terms of higher incomes.

The policy implication is that the rural poor households on low incomes are an obvious potential candidate for fuel poverty initiatives. In this context, it is worth noting that the rural poor tend not to be a major focus of government anti-poverty policy more generally, at least partly because income poverty is less prevalent (and less concentrated) in rural areas than in urban areas. In this sense there is a parallel between the rural poor and poor single-person households of working age: a group of concern from a fuel poverty perspective who are often overlooked in the government’s more general anti-poverty policies.

England, Scotland, Wales and Northern Ireland

The table below summarises the official fuel poverty estimates for each country, together with the dates to which these estimates apply:

<table>
<thead>
<tr>
<th>Country</th>
<th>Proportion of households in fuel poverty</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>7%</td>
<td>2005</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>2004</td>
</tr>
<tr>
<td>Scotland</td>
<td>23%</td>
<td>2005/06</td>
</tr>
<tr>
<td>Wales</td>
<td>11%</td>
<td>2004</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>23%</td>
<td>2004</td>
</tr>
</tbody>
</table>

Both a review of the associated documentation, and conversations with some of the relevant people, suggest that Scotland, Wales and Northern Ireland consider their fuel poverty estimates to be directly comparable with those of England. For a number of reasons, we think it reasonable for the risks of fuel poverty to be less in England than in the other countries. However, given the scale of the differences, we find it very difficult to believe that the estimates in the table above are truly comparable, particularly in terms of England/Wales versus Scotland/Northern Ireland. Our main reasons for this are as follows:

- It is clearly not due differences in the different time periods to which the statistics apply: the Scotland figure of 23% for 2005/06 is effectively for the same time period as the England figure of 7% for 2005, and the Northern Ireland of 23% is for the same time period as the England figure of 6% for 2004.
- The scale of the differences between England/Wales, and Scotland/Northern Ireland is an order of magnitude greater than that between the different regions within England. For example, the region in the England with the highest estimated rate in 2005 (the North East) was, at 10%, still only half that in Scotland or Northern Ireland. So while the risk of fuel poverty might rise as one moves north (e.g. because of the colder weather), the differences in rates in England suggests that this factor is nowhere near large enough to account for the differences.
- It is not just the overall rates which are dramatically different, but also the rates for each subgroup within the population. For example, it is estimated that almost 50% of single
pensioners in Scotland, and over 40% in Northern Ireland, were in fuel poverty compared with 20% in England. And 20% of urban households in both Scotland and Northern Ireland were in fuel poverty compared with less than 10% in England. So, the differences in rates is not due to differences in demographics.

- Contrary to what some people think, income poverty rates in Scotland and Northern Ireland are similar to those in England and Wales, not a lot higher. So, the differences in the risks of fuel poverty are not due to differences in the number of poor people.

- Fuel costs in Northern Ireland do appear to be somewhat higher than in the rest of the UK and the Northern Ireland Housing Executive estimate that fuel poverty in Northern Ireland would be around a fifth lower if this were not the case, although this would still leave the Northern Ireland fuel poverty rate much higher than anywhere in England. Another factor in Northern Ireland might be the different mix and types of fuel that are used. In Scotland, however, fuel costs appear to be no greater than those in England or Wales and the mix and types of fuels used is similar.

This scepticism about comparability notwithstanding, we have looked at the extent to which our findings for England also apply to the other countries. This suggests that:

- In all four countries, single-person households, both working-age and older, are, relative to other households types, at a much higher risk of fuel poverty. In Scotland and Northern Ireland, however, the estimated risk is much higher for older singles than for working-age singles and, furthermore, pensioner couples also become a high risk group.

- Unlike England, households in rural areas in Scotland, Wales and Northern Ireland are all much more likely to be in fuel poverty than their urban counterparts. Note that, as discussed earlier, this might be due to differing thresholds for rurality.

**OVERALL CONCLUSION**

**Regarding fuel poverty**

The Government’s latest annual progress report on the UK fuel poverty strategy suggests that nearly three-quarters of the reduction in fuel poverty between 1996 and 2005 was due to increased incomes, around a fifth was due to energy efficiency measures and the remainder was due to energy price reductions. Since 2005, however, the substantial rise in fuel poverty is clearly due to energy price increases. Our analysis has also highlighted the high rates of fuel poverty among single-person households of both working age and pensionable age. Our challenge to policy makers, campaigners and others working in the fuel poverty area is therefore twofold:

- To consider what can be done to reduce fuel prices for those in fuel poverty.
- To ensure that their initiatives take proper account of the burden of fuel costs on single-person households, particularly those of working age.

Regarding the first challenge above, clearly one obvious way of reducing fuel prices for those in fuel poverty is to reduce domestic fuel prices for everyone. But there are also potential opportunities for price reductions which particularly benefit those in fuel poverty. For example, usage of prepayment meters is more common among low income households and households using prepayment meters typically pay much higher unit costs that those paying by direct debit, but the rationale for these higher unit costs is, at best, arguable.

Regarding the second challenge, one reason for highlighting those of working age is that there have been no obvious fuel poverty initiatives focussed on them, whereas most pensioners
qualify for winter fuel payments. One possible target group would be workless people in receipt of disability benefits: like other workless people, they are at high risk of fuel poverty because of the combination of low income and high fuel costs (they are at home all day and therefore assumed to have to heat their home all day); but unlike, for example, officially unemployed people, they are likely to remain out of work for long periods of time and are thus likely to remain in fuel poverty for long periods of time. Around half of all the single-person households of working age who are in fuel poverty are probably workless people in receipt of disability benefits.

Regarding income poverty

Policies to address income poverty over the last decade have tended to focus on children and older people, whilst deprivation-related policies have focussed almost exclusively on regenerating deprived urban areas. But our analysis suggests that two of the key groups of concern from a fuel poverty perspective have a very different focus, namely single-person households of working age and the rural poor. So, although these two groups are of concern from a fuel poverty perspective, they are often overlooked in the government’s more general anti-poverty policies. We therefore add a third challenge to those working in the fuel poverty area:

• To ensure that government policy makers understand that progress on fuel poverty will be limited unless broader government policy adequately addresses the problems of income poverty among both single-person households of working age and the rural poor.

Note that this challenge relates to government policy regarding the income of single-person households and the rural poor rather than their fuel costs. As such, it is not a comment on fuel poverty initiatives per se. Rather, it concerns such matters as helping people back into work, benefit levels and the tax credit system.
This section is concerned with the overall overlap between fuel poverty and income poverty.

The analysis focuses on England, for which large annual datasets (The English House Condition Survey or EHCS) are publicly available. Whilst datasets are also available for Scotland, Wales and Northern Ireland, these datasets do not really provide sufficiently detailed data to calculate whether or not a household is in income poverty. For Scotland and Northern Ireland, this is mainly because, rather than including an actual figure for each household’s income, the datasets simply allocate each household to one of a number of income bands. For Wales, it is mainly due to a combination of levels of non-response and small sample sizes.

The discussion covers both the latest official estimates (for 2005) plus our estimates for 2007.

The raw household income data from EHCS has been adjusted for differing household sizes and compositions so that these factors do not distort the analysis of who is in income poverty.

The material is supported by three appendices: appendix 2 provides the basic analysis of risks and overlaps; appendix 3 provides the equivalent analysis for those households who were also in income poverty; and appendix 4 provides an analysis of the impact of fuel price rises since 2005. The appendices can be found online at www.npi.org.uk.

**IDENTIFYING THOSE IN FUEL POVERTY**

For each household, the EHCS dataset provide a fuel poverty flag which is set to yes or no, together with the estimated required fuel cost and the disposable income. Unless otherwise stated, all figures in this report use the ‘full income definition’ of fuel poverty as this is the main measure used by Government.

The household’s estimated fuel cost is not an estimate of the actual costs of fuel used by the household. Rather, it is an estimate of the fuel costs that would be required to keep the home at defined temperature levels given various characteristics of both the household (number of occupants, working patterns, etc) and the home (size, energy efficiency of the walls, location, fuel type, boiler type, etc). The estimates are done by bre, an independent construction consultancy, using a model that they have developed and which is widely accepted. Note that this model is complex and involves a number of assumptions which are not immediately obvious. For example, households that ‘under occupy’ are assumed to only heat half of their accommodation but for a greater proportion of the day than most other household types. Appendix 1 provides a summary of the model.

**IDENTIFYING THOSE IN INCOME POVERTY**

Income poverty is defined at a household level, rather than at an individual level, with all members of that household being in income poverty or not depending on the total disposable income of the household.
The raw data on the disposable income of each household in EHCS is not appropriate to distinguish between those in income poverty and those not in income poverty because it does not reflect the impact of differing household sizes and compositions. For example, a family of four requires a higher household income to enjoy the same standard of living as a single person.

However, because of economies of scale, the family of four does not need four times as much income as the single person to have the same standard of living. This means that the process of adjusting for household size and composition is necessarily more complicated than simply dividing the household income by the number of people in the household.

In reaction, there are internationally agreed procedures (term ‘equivalisation’) for adjusting household incomes to put them on a comparable basis. These assume that there are both economies of scale and that young children require less expenditure than either older children or adults, as set out in the table below. So, for example, a single-person household would have their actual income divided by 0.67 to put it on the same basis as a couple with no children.¹⁰

<table>
<thead>
<tr>
<th>Individuals in the household</th>
<th>Weighting</th>
<th>Example household</th>
<th>Required income to achieve the same standard of living as a couple with no children and income of £X</th>
</tr>
</thead>
<tbody>
<tr>
<td>First adult in the household</td>
<td>0.67</td>
<td>Single adult with no children</td>
<td>£0.67X</td>
</tr>
<tr>
<td>Subsequent adults in the household</td>
<td>0.33</td>
<td>Couple with no children</td>
<td>(0.67 + 0.33)X = £1X</td>
</tr>
<tr>
<td>Any child aged 14 or over</td>
<td>0.33</td>
<td>Couple with two children aged 14 or over</td>
<td>(0.67 + 0.33 + 0.33*2)X = £1.66X</td>
</tr>
<tr>
<td>Any child below the age of 14</td>
<td>0.20</td>
<td>Single adult with one child aged 15 and the other aged 12</td>
<td>(0.67 + 0.33 + 0.2)X = £1.2X</td>
</tr>
</tbody>
</table>

This process of equivalisation makes a substantial difference to the profile of those in low income. Using an unequivalised measure, most (around 75%) of households in the bottom sixth by income are single-person households. This is not surprising, as singles only have one source of income. By contrast, using the equivalised measure, ‘only’ 30% of households in the bottom sixth by income are single-person households.

Using this equivalisation process, we have gone through all the EHCS records and calculated the equivalised household incomes and it is these incomes that are used to decide whether a household is in income poverty or not.¹¹,¹²

## The Overlap Between Fuel Poverty and Income Poverty

### Analysis for 2005

The Government defines a household as being in ‘fuel poverty’ if it needs to spend at least 10% of its total net income on fuel to keep the home warm. In 2005, around 1.5 million households in England were in fuel poverty on this basis – around 7% of all households.¹³
The Government defines a household as being in 'income poverty' if its equivalised household income is less than 60% of the average (median) household income. In 2005, around a sixth of households in England (3.5 million households) were in income poverty on this basis before deducting housing costs.\textsuperscript{14}

1.1 million households were in both fuel poverty and income poverty.\textsuperscript{15}

The majority of those in fuel poverty were also in income poverty (1.1 million households out of 1.5 million, which is around three-quarters).

By contrast, the majority of those in income poverty were not in fuel poverty (1.1 million households out of 3.5 million, which is around a third).

In other words, most households in fuel poverty in 2005 were also in income poverty but most households in income poverty were not in fuel poverty.

Analysis for 2007

Since the 2005 EHCS survey was undertaken, domestic fuel costs have risen considerably. According to BERR figures, domestic gas prices rose on average by 31-37\% in real terms from 2005 to 2007, with electricity prices rising by an average of around 21-25\%.\textsuperscript{16}

The effect of these price rises on the number of households in fuel poverty will have been considerable. We estimate that there were around 2.4 million households in fuel poverty in 2006 and 3.0 million in 2007. In other words, we estimate that the number of households in fuel poverty will have doubled between 2005 and 2007, from 1.5 million to 3.0 million.\textsuperscript{17} This latter figure equates to 14\% of all households.
1.1 million households in fuel poverty but not in income poverty
1.9 million households in both fuel poverty and income poverty
1.6 million households in income poverty but not in fuel poverty

2007 (estimated numbers)

Around half of the additional 1.5 million people moving into fuel poverty between 2005 and 2007 will be in income poverty, whilst the other half will not. As a result, the estimated proportion of those in income poverty who are also in fuel poverty rose from a third to just over half. And the estimated proportion of those in fuel poverty who are also in income poverty fell from three-quarters in 2005 to two-thirds in 2007.

Implications for policies to address fuel poverty

The analysis above shows that there is a strong overlap between fuel poverty and income poverty but that this overlap is by no means perfect.

In 2005, because most households in fuel poverty were also in income poverty, policies which raise the incomes of those in poverty would also have had a substantial impact on fuel poverty. In other words, reducing income poverty would have been an effective method of reducing fuel poverty.

However, because most households in income poverty were not in fuel poverty, fuel poverty considerations would not have been a major driving force in the development of any policies to reduce income poverty.

By 2007, however, the balance of the argument has shifted somewhat. On the one hand, policies which raise the incomes of those in poverty are now less effective in reducing fuel poverty because of the trebling in the numbers of households who are in fuel poverty but not in income poverty. On the other, concerns about fuel poverty could feature more in the government’s general anti-poverty thinking as it now affects more than half of those in income poverty.
SUBJECTIVE MEASURES OF FUEL POVERTY AND HOW THEY OVERLAP WITH INCOME POVERTY

In the discussion so far, the definition of fuel poverty used has been that a household is deemed to be in fuel poverty if it would have to spend more than 10% of its disposable income on fuel to keep the dwelling warm. There are other, more subjective, possible measures of fuel poverty, such as whether a household feels their home is warm enough, and whether they feel that the cost of heating affects the warmth and comfort of their homes.

The EHCS does actually cover subjective measures to a limited extent, namely by asking the following two questions:

• Whether the household was able to keep comfortably warm in winter.
• If not, whether cost was a reason for this.

The material below summarises the overlap between households’ answers to these two questions in EHCS and their recorded status in terms of fuel poverty and income poverty. It is necessarily limited to the questions actually asked in EHCS.

In 2005, around 450,000 households said that their living rooms were not warm in winter because of the cost it took to do so. But less than half of these were in income poverty and a third had average or above-average incomes. Furthermore, the vast majority (almost 90%) of those in income poverty said that they were able to keep their living rooms warm in winter. In other words, there was much less overlap between this subjective measure of fuel poverty and income poverty than there was between the normal measure of fuel poverty and income poverty.

Of the 450,000 households, only 20% were in fuel poverty by the normal definition. Furthermore, only 6% of households in fuel poverty by the normal definition said that their living rooms were not warm in winter because of the cost it took to do so. In other words, there was very little overlap between fuel poverty using the subjective measure and fuel poverty using the normal (objective) measure.

Finally, it is interesting that, on average, pensioners were less likely to say that they were not able to keep their living rooms warm that working-age households.

These points suggest problems with using these types of subjective questions as a measure for fuel poverty. If a third of households who say they do not heat their homes fully due to cost actually have average or above-average incomes, this measure is clearly picking up something other than income (e.g. attitudes to expenditure). Second, not heating the home for reasons of cost is not necessarily the same as not being able to afford it. And, third, it is possible that some groups are less likely than others to complain about their homes being cold.
In addition to income poverty, three other types of deprivation have been looked at, namely:

- Workless, working-age households.
- ‘Vulnerable’ households.
- Households living in deprived areas.

As with the previous section, the analysis focuses on England, using the latest official estimates from EHCS but with the specific numbers quoted being the average for 2003 to 2005. The material is supported by two appendices: appendix 2 provides the basic analysis of risks and overlaps and appendix 3 provides the equivalent analysis for those households who were also in income poverty. The appendices can be found online at www.npi.org.uk.

**WORKLESS WORKING-AGE HOUSEHOLDS**

In the population as a whole, there are around 15 million working-age households in England, around 2 million of which are classified in EHCS as ‘none working and none retired’. Around 20% of these households were in fuel poverty. This compares with only 1% of households where at least one of the adults was working full-time.

Conversely, around two-thirds of working-age households in fuel poverty were workless, with the other third having ‘one or more working’.
It is perhaps surprising that the proportion of workless working-age households who were in fuel poverty was as low as 20% given that one would expect many of them to have both a very low income (because workless) and a potentially high fuel cost (because they need to heat the house all day). Furthermore, even among workless working-age households who are also in income poverty, the proportion who were in fuel poverty was ‘only’ 30%. This suggests that part of the likely explanation lies in factors which are reducing fuel costs of the other 70%, such as the small size of dwellings that many of the occupy.

‘VULNERABLE’ HOUSEHOLDS

The fuel poverty programme uses a very broad – and non-standard – definition of vulnerability, namely any household with a child, an older person or someone receiving state benefits. This means that around three-quarters of all households are defined as being ‘vulnerable’.

Given this, it is not surprising that most people in fuel poverty were classed as vulnerable (80%) even though the vast majority of vulnerable households were not in fuel poverty (over 90%).

There was little difference in fuel poverty risks between those who were and were not classed as vulnerable – 5% for the non vulnerable, 7% for the vulnerable. Furthermore, amongst those who are in income poverty, those classed as vulnerable were actually much less likely to be in fuel poverty (27%) than those classed as non-vulnerable (42%).

In our view, this calls into question the value of using such a broad, and completely non-standard, definition of vulnerability. It can also cause misunderstandings among those who do not read the small print and assume that a more standard definition is being used, for example those in receipt of means-tested or disability-related benefits.
Using this, much more common, definition of ‘vulnerable’ would have the added advantage of focussing on a group who are actually at relatively high risk of fuel poverty: at 13%, their risk of fuel poverty was twice the national average and three times the rate for other households. This percentage is, however, much less than the equivalent 20% figure for workless working-age households, partly because it includes a lot of retired households where the relevant benefits are either not means-tested (e.g. attendance allowance) or are more generous than their working-age equivalents (e.g. pension credit).

**Average 2003 to 2005**

('vulnerable' = usual government definition)

- 0.6 million households in fuel poverty but not ‘vulnerable’
- 0.8 million households in both fuel poverty and ‘vulnerable’
- 5.1 million ‘vulnerable’ households not in fuel poverty

**DEPRIVATION OF AREA**

Households in more deprived areas were a bit – but only a bit – more likely to be in fuel poverty than other households: 8% compared with 7% of households in areas of average deprivation and 4% of households in less deprived areas.23

What is perhaps surprising here is not that there is a difference but that the difference is so slight and that the vast majority (over 90%) of households in deprived areas were not in fuel poverty. As a consequence, the majority (75%) of households in fuel poverty were not living in deprived areas. See the diagram overleaf.

Furthermore, among those in income poverty, those living in deprived areas were actually less likely to be in fuel poverty than those living in other areas: 24% of households in deprived areas compared with 34% in areas of average deprivation and 39% in less deprived areas. A likely explanation for this is that they tend to live in either smaller or more energy-efficient properties than their counterparts in other areas. Such explanations would be compatible with the finding discussed in the next section that, among those in income poverty, social renters were much less likely to be in fuel poverty than owners with a mortgage given that social rented accommodation is more prevalent in deprived areas than in other areas.
This analysis has important potential implications for policy, namely that if measures to combat fuel poverty are focussed on areas of high deprivation then they will only reach a small proportion of those in fuel poverty.
Whilst the previous two sections were concerned with the overall overlap between fuel poverty and other forms of deprivation, this section is concerned with how the degree of overlap varies according to the characteristics of the household. The material focuses on six types of characteristic, namely:

- SAP rating.
- Floorspace.
- Household type: single or couple, with or without children, working age or pensionable age.
- Type of area: urban or rural.
- Housing tenure.
- Geographic location (both within England and between the four home countries).

It then goes on to provide an analysis of why some of these factors are affecting the risk of fuel poverty.

The discussion focuses on the latest official estimates (for 2005) with the specific numbers quoted being the average for 2003 to 2005. In selected cases, some observations are also made about the likely changes between 2005 and 2007.

The material is supported by four appendices: appendix 2 provides the basic analysis of risks and overlaps; appendix 3 provides the equivalent analysis for those households who were also in income poverty; appendix 4 provides an analysis of the impact of fuel price rises since 2005; and appendix 6 provides more detail on the mathematical model used to analyse why selected factors are affecting the risk of fuel poverty. The appendices can be found online at www.npi.org.uk.

**ANALYSIS OF RISKS**

**Summary**

The table below provides a summary.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Groups with a high risk of being in fuel poverty (average of 2003 to 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Among the total population</td>
</tr>
<tr>
<td>SAP rating</td>
<td>Under 30 (26%)</td>
</tr>
<tr>
<td>Floor space</td>
<td>All roughly equal</td>
</tr>
<tr>
<td>Household type</td>
<td>Singles – both over and under 60 (15%)</td>
</tr>
<tr>
<td>Tenure</td>
<td>Outright owners and private renters (10%)</td>
</tr>
<tr>
<td>Type of area</td>
<td>Rural, slightly (8%)</td>
</tr>
<tr>
<td>Geography (within England)</td>
<td>North East (10%)</td>
</tr>
<tr>
<td>Geography (between countries)</td>
<td>Scotland and Northern Ireland (23)%</td>
</tr>
<tr>
<td>All</td>
<td>6%</td>
</tr>
</tbody>
</table>
The main points of interest in the analysis are of two types, namely:

- Those factors where the risk of fuel poverty varies markedly. Whilst some of these are well known and reasonably obvious (e.g. the risk of fuel poverty is much higher for those living in very energy-inefficient homes), others are just as marked but have historically received relatively little attention (e.g. the risk of fuel poverty is much higher among single-person households than among other household types).

- Those factors where the variation in fuel poverty risk follows a different pattern for those in income poverty than for the population as a whole. For example, whilst the overall risk of fuel poverty is only a bit higher for households living in rural areas compared with those living in urban areas, it is much higher when just looking at those in income poverty.

**SAP rating**

Unsurprisingly, those living in accommodation with poor energy efficiency face a high risk of fuel poverty and, as efficiency improves, the risk of fuel poverty decreases. So, for example, for households in homes with a SAP rating of less than 30, the risk of fuel poverty was 26%, 8% for those with a SAP rating of 30-40, and progressively reducing to 0% for those with a SAP rating of 70 or more. The net result is that, although only a tenth of all homes have a SAP rating of less than 30, two-fifths of all households in fuel poverty have a SAP rating of less than 30.

Among those in income poverty, the pattern was similar, with a risk of 83% for those with a SAP rating of less than 30, 50% for those with a SAP rating of 30-40, and progressively reducing to 2% for those with a SAP rating of 70 or more.

By 2007, we estimate that, among those in income poverty, the risk of fuel poverty had increased to more than 50% for all below-average SAP ratings (i.e. up to 50).

**Floorspace**

Overall, there is little correlation between floor space and the risk of fuel poverty. This is perhaps somewhat surprising given that average estimated fuel cost increases sharply as floorspace increases but a likely explanation is that average incomes also increase sharply as floorspace increases, so the proportion of income represented by fuel costs remains reasonably constant.
For those in income poverty, however, the risk of fuel poverty tends to rise as floorspace increases. This is not surprising given that those in larger properties will generally have higher fuel costs. Although households who are both in income poverty and live in large homes (110 square metres or more) had a high (50%) risk of fuel poverty, there are relatively few such households. As a result, only a tenth of those in fuel poverty were both in income poverty and live in large homes.

**Household type**

The risk of fuel poverty for a single-person household is much higher than for a couple or larger family. 16% of single pensioners and 14% of working-age singles were in fuel poverty, with the next highest group (lone parents) having a 7% risk. Because of their relatively high risk, two-thirds of the households in fuel poverty were single-person households, even though only a quarter of all households were single-person households.

This difference is equally pronounced among those in income poverty. Whereas the overall risk of fuel poverty was 30%, it was just over 50% among both single pensioners and working-age singles. In other words, singles in income poverty – both working-age and pensionable age – were more likely than not to be in fuel poverty.

As prices rise, the proportion of single-person households in income poverty who are also in fuel poverty is estimated to increase to around 80% in 2007.

More detailed analysis shows that the risk of fuel poverty for working-age singles varies greatly by work status: from 40% if not working, to 20% if working part-time, to 4% if working full-time. The high rate of fuel poverty among working-age singles is not, however, solely due to their high levels of worklessness; rather, for any given work status, their risk of fuel poverty is much greater than that for any other household type; for example, the risk of fuel poverty of working-age couples with children was 10% if workless, 2% if part-time work only, and 1% if one or more working full-time.
Clearly, a workless single person in fuel poverty is quite likely to move out of fuel poverty if they move into work, particularly if it is full-time work. Conversely, a working single person is quite likely to move into fuel poverty if they lose their job. In this context, it is interesting to note that, at any one time, around half of recipients of out-of-work benefits have been out of work for at least the previous five years whilst the other half have been claiming out-of-work benefits for less than five years.28 Within these overall totals, however, only 5% of the unemployed (recipients of Jobseeker’s Allowance) have been out of work for at least the previous five years compared with 60% of those in receipt of Incapacity Benefit. It could therefore be argued that any fuel poverty initiatives for working-age singles could usefully focus on those in receipt of Incapacity Benefit (the main disability benefit) as most of these people remain out of work for long periods of time – such people probably represent around half of all single-person households of working age who are in fuel poverty.29

Two other points are also worth noting. First, lone parents have an average fuel poverty risk, both in general and among those in income poverty. This is in contrast to the situation for income poverty, where lone parents have a much higher risk than any other household type. Second, with the price rises since 2005, we estimate that the household types whose risk of fuel poverty has increased the most are single pensioners and lone parents, indicating that many of these were just below the fuel poverty ‘threshold’ in 2005.

**Type of area (rural/urban)**

The findings here depend on the view taken about ‘how rural is rural’. Households in ‘remote rural’ areas in England were much more likely to be in fuel poverty than households in other areas, their risk being twice as high as the next highest area type (‘village centres’). But most households whom the government classifies as ‘rural’ do not live in these remote areas and, taking all types of rural area as a whole, the overall risk of fuel poverty is only a bit greater than in urban or suburban areas: 8% of households in rural areas were in fuel poverty compared with 7% in cities and 5% in suburban areas.

Among those in income poverty, however, those in rural areas (taken as a whole) were much more likely to be in fuel poverty than those in either urban or suburban areas: 44% in rural areas compared with 28% in suburban areas and 26% in urban areas.

Price rises since 2005 are unlikely to have changed these overall patterns.
Tenure

Overall, the risk of fuel poverty was highest among households who own their own homes outright and those who rent from private landlords are most at risk (both around 10%) and lowest among those who own with a mortgage (3%). Social renters had a middling risk.

The pattern among those in income poverty was, however, somewhat different. In particular, mortgage holders in income poverty become a high risk group (30% in fuel poverty) whilst social renters become the lowest risk group (around 15% in fuel poverty). In other words, the low overall risk of fuel poverty among mortgage holders masks a high risk among low income mortgage holders.

Price rises since 2005 are unlikely to have changed these overall patterns.

It is interesting that social renters overall have an average fuel poverty risk, and that they have a below-average fuel poverty risk among those in income poverty. This is in contrast to the situation for income poverty, where social renters have a much higher risk than any other tenure type.

Geography (within England)

The risk of fuel poverty was somewhat higher in the North East (10%) than in other parts of England and noticeably higher than in London and the South East (both 4%). One reason for this is that the calculation of required fuel costs takes into account average local temperature and the lower the temperature, the more fuel is assumed to be needed for heating. With the exception of the three regions above, however, this has not led to a more general north-south divide in poverty risks within England (the other regions all had a risk of fuel poverty between 6% and 8%). Furthermore, for those in income poverty, the risk of fuel poverty in the North East was similar to elsewhere.

Price rises since 2005 are unlikely to have changed these overall patterns.

Geography (between countries)

The table below summarises the official fuel poverty estimates for each country, together with the dates to which these estimates apply:

<table>
<thead>
<tr>
<th>Country</th>
<th>Proportion of households in fuel poverty</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>7%</td>
<td>2005</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>2004</td>
</tr>
<tr>
<td>Scotland</td>
<td>23%</td>
<td>2005/06</td>
</tr>
<tr>
<td>Wales</td>
<td>11%</td>
<td>2004</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>23%</td>
<td>2004</td>
</tr>
</tbody>
</table>

Both a review of the associated documentation, and conversations with some of the relevant people, suggest that Scotland, Wales and Northern Ireland consider their fuel poverty estimates to be directly comparable with those of England. So, these figures suggest that fuel poverty is more than three times as prevalent in Scotland and Northern Ireland as it is in England. We find it difficult to believe that this is genuinely the case, because:
• It is clearly not due differences in the different time periods to which the statistics apply: the Scotland figure of 23% for 2005/06 is effectively for the same time period as the England figure of 7% for 2005, and the Northern Ireland of 23% is for the same time period as the England figure of 6% for 2004.

• The scale of the differences between England/Wales, and Scotland/Northern Ireland is an order of magnitude greater than that between the different regions within England. For example, the region in the England with the highest estimated rate in 2005 (the North East) was, at 10%, still only half that in Scotland or Northern Ireland. So while the risk of fuel poverty might rise as one moves north (e.g. because of the colder weather), the differences in rates in England suggests that this factor is nowhere near large enough to account for the differences.

• It is not just the overall rates which are dramatically different, but also the rates for each subgroup within the population. For example, it is estimated that almost 50% of single pensioners in Scotland, and over 40% in Northern Ireland, were in fuel poverty compared with 20% in England. And 20% of urban households in both Scotland and Northern Ireland were in fuel poverty compared with less than 10% in England. So, the differences in rates is not due to differences in demographics.

• Contrary to what some people think, income poverty rates in Scotland and Northern Ireland are similar to those in England and Wales, not a lot higher. So, the differences in the risks of fuel poverty are not due to differences in the number of poor people.

• Fuel costs in Northern Ireland do appear to be somewhat higher than in the rest of the UK and the Northern Ireland Housing Executive estimate that fuel poverty in Northern Ireland would be around a fifth lower if this were not the case, although this would still leave the Northern Ireland fuel poverty rate much higher than anywhere in England. Another factor in Northern Ireland might be the different mix and types of fuel that are used. In Scotland, however, fuel costs appear to be no greater than those in England or Wales and the mix and types of fuels used is similar.
WHAT ACCOUNTS FOR THE HIGHER RISKS?

So far, the analysis has been largely descriptive, detailing which the risks of fuel poverty for each group. The material below explores what underlying factors account for these differing risks. It is based on a mathematical (regression) model that we have developed using the 2004 EHCS and which is explained in appendix 6.

For SAP rating, the reason why lower SAP ratings lead to a higher risk of fuel poverty is obvious: the amount of fuel required is less. For floor space, the lack of correlation with the risk of fuel poverty is because household income and fuel costs both increase as floor space increases, with these increases largely offsetting each other.

By contrast it is much less immediately clear why factors such as household type, rurality, housing tenure and deprivation of area should affect the risk of fuel poverty. These are therefore discussed below. The table below summarises the results.

<table>
<thead>
<tr>
<th>Group</th>
<th>Comparator</th>
<th>Difference in proportion of income spent on fuel</th>
<th>Difference in income</th>
<th>Difference in fuel costs</th>
<th>Major factors accounting for difference in fuel cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singles in income poverty</td>
<td>Other households in income poverty</td>
<td>60% more</td>
<td>50% less</td>
<td>25% less</td>
<td>Smaller homes (-10%). Fewer people (-15%)</td>
</tr>
<tr>
<td>Rurals in income poverty</td>
<td>Other households in income poverty</td>
<td>20% more</td>
<td>5% less</td>
<td>15% more</td>
<td>Larger homes (5%). Less energy efficient (15%). Various other factors (-5%)</td>
</tr>
<tr>
<td>Outright property owners in income poverty</td>
<td>Other households in income poverty</td>
<td>30% more</td>
<td>20% less</td>
<td>5% more</td>
<td>Larger homes (5%). Less energy efficient (5%). Fewer people (-5%).</td>
</tr>
<tr>
<td>Households in less deprived areas in income poverty</td>
<td>Other households in income poverty</td>
<td>10% more</td>
<td>5% less</td>
<td>5% less</td>
<td>Larger homes (4%). Lower SAP (3%). Geography (-2%).</td>
</tr>
<tr>
<td>All singles</td>
<td>All other households</td>
<td>60% more</td>
<td>50% less</td>
<td>25% less</td>
<td>Smaller homes (15%). Fewer people (10%).</td>
</tr>
<tr>
<td>All rurals</td>
<td>All other households</td>
<td>3% more</td>
<td>18% more</td>
<td>20% more</td>
<td>Larger homes (10%). Lower SAP (10%).</td>
</tr>
<tr>
<td>All outright property owners</td>
<td>All other households</td>
<td>15% more</td>
<td>2% less</td>
<td>10% more</td>
<td>Larger homes (10%). Lower SAP (5%). Fewer people (-5%).</td>
</tr>
<tr>
<td>Households in more deprived areas</td>
<td>All other households</td>
<td>30% more</td>
<td>30% less</td>
<td>10% less</td>
<td>Smaller homes (10%).</td>
</tr>
</tbody>
</table>
Why are low income single-person households at high risk of fuel poverty?

The simple reason for the high risk of fuel poverty among single-person households in income poverty is that, whereas their estimated fuel costs tend to be a bit lower than those for other household types, their household incomes tend to be a lot lower. The average annual fuel bill for a low income single in 2004 was £550, some 25% lower than the average fuel bill for a household of more than one person. This is for quite straightforward reasons: singles’ homes are, on average, smaller (which reduces fuel cost by 10%) and there is only one person requiring cooking etc (which reduces the fuel cost by a further 15%).

However, the average income for a single-person household in income poverty was £5,300, which is around half the average for other household types. Again, the reason is straightforward – their total income is low as there is only one source of income. Even children receive some income in the form of child benefit etc, so a lone parent household will, on average, have a higher income than a childless single-person household all else equal.

The situation for single-person households in total is similar: they needed to spend an average of 25% less on fuel than other household types but their income was on average 50% less.

Another way of putting all this is that fuel costs are not proportional to household size and that, both overall and for those in income poverty, a single-person household typically has to pay much more per person for fuel than a multi person household does.

The analysis above applies equally to single pensioners and to working-age singles.

Why are the rural poor at high risk of fuel poverty?

As discussed earlier, whilst rural households overall were only slightly more likely to be in fuel poverty than households elsewhere, among those in income poverty, rural households were much more likely to be in fuel poverty than households elsewhere.

On average, rural households in income poverty needed to spend £760 a year in 2004 on fuel, 15% more than households elsewhere. Two factors account for the majority of this difference: homes were, on average, bigger, leading to a 5% rise in costs; and they were also less energy efficient, resulting in 15% higher fuel costs. It is these two factors which cause rural households in income poverty to be much more likely to be in fuel poverty than households in income poverty who live in urban areas.

Overall, whilst rural households were still on average both bigger (leading to a 10% increase in fuel costs) and less energy efficient (resulting in a 10% higher fuel cost), incomes in rural areas also tended to be higher. These higher incomes largely offset the higher costs of fuel, meaning that, overall, the risk of fuel poverty is not that much higher in rural areas than elsewhere.

Why are low income outright owners at greater risk of fuel poverty?

Households in income poverty who own their properties outright need to spend, on average, around 5% more on fuel than other household types. This is because they tend to live in larger and less energy efficient houses. However, the main reason for the difference in fuel poverty risk is not higher fuel cost but lower income due to the large proportion of single-person households, in this case pensioner singles, in this group.

The pattern for outright owners in total is similar.
The majority of those who own their own homes outright are pensioners. This is particularly true for outright owners in income poverty, 70% of whom are pensioners split evenly between pensioner couples and singles. But being a pensioner is not in itself a risk factor; rather, the reason that outright owners are at greater risk of fuel poverty is that so many of them live alone.

**Why are low income households in less deprived areas at higher risk of fuel poverty**

A major reason why low income households in less deprived areas are at higher risk of fuel poverty is that they tend to live in homes which are both larger and less energy efficient, both factors increasing average fuel costs by 3-4%.

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29
COMBINED RISKS OF FUEL POVERTY

From the discussion in the previous sections, it is clear that four of the biggest factors affecting the risk of fuel poverty are fuel prices, income poverty, energy efficiency and whether or not the household is a single-person household. The table below provides a ‘ready reckoner’ of fuel poverty risks for different combinations of these four factors. Note that:

- The top half of the table shows the estimated risks using 2005 prices whilst the bottom half of the table uses 2007 prices.
- The threshold SAP rating of 50 has been chosen as it is roughly the average English SAP rating in 2005.37

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2005 prices</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>530,000</td>
<td></td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>370,000</td>
<td></td>
<td>34%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>170,000</td>
<td></td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>230,000</td>
<td></td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>70,000</td>
<td></td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>160,000</td>
<td></td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>0</td>
<td></td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>0</td>
<td></td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2005 prices</td>
<td>Total</td>
<td></td>
<td></td>
<td>1,530,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007 prices</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>630,000</td>
<td>100,000</td>
<td>97%</td>
<td>15%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>700,000</td>
<td>330,000</td>
<td>65%</td>
<td>31%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>360,000</td>
<td>190,000</td>
<td>60%</td>
<td>32%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>590,000</td>
<td>360,000</td>
<td>30%</td>
<td>18%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>230,000</td>
<td>160,000</td>
<td>19%</td>
<td>13%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>420,000</td>
<td>260,000</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>60,000</td>
<td>60,000</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>20,000</td>
<td>60,000</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2007 prices</td>
<td>Total</td>
<td></td>
<td></td>
<td>3,020,000</td>
<td>1,490,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All four factors have a major impact on the overall numbers in fuel poverty. Clearly low income is a major factor, but the risk of fuel poverty for those in income poverty in 2005 was substantially raised if either the household was a single-person household or it had a below-average SAP rating. So, for example, if neither of the other factors are present, the risk of fuel poverty was 6%, rising to around 30% if either of the other factors was present to 80% if both were present.

By contrast, for those not in income poverty in 2005, the risks of fuel poverty was very small unless the household was both a single-person household and had a below-average SAP rating, in which case it was 12%.

The prices rises since 2005 have increased the fuel poverty risks for each combination of income poverty, single/multi-person households and SAP rating. For those in income poverty, the price rises appear to have had a particular impact on those who are either single-person households or had below-average SAP ratings. And for those not in income poverty, substantial numbers of households with below-average SAP ratings have been drawn into fuel poverty – in effect, their higher incomes (compared with those income poverty) are largely being offset by the higher fuel prices.

Whilst all four factors are important, their policy context is very different. For example:

- Government fuel poverty strategy has traditionally focussed on improving energy inefficiency.
- Whilst income poverty is a longstanding government concern, policy developments to reduce it are not currently closely associated with the issue of fuel poverty.
- Whilst fuel prices have an obvious and direct impact on the extent of fuel poverty, the widely held view appears to be that they are market-driven and not susceptible to government influence.
- The fact that fuel costs are a larger burden on single-person households than on larger households has not hitherto been given as much attention by either policy makers or researchers.\(^{38}\)

It is also worth noting that the issues regarding single-person households are wider than just fuel poverty. They also face higher relative housing costs than other family types and are more susceptible to adverse events, such as illness or unemployment. And they are a growing group in the population, particularly those of working age – there are now almost 4 million single people of working age living alone compared to just 1 million in 1971.\(^{39}\)

In this context, it is notable that the definition of ‘vulnerability’ used in the fuel poverty programme is such that the main group classified as ‘non-vulnerable’ are working-age people living alone.

**THE EFFECTS OF CHANGES TO KEY FACTORS**

The previous sections have set out an explanation of the factors causing fuel poverty and how they interact. It is worth considering, then, what would happen to fuel poverty if changes were made to these key factors. For instance, how many households would be in fuel poverty if all households had a decent SAP rating or if no households were in income poverty?

If all households had a decent SAP rating

Increasing SAP ratings could potentially massively reduce the number of households in fuel poverty. To illustrate this, the table below assumes that the risks of fuel poverty for households with below-average SAP ratings are reduced to the same as those for households with above-average SAP ratings.
The percentages in the table above are the same as those in the relevant row in the first table in this section. So, for example, the 28% in the first row is from the row of the original table for ‘2005 prices – in income poverty – SAP not below 50 – single person’ and the 60% is from the row of original table for ‘2007 prices – in income poverty – SAP not below 50 – single person’. The numbers in the table are then calculated by multiplying these percentages by the size of the underlying population. So, for example, there are around 1.25 million single-person households in England in income poverty; 1.25 million multiplied by 28% = 350,000 and 1.25 million multiplied by 60% = 750,000.

In this hypothetical scenario, fuel poverty in 2005 would have been a third of what it actually was, down from 1.5 million to 0.5 million. The reduction in 2007 would have been somewhat higher in absolute terms but lower in proportional terms, down from 3.0 million to 1.4 million. It is worth noting, however, that this potential halving of 2007 fuel poverty would still only have brought it back to 2005 levels.

If no households lived in income poverty

If income poverty were eliminated, this would also massively reduce the number of households in fuel poverty. To illustrate this, the table below assumes that the risks of fuel poverty for those in income poverty are reduced to the same as those for households not in income poverty.

The percentages in the table below are the same as those in the relevant row in the first table in this section. So, for example, the 12% in the first row is from the row of the original table for ‘2005 prices – not in income poverty – SAP below 50 – single person’ and the 30% is from the row of original table for ‘2007 prices – not in income poverty – SAP below 50 – single person’. The numbers in the table are then calculated by multiplying these percentages by the size of the underlying population. So, for example, there are around 2.6 million single-person households in England living in dwellings with a SAP rating below 50; 2.6 million multiplied by 12% = 310,000 and 2.6 million multiplied by 30% = 780,000.

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<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>350,000</td>
<td>28%</td>
<td>750,000</td>
<td>60%</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>130,000</td>
<td>6%</td>
<td>440,000</td>
<td>19%</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>10,000</td>
<td>0%</td>
<td>120,000</td>
<td>3%</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>10,000</td>
<td>0%</td>
<td>50,000</td>
<td>0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>490,000</td>
<td>2%</td>
<td>1,360,000</td>
<td>6%</td>
</tr>
</tbody>
</table>

Baseline: 1,530,000 (7%) 3,020,000 (14%)

Scale of reduction: 1,040,000 (5%) 1,660,000 (8%)
The effect of this hypothetic scenario is similar to that for improved SAP ratings. Fuel poverty in 2005 would have been a third of what it actually was, down from 1.5 million to 0.5 million. The reduction in 2007 would again have been somewhat higher in absolute terms but lower in proportional terms, down from 3.0 million to 1.4 million. Again, this potential halving of 2007 fuel poverty would still only have brought it back to 2005 levels.

Whilst the numbers above are purely illustrative, they do make two things clear. First, making substantial progress on either energy efficiency or income poverty would have a substantial impact on fuel poverty. Second, that rises in fuel prices, such as those seen since 2005, have an equally substantial effect, but in an adverse direction (and actually happened, whereas the scenarios for energy efficiency and income poverty are both extremely optimistic). Putting this another way, if income poverty had miraculously been eliminated between 2005 and 2007, levels of fuel poverty in 2007 would still have been similar to those in 2005 because of the fuel price rises.

<table>
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<tr>
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<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>310,000</td>
<td>780,000</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>180,000</td>
<td>480,000</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>0</td>
<td>80,000</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>0</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>500,000</td>
<td>1,370,000</td>
</tr>
</tbody>
</table>

Baseline 1,530,000 7% 3,020,000 14%

Scale of reduction 1,030,000 5% 1,650,000 8%
1 More specifically, in 2005, 73% of households in fuel poverty in England were also in income poverty. By 2007, we estimate that this proportion had fallen to 63%.

It seems likely that this is a particular instance of a more general trend, namely that the overlap between fuel poverty and income poverty weakens as fuel poverty rises but strengthens as fuel poverty falls. If so, then it seems likely that the overlap became stronger between 1996 and 2003, as this was a period during which the number of households in fuel poverty in England fell from 5 million to 1.2 million.

This general conclusion is supported by a 2008 internal note produced by the Scottish Executive which estimates that 53% of households in fuel poverty in Scotland were also in income poverty. This 53% is less than either of the English statistics above, whilst the overall estimated rate of fuel poverty in Scotland was, at 23%, higher than either the 7% 2005 figure for England or the estimated 14% 2007 figure for England.

2 All the ‘2005’ statistics in the rest of this summary are actually the average of 2003 to 2005. They are referred to in the text as ‘2005’ in the interests of simplicity. This three-year averaging has been done to improve the statistical reliability of the results, where the breakdowns mean that some of the sample sizes are relatively small. Although the overall levels of fuel poverty were somewhat lower in 2003 and 2004 (both 1.2 million households) than in 2005 (1.5 million households), these differences are not great and our analysis suggests that the overlap estimates are more reliable if the three year averages are used than if just 2005 is used.

3 The Scotland figure is for 2005/06 and the Northern Ireland one is for 2004.

4 Whilst datasets are available for Scotland, Wales and Northern Ireland, these datasets do not really provide sufficiently detailed data to calculate whether or not a household is in income poverty. For Scotland and Northern Ireland, this is mainly because, rather than including an actual figure for each household’s income, the datasets simply allocate each household to one of a number of income bands. For Wales, it is mainly due to a combination of levels of non-response and small sample sizes.


7 The accounting of winter fuel payments is beyond the scope of this study. It is, however, worth noting that, in the fuel poverty calculations, these are considered to be increases in income rather than reductions in fuel cost. As such, the payments have relatively little impact on the number of people aged 60 and over who are considered to be in fuel poverty. By contrast, if the fuel poverty calculations considered winter fuel payments to be a reduction in fuel costs then this would substantially reduce the calculated risk of fuel poverty for those aged 60 and over. For example, The UK fuel poverty strategy, 5th annual progress report estimated (paragraph 2.3) that the number of households in fuel poverty in England in 2005 would have been 1.0 million rather than 1.5 million if this had been done. That means that the number of households aged 60 or over in fuel poverty would have been around 250,000 rather than 750,000. So, the risk of fuel poverty among single pensioners would have been reduced by around two-thirds, from 18% to 6%. This would make their risk of fuel poverty an order of magnitude lower than the risk of fuel poverty among single-person households of working age, and much closer to that for the other household types.

8 There are actually two fuel poverty flags, and two household income fields, in EHCS. One of the fuel poverty flags and its associated household income field uses a ‘full income definition’ of household income whereas the other fuel poverty flag and its associated household income field uses a ‘basic income definition’ of household income. This is because government reports fuel poverty statistics using both the ‘full income definition’ and the ‘basic income definition’. In the ‘full income definition’,
Housing Benefit and Income Support for Mortgage Interest are both included in the household income estimate. In the ‘basic income definition’ Housing Benefit and Income Support for Mortgage Interest are both excluded from the household income estimate.

Also, note that the household income field is ‘derived household income’ rather than ‘raw household income’. This means that where the raw income data was either incomplete, or judged to be incorrect, government has estimated a derived household income rather than omit that household from its fuel poverty calculations. The main two types of occurrence are a) where some benefit levels had to be imputed or changed and b) where the raw household income data was below basic Income Support levels and therefore needed to be increased. Whilst the details of these procedures may well be different from those in other government datasets (e.g. the Households Below Average Income dataset used for the official income poverty estimates), such differences do not materially affect the statistics in this report as these statistics use the same source (i.e. EHCS) for both its fuel poverty and income poverty allocations.

9 The term ‘household’ is used to cover everyone living in a dwelling. It should not be confused with the term ‘benefit unit’ which is limited to an adult and (if applicable) their spouse and any dependent children. So, for example, a young adult living with their parents would count as one household but two benefit units, as would two adults who were living together but not cohabiting. Among those working in income poverty, the term ‘family’ is sometimes used as a more user-friendly term for ‘benefit unit’ but, confusingly, some people also sometimes use the term ‘family’ to mean ‘household’.

10 There are various different equivalisation weights in use. The ones used here are the OECD scale, as now used by the Department of Work and Pensions (DWP) in its annual report Households below average income when looking at household incomes before deducting housing costs.

11 The 2005 dataset actually includes equivalised household income but the 2003 and 2004 datasets did not.

12 This process of equivalisation does not affect the calculations of who is in fuel poverty, which is still simply determined by the ratio of required fuel costs to actual (unequivalised) household income. Some researchers we have spoken to seem to think that the fuel poverty calculation should use equivalised rather than unequivalised income. In our view, this is simply wrong and can potentially lead to completely erroneous conclusions. It would only make sense if the fuel costs were also equivalised in which case, of course, the answer is the same as equivalising neither. If, for example, a single-person household has to spend 10% of its income on fuel then the burden of fuel costs on it are clearly and straightforwardly greater than that for a couple which only has to spend 5% of its income on fuel. The fact that the couple may need to spend proportionally less of its income than the single-person household on other non-fuel essentials may well say something about income poverty and deprivation but it says nothing at all about fuel poverty.

Some other researchers seem to think that the required fuel costs in EHCS have already been equivalised in some sense. There is, however, nothing in either the documentation or the arithmetic of the fuel cost model which suggests the fuel costs are in any sense ‘equivalised’ – and bre have confirmed this to us in conversation.

13 This figure relates to the ‘full income definition’ of fuel poverty. Using the ‘basic income definition’, there were around 1.8 million households in England in fuel poverty in 2005 – around 8% of all households.

14 From the Department of Work and Pensions (DWP) dataset, Households Below Average Income, 18% of households in England in 2005/06 were in income poverty. Note that, to put it on the same basis as the fuel poverty statistics, this is the proportion of households who are in income poverty, not the proportion of individuals.

Government reports income poverty statistics using two definitions of households income, namely ‘before deducting housing costs’ and ‘after deducting housing costs’. In the ‘before deducting housing costs’ measure, household income is total net disposable income, with Housing Benefit and
Income Support for Mortgage Interest both included in the household income estimate. In the ‘after deducting housing costs’ measure, household income is total net disposable income after deducting housing costs, with Housing Benefit and Income Support for Mortgage Interest both counted as housing costs (and therefore excluded). All figures in this report use the ‘before deducting housing costs’ definition of income, as this is the one used in the ‘full income definition’ of fuel poverty. Note that the ‘after deducting housing costs’ definition of income is by no means the same as the ‘basic income definition’ of fuel poverty as the former deducts rent, mortgage interest etc from household income whereas the latter does not.

15 Again, this figure uses the ‘full income definition’ of fuel poverty. On the ‘basic income definition’, 1.2 million households were in both fuel poverty and income poverty.

16 The ranges in the main text are because the price changes varied slightly for different methods of payment.

The official BERR statistics on energy prices can be found at www.berr.gov.uk/energy/statistics/publications/prices/tables/page18125.html. Of the various tables to be found there, tables 2.2.2 (average annual domestic electricity bills for selected towns and cities in the UK and average unit costs) and 2.2.3 (average annual domestic gas bills for selected towns and cities in Great Britain and average unit costs) are the ones that have been used. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Gas (Great Britain)</th>
<th>Electricity (United Kingdom)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard credit</td>
<td>Direct debit</td>
</tr>
<tr>
<td>Unit costs</td>
<td>2.14</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>2.63</td>
<td>2.36</td>
</tr>
<tr>
<td></td>
<td>3.07</td>
<td>2.76</td>
</tr>
<tr>
<td>% change in cash terms</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>43%</td>
<td>41%</td>
</tr>
<tr>
<td>% change in real terms</td>
<td>19%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>33%</td>
<td>31%</td>
</tr>
</tbody>
</table>

To calculate the percentage changes in real terms from the percentage changes in cash terms, the all-items annual Retail Price Index (CHAW) has been used. This was 192.0 in 2005, 198.1 in 2006 and 206.6 in 2007. Using alternative prices indices would make little material difference to the results.

17 To derive our estimates, we uprated the fuel cost for each household in the 2005 EHCS in line with rises in unit costs whilst raising household incomes in line with earnings or out-of-work benefit levels (whichever is more applicable).

For fuel costs, different rates of increase were applied for different types of payment method, namely standard credit, direct debit or prepayment. For households with electricity as their main fuel system, the changes in electricity prices were used. For households with gas fired systems, the changes in gas prices were applied to the heating and water costs plus half of the cooking costs, with the changes in electricity prices applied to the lighting and appliance costs plus the other half of the cooking costs. The results are not materially different if alternative assumptions are applied to the cooking costs. For households with other fuel systems, where the rise in unit costs is not known, the average of the change in gas and electricity prices were applied to the heating and water costs plus half of the cooking costs, with the changes in electricity prices applied to the lighting and appliance costs plus the other half of the cooking costs. The results are not materially different if alternative assumptions are made for these households.
For household incomes, assumptions have to be made because the actual changes in household incomes for those in and near fuel poverty between 2005 and 2007 are not known and these assumptions necessarily have to relate to overall changes in earnings, benefit levels, etc. In this context, different rates of increase were applied for each combined employment status of the household reference person and (if applicable) spouse. For those where at least one of the adults was working, the change in average earnings was used. For those where neither of the adults was working but neither was retired, the change in out-of-work benefit levels was used. For those where neither of the adults was working but at least one was retired, the change in the guaranteed level of Pension Credit was used. Alternative assumptions could have been made but our analysis strongly suggests that these would not have made a material difference to the results. This is because average earnings, the levels of the various out-of-work benefits and the retail price index all rose at a similar rate over the period 2005 to 2007 (the LNSQ average earnings index and the CHAW price index both rose by 8%, and the various out-of-work benefits rose by between 5% and 9%).

18 Assuming, as seems likely, that the overall rates of income poverty have remained largely unchanged since 2005/06.

19 More specifically, a third had household incomes that were not in the bottom third of the income distribution.

20 This averaging has been done to improve the statistical reliability of the results. Although the overall levels of fuel poverty were somewhat lower in 2003 and 2004 (both 1.2 million households) than in 2005 (1.5 million households), these differences are not great and our analysis suggests that the overlap estimates are more reliable if the three year averages are used than if just 2005 is used.

21 The expectation of a very low income is because there is no earned income from work and the expectation of a potentially high fuel cost being is because the fuel cost model assumes that the home needs to be heated throughout the day (unlike working households, where it assumes that the home only needs to be heated for part of the day).

22 In EHCS, the term ‘household’ is used to cover everyone living in a dwelling and, according to the EHCS documentation, a ‘workless household’ is one where no-one aged 16 or over is in employment. The detailed data, however, suggests that a ‘workless household’ is one where neither the Household Reference Person nor (if applicable) their spouse is working. These two definitions are not quite the same: for example, if a working young adult lived with their workless parents, then this would count as a working household in the first definition but as a workless household in the second definition. This is part of a wider issue of whether work status should be defined in relation to a ‘family’ rather than to a ‘household’, where the term ‘family’ is used to cover an adult and their spouse (if applicable). So, a young adult living with their parents would count as one ‘household’ but two ‘families’. Note that an alternative – and more technically correct – term for ‘family’ is ‘benefit unit’.

23 ‘More deprived areas’ being used here to describe the fifth of small areas (technically, ‘super output areas’) with the highest levels of deprivation according to the Department of Communities and Local Government’s Index of Deprivation. ‘Areas of average deprivation’ is used to describe the middle fifth of small areas and ‘less deprived areas’ is used to describe the fifth of areas with the least deprivation.

24 This averaging has been done to improve the statistical reliability of the results. Although the overall levels of fuel poverty were somewhat lower in 2003 and 2004 (both 1.2 million households) than in 2005 (1.5 million households), these differences are not great and our analysis suggests that the overlap estimates are more reliable if the three year averages are used than if just 2005 is used.

25 The Scotland figure is for 2005/06 and the Northern Ireland one is for 2004.

26 Whilst datasets are available for Scotland, Wales and Northern Ireland, these datasets do not really provide sufficiently detailed data to calculate whether or not a household is in income poverty. For Scotland and Northern Ireland, this is mainly because, rather than including an actual figure for each household’s income, the datasets simply allocate each household to one of a number of income bands. For Wales, it is mainly due to a combination of levels of non-response and small sample sizes.
27 In 2005, the precise calculations of SAP rating in EHCS were changed slightly and these changes have been applied retrospectively to the earlier datasets. For this reason, the results in this report may differ slightly from those in previously published reports.

28 February 2007 data for Great Britain from the Work and Pensions Longitudinal Study, DWP. The main out-of-work benefits included in the statistics are Jobseeker’s Allowance, Incapacity Benefit, Severe Disablement Allowance, Income Support and Carer’s Allowance. The statistics quoted in the text relate to the duration of the current claim for out-of-work benefits.

29 From EHCS, two-thirds of single-person households of working age who are in fuel poverty are workless. From DWP benefit statistics, three-quarters of out-of-work benefit recipients are recipients of Incapacity Benefit. Two-thirds multiplied by three-quarters equals a half.

30 Note that the smaller sample sizes that apply to individual regions make their estimates of fuel poverty risks less reliable than the overall England estimate. For this reason, we do not consider the differences between any of the regions apart from the North East, South East and London to be statistically significant. This view is supported by looking at the individual statistics for each of 2003, 2004 and 2005: whilst the risk of fuel poverty is highest in the North East in each of the three years and lowest in the South East and London in each of the three years, the order of the other regions varies from year to year; for example, the North West had the second highest risk of fuel poverty in 2005 but only an average risk in 2003.

31 The points below are inevitably not a comprehensive analysis of reasons why the fuel poverty rates may differ between the countries and, for example, it has been suggested to us that differences in housing stock may be a reason for some of the differences. What they are, however, is a discussion of those issues which, in our view, could potentially have led to major differences in fuel poverty rates and why we find it difficult to believe that they have led to the scale of the differences that are reported.

32 Our analysis also suggests that the differences are not due to differences in the prevalence of either energy-efficient homes or the absence of central heating.

33 Office of National Statistics, Relative Regional Price Levels in 2004 using the price indices for ‘fuel and light’: UK = 100, Wales = 101, Scotland= 98, and Northern Ireland = 109 to 113 (depending on what weights are used).

34 The Northern Ireland Housing Executive has estimated that, if prices had been the same as in England, 43,000 households would have been removed from fuel poverty in 2001.

35 There are several other factors such as geography and type of building that, whilst small in themselves, result in a total average reduction of 5%.

36 It has been suggested to us that another factor that might be relevant is whether or not households have access to gas.

37 Note that, using the pre-2005 SAP rating system, the government target was for all social housing to have a SAP rating of 60 or more. It is not, however, clear precisely what this target means in terms of the revised SAP rating introduced in 2005.

38 This was an issue which provoked a lot of discussion when we shared some of our findings with a group of fuel poverty analysts. Some of these analysts argued that the high prevalence of fuel poverty among single-person households was something of an artefact which arises out of the definition of fuel poverty which means that a single person and a couple with the same total income and the same fuel costs are equally fuel poor even though the single person clearly has more disposable income than either of the individuals in the couple (who have to share that income).

There is a more complex point, too, which is of particular relevance to those on low incomes. The equivalisation process assumes that, to achieve the same standard of living, a single person needs to
spend 67% of what a couple spends. If, then, as we have observed, a single person spends, on average, 75% of what a couple spends on fuel, they must, by definition, spend less than 67% than a couple on other items, to make the average across all items 61%. This means that, whilst low income single people are more likely to be in fuel poverty than low income couples, then they must, on average, be less likely to be in ‘non-fuel’ poverty given that their equivalised incomes are the same. The issue then becomes simply one of income poverty, not fuel poverty.

It seems to us that, whilst these arguments could potentially affect how one views the high levels of fuel poverty among single-person households, they do no negate the basic fact that, on average, fuel represents a much higher burden for single-person households than for larger households.

APPENDIX 1 – THE MODEL USED TO ESTIMATE FUEL COSTS

If total household expenditure on fuel / total household income > 10%, then a household is deemed to be in fuel poverty.

Expenditure on fuel is modelled on four things, namely:

Total expenditure = lighting cost + water cost + cooking cost + heating cost.

For each element of cost, the relevant demand must first be estimated.

LIGHTING DEMAND (GIGAJOULES PER MONTH)

\[(4.47 + 0.0232 \times A \times N) \times \frac{d}{365}, \text{ if } A \times N \leq 710; \text{ or} \]
\[= (11.98 + (0.0146 A \times N) - (2.78 \times (A \times N)^2)) \times \frac{d}{365} \text{ if } 2400 \geq A \times N \geq 710; \text{ or} \]
\[= 31.01 \times \frac{d}{365} \text{ for all other } A \times N\]

where \(A = \) floorspace, \(N = \) number of occupants, and \(d = \) the number of days in the month

Most households fall into the first category.

COOKING DEMAND (GIGAJOULES PER MONTH)

\[= (f_{\text{Gas}} (2.98 + 0.6 N) + f_{\text{Electricity}} (1.7 + 0.34 N))/365 \times d\]

where \(f_{\text{Gas}}\) and \(f_{\text{Electricity}}\) are the proportion of demand met by gas and electricity respectively

If a household has both gas and electricity, then it is assumed that both \(f_{\text{Gas}}\) and \(f_{\text{Electricity}}\) are equal to 50%.

WATER HEATING DEMAND (GIGAJOULES PER MONTH)

\[= 8.64 \times 10^{-5} \times ((78+52 \times N) \times \text{Demand factor} + \text{energy lost through storage})/ \text{efficiency of boiler} \times d \text{ays in the month}\]

where the demand factor is estimated as 1.2

Energy lost through storage is made up of two factors – loss in the storage cylinder and loss in the pipes. In order to work this out, the surveyor will need to know how the boiler is insulated, what type of boiler it is and what type of heating system the home has. The efficiency of the boiler is set out in a series of tables, which will be in the possession of the surveyor. Efficiency depends on the type of boiler. The most modern boilers are 100% efficient while older solid fuel boilers tend to be around 66% efficient.
SPACE HEATING DEMAND

Heating requirement

For space heating, the house is divided into two zones, - Q₁, the living area and Q₂, the rest of the house. Q₁ is kept at a higher temperature than Q₂, as a rule. Q₁, in an average two storey household, takes up one half of the ground floor, or one quarter of the entire floorspace. If the dwelling has storage heaters, Q₁ is defined as the area heated by storage heaters.

Space heating is by far the most complicated of the four types of demand. Calculation involves multiple other variables. The first part of the calculation is heat loss for the zone:

\[ H_i = \text{Heat loss} \]

\[ A_i = \text{the external surface area of an element, such as a window} \]

\[ U_i = \text{the element’s u value – its energy efficiency rating, varies between types of windows and types of walls. For instance, an old granite wall has a u value of 2.4, a new insulated wall has a u value of 0.3.} \]

\[ L_i = \text{Length of thermal bridge} \]

\[ W_i = \text{heat loss through thermal bridge} \]

\[ R_i = \text{rate of heat loss through ventilation} \]

\[ V_i = \text{volume of zone} \]

\[ H_i = \sum A_i U_i + \sum L_i W_i + 0.33 R_i V_i, \text{ all measured in Watts per Celsius} \]

The size of the zone comes into this formula twice – through the surface area which affects the thermal loss and the volume which affects the ventilation loss. Thermal bridging can contribute very little, so essentially heat loss is dictated by size.

In the second part of the calculation, the rate of heat loss is combined with other variables to calculate the total space heating requirement:

Desired internal temperature in zone – Tᵢ

Average external temperature – Tₚₑₓₜ

Heat transfer to zone - Hₐₙₜ

Heat gain in zone - Gᵢ

The equations are as follows:
Space heating requirement in zone 1 for one month
\[ = 8.64 \times 10^{-5} \times d \times \{H_1(T_1 - T_{ext}) + H_3(T_1 - T_2) - G_1\} \]

where \( d \) = number of days in a month, and \( T_{ext} \) the average external temperature that month

Space heating requirement for zone 2 for one month
\[ = 8.64 \times 10^{-5} \times d \times \{H_2(T_2 - T_{ext}) + H_3(T_1 - T_2) - G_2\} \]

If the heat transfers and gains are small, the space heating requirement is dominated by, and is in fact directly proportional to, the heat loss in the zone. As noted above, the heat loss is strongly affected by the size of the zone being heated.

Heating regime

It is assumed that the length of time for which the house is heated and the extent to which it is heated both vary by household composition. Households where individuals are assumed to be at home all day require more heating than others. Similarly, underoccupied households do not require as much space heating as others. The tables below come from the official documentation of the model. The standard regime assumes that householders are not in the house during normal working hours. The full regime assumes they are at home. The partial regime assumes the household is underoccupied, that is to say it has more bedrooms than the bedroom standard and more space then the Parker Morris standard for the number of residents.

<table>
<thead>
<tr>
<th>Details of STANDARD heating regime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Pattern</td>
</tr>
<tr>
<td>Weekday 9 hours of heating</td>
</tr>
<tr>
<td>Weekend 16 hours of heating</td>
</tr>
<tr>
<td>Heating Extent</td>
</tr>
<tr>
<td>Whole house</td>
</tr>
<tr>
<td>Demand Temperature</td>
</tr>
<tr>
<td>Primary living zone 21C</td>
</tr>
<tr>
<td>Secondary living zone 18C</td>
</tr>
</tbody>
</table>

Whilst called the standard regime, this does not apply to large proportions of the population. If anyone in the household occupies the dwelling either in the morning or the afternoon, as indicated in reply to a question in the EHCS, it is assumed that the dwelling requires all day heating, a regime set out in the table below. The regime is based on the answer to this question, not an assumption based on another variable, such as worklessness

<table>
<thead>
<tr>
<th>Details of FULL heating regime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Pattern</td>
</tr>
<tr>
<td>Weekday 16 hours of heating</td>
</tr>
<tr>
<td>Weekend 16 hours of heating</td>
</tr>
<tr>
<td>Heating Extent</td>
</tr>
<tr>
<td>Whole house</td>
</tr>
<tr>
<td>Demand Temperature</td>
</tr>
<tr>
<td>Primary living zone 21C</td>
</tr>
<tr>
<td>Secondary living zone 18C</td>
</tr>
</tbody>
</table>
The final regime applies only to those who underoccupy. The partial regime, is, in effect, the full regime for half the house only.

<table>
<thead>
<tr>
<th>Details of PARTIAL heating regime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Pattern</td>
</tr>
<tr>
<td>Weekday 16 hours of heating</td>
</tr>
<tr>
<td>Weekend 16 hours of heating</td>
</tr>
<tr>
<td>Heating Extent</td>
</tr>
<tr>
<td>Half house</td>
</tr>
<tr>
<td>Demand Temperature</td>
</tr>
<tr>
<td>Primary living zone 21C</td>
</tr>
<tr>
<td>Secondary living zone 18C</td>
</tr>
</tbody>
</table>

COST PER UNIT OF ENERGY

The cost per unit of energy varies between households based on where they are in the country and what method of payment they use. An average price per region per payment method is applied in the model.
This diagram is taken from the report, *Peer review of the methodology for calculating the number of households in fuel poverty in England*, a report to DTI and DEFRA by Tom Sefton and John Chesshire.
APPENDIX 2 – OVERALL RISKS OF FUEL POVERTY

By way of background, this appendix looks at how the risk of fuel poverty in England varies among different groups in the population, namely by:

- Income.
- Work status.
- Vulnerability.
- Deprivation of area.
- Household type.
- Number of people in the household.
- Tenure.
- Type of area (urban/rural).
- Geography.
- SAP rating.
- Under occupancy
- Floorspace.

In each case, two graphs are shown namely:

- The risks of fuel poverty by the characteristic in question.
- The shares of those in fuel poverty by the characteristic in question.

All the data in this appendix is the average for the three latest years (i.e. 2003 to 2005). This averaging has been done to improve the statistical reliability of the results given that the sample sizes for some of the breakdowns are rather small.
INCOME

30% of households in income poverty are also in fuel poverty. Almost no one in the top two-thirds of the income distribution is in fuel poverty.

Four-fifths of households in fuel poverty are also in income poverty

Source: EHCS; the data is the average of 2003 to 2005

WORK STATUS

Note that, in EHCS, the term ‘household’ is used to cover everyone living in a dwelling and, according to the EHCS documentation, a ‘workless household’ is one where no-one aged 16 or over is in employment. The detailed data, however, suggests that a ‘workless household’ is one where neither the Household Reference Person nor (if applicable) their spouse is working. These two definitions are not quite the same: for example, if a working young adult lived with their workless parents, then this would count as a working household in the first definition but as a workless household in the second definition. This is part of a
wider issue of whether work status should be defined in relation to a ‘family’ rather than to a ‘household’, where the term ‘family’ is used to cover an adult and their spouse (if applicable). So, a young adult living with their parents would count as one ‘household’ but two ‘families’. Note that an alternative – and more technically correct - term for ‘family’ is ‘benefit unit’.

If a household has someone in full time work, it is very unlikely that they will be in fuel poverty. The risk for workless working-age households is much higher than that of pensioner households

Workless households are more likely to be in fuel poverty for two reasons. First, and most obviously, their incomes are likely to be low. Second, they are more likely to be at home during the day, so need to heat the house for longer. Given this, it is perhaps surprising that ‘only’ 20% of workless households were in fuel poverty.
'Vulnerability' here uses the fuel poverty programme definition, namely any household with a child or retired person or receiving a means tested benefit. This is a very broad definition and not the same as that used by the Department of Communities and Local Government when talking about other subjects.

It is not surprising that most households in fuel poverty were vulnerable given that – using the definition of vulnerability above – three-quarters of all households are considered to be vulnerable.
Unsurprisingly, those living in the most deprived areas were at the most at risk of fuel poverty. Perhaps more surprising is that the differences by level of deprivation were relatively small. So, for example, ‘only’ 8% of households in the most deprived areas were in fuel poverty and thus the vast majority (92%) were not.

Reflecting the relatively small differences in risks, around half of those in fuel poverty lived in areas with average or below-average deprivation.
The risk of fuel poverty for a single-person household was much higher than for a couple or larger family. 16% of single pensioners and 14% of working-age singles were in fuel poverty, with the next highest group (lone parents) having a 7% risk.

Because of their relatively high risks, two-thirds of the households in fuel poverty were single-person households, even though only a quarter of all households are single-person households.
Unsurprisingly, the pattern by number of people in the household was similar to that for household type, namely that single-person households faced a much higher risk of fuel poverty than larger households.
Overall, the risk of fuel poverty was highest among households who own their own homes outright and those who rent from private landlords are most at risk (both around 10%) and lowest among those who own with a mortgage (3%). Social renters had a middling risk.
Despite their risks being somewhat lower, the biggest group in fuel poverty was households in suburban areas. The reason for this is that a majority of households in England are classified as suburban, so even a relatively low risk means a high number of such households in fuel poverty.
The risk of fuel poverty was somewhat higher in the North East (10%) than in other parts of England and noticeably higher than in London and the South East (both 4%).
SAP RATING

Note that, in 2005, the precise calculations of SAP rating in EHCS were changed slightly and these changes were applied retrospectively to the earlier datasets. For this reason, the results in this report may differ slightly from those in previously published reports.

There was a clear and strong relationship between SAP rating and fuel poverty.

Although only a tenth of all homes have a SAP rating of less than 30, two-fifths of all households in fuel poverty had a SAP rating of less than 30.
UNDEROCCUPANCY

The definition of underoccupancy is that a household is both above the bedroom standard and has twice as much space as it requires per person based on the Parker Morris standard. Using the Parker Morris standard, a single person requires 33 square metres of living space so a single person in a house with two bedrooms and 66 metres of living space would be classed as underoccupying. Of the two conditions, the second is the more restrictive; in other words, only a minority of households above the bedroom standard have more than twice as much space as they need.

Almost half of all underoccupied households are single-person households, and around half of singles underoccupy. In a sense this follows from the second part of the definition of underoccupancy: it gets harder for a household to have twice as much space as it needs as the number of people in the household grows, so it gets harder for that household to be classed as underoccupying.

![Graph showing under-occupying households are more than twice as likely to be in fuel poverty as other households.](source: EHCS; the data is the average of 2003 to 2005)
It might have been expected that larger houses would be more at risk of fuel poverty as their required fuel costs will generally be higher. As the graph above shows, however, this was not the case.
Three-quarters of households in fuel poverty live in accommodation smaller than 90 square metres.

- 50 to 69 sqm: 29%
- 70 to 89 sqm: 32%
- 90 to 109 sqm: 12%
- 110 sqm or more: 16%
- Less than 50 sqm: 11%

Source: EHCS; the data is the average of 2003 to 2005.
APPENDIX 3 – RISKS OF FUEL POVERTY BY INCOME GROUP

This appendix looks at how, for selected household income groups, the risk of fuel poverty in England varies among different groups in the population, namely by:

- Work status.
- Vulnerability.
- Deprivation of area.
- Household type.
- Number of people in the household.
- Tenure.
- Type of area (urban/rural).
- Geography.
- SAP rating.
- Under occupancy.
- Floorspace.

In each case, two graphs are shown.

The first graph shows the risk of fuel poverty for each of:

- Those in the bottom sixth of the income distribution (i.e. those in income poverty).
- Those in the second sixth of the income distribution.
- Those with higher levels of income.

The second graph shows the shares of those in fuel poverty by whether or not they are in income poverty and, for those in income poverty, by the characteristic in question.

All the data in this appendix is the average for the three latest years (i.e. 2003 to 2005). This averaging has been done to improve the statistical reliability of the results given that the sample sizes for some of the breakdowns are rather small.
To provide context, the graph below shows the overall risks of fuel poverty for each of the income groups.

30% of households in income poverty are also in fuel poverty. Almost no one in the top two-thirds of the income distribution is in fuel poverty.

And the following graph shows the overall shares of those in fuel poverty by income group.

The vast majority (83%) of households in fuel poverty are also in income poverty.
Among those in income poverty, workless households were more likely to be in fuel poverty than working households. This is not surprising given that some of their incomes will be very low and they are also more likely to be at home during the day, so need to heat the house for longer. Given this, what is perhaps more surprising is that ‘only’ 30% of workless working-age households in income poverty were also in fuel poverty.
At all income levels, those classified as ‘non-vulnerable’ were actually at higher risk of fuel poverty than those classified as ‘vulnerable’. The definition of vulnerability is so broad – any household with a child, a person over 60 or someone in receipt of state benefits – that the only groups left out are single working-age adults and couples without children. As discussed later, at all income levels, single working-age adults have a much higher risk of fuel poverty than larger households, thus increasing the overall risk of fuel poverty of non-vulnerable households compared with vulnerable ones.
It is perhaps surprising that, among those in income poverty, the risk of fuel poverty decreased as the deprivation of the local area increased. Note that there are, of course, far more households in income poverty in the most deprived fifth than in the least deprived fifth (1,200,000 compared to 350,000).
For both those in income poverty and those with slightly higher incomes, the risk of fuel poverty for a single-person household was much higher than for a couple or larger family. Half of all singles in income poverty – both working-age and pensionable age – were also in fuel poverty.

It is interesting that lone parents had an average fuel poverty risk, both in general and among those in income poverty. This is in contrast to the situation for income poverty, where lone parents have a much higher risk than any other household type.
Unsurprisingly, the pattern by number of people in the household was similar to that for household type, namely that single-person households in income poverty faced a much higher risk of fuel poverty than larger households in income poverty.
Among those in income poverty, outright owners faced the highest risk of fuel poverty, followed by private renters and those who own with a mortgage, and with social renters having the lowest risk. This pattern among those in income poverty was somewhat different than that for the population as a whole (see Appendix 2), where those who own with a mortgage were at low risk and social renters were at medium risk.

Of those in fuel poverty, two-fifths are both in income poverty and own their properties outright.

Source: EHCS; the data is the average of 2003 to 2005.
Among those in income poverty, the risk of fuel poverty was much higher for those living in rural areas than for those living in urban areas. These differences are much greater than those for the population as a whole (see Appendix 2).
Whereas the North East had a somewhat higher risk of fuel poverty than other regions in England (see Appendix 2), this was not noticeably the case when looking solely at households in income poverty.
At all levels of income, there was a clear and strong relationship between SAP rating and fuel poverty.

Because the risks of fuel poverty among those in income poverty only became low if the home is energy efficient, a substantial proportion of those in fuel poverty were both in income poverty and lived in energy inefficient homes. More specifically, of those in fuel poverty, almost half were both in income poverty and lived in homes with below-average energy efficiency (i.e. below a SAP rating of 50).
Two-thirds of those in income poverty who were underoccupying were also in fuel poverty, a much higher proportion than for those who were not underoccupying. Similarly, unoccupancy also increased the risk of fuel poverty for those on lowish incomes but not in income poverty (i.e. the second sixth). Neither of these observations are surprising given that, all else equal, required fuel costs will be higher for those who are underoccupying compared with those who are not.
Unoccupancy was quite common among those in income poverty (around a quarter of all households in income poverty). As a result, two-fifths of all those in fuel poverty were both in income poverty and underoccupying.

**FLOORSPACE**

For those in income poverty, the risk of fuel poverty increased as floorspace increased. This is not surprising given that those in larger properties will generally have higher fuel costs.

Although households who were both in income poverty and lived in large homes (110 square metres of more) had a high (50%) risk of fuel poverty, there are relatively few such households. As a result, only a tenth of those in fuel poverty were both in income poverty and lived in large homes.
Only a tenth of those in fuel poverty are both in income poverty and live in large homes (110 sqm or more)

- Not in income poverty: 22%
- In income poverty: less than 50 sqm: 10%
- In income poverty: 50 to 69 sqm: 24%
- In income poverty: 70 to 89 sqm: 25%
- In income poverty: 110 sqm or more: 10%
- In income poverty: 90 to 109 sqm: 9%

Source: EHCS; the data is the average of 2003 to 2005
APPENDIX 4 - THE IMPACT OF RISING FUEL COSTS SINCE 2005

This appendix looks at how the risks of fuel poverty are likely to have changed between the latest official data (2005) and 2007. It does so for each of:

The following groups of the population are analysed:
- Overall.
- Household type.
- Number of people in the household.
- Tenure.
- Type of area (urban/rural).
- Geography.
- SAP rating.
- Under occupancy.
- Floorspace.

In each case, two graphs are shown, namely:
- The risks of fuel poverty for the whole population.
- The risks of fuel poverty among those in income poverty.

Note that, to be consistent with the other appendices, the ‘2005 figures’ are actually the average for the years 2003 to 2007. As the 2007 estimates require a number of assumptions to have been made, they should be treated with caution.

METHOD OF ESTIMATION

Since the 2005 EHCS survey was undertaken, domestic fuel costs have risen considerably. The official BERR statistics on energy prices can be found at www.berr.gov.uk/energy/statistics/publications/prices/tables/page18125.html. Of the various tables to be found there, tables 2.2.2 (average annual domestic electricity bills for selected towns and cities in the UK and average unit costs) and 2.2.3 (average annual domestic gas bills for selected towns and cities in Great Britain and average unit costs) are the ones that have been used. The resulting unit costs are shown in the table below.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Year</th>
<th>Gas (Great Britain)</th>
<th>Electricity (United Kingdom)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Standard credit</td>
<td>Direct debit</td>
</tr>
<tr>
<td>Unit costs</td>
<td>2005</td>
<td>2.14</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>2.63</td>
<td>2.36</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>3.07</td>
<td>2.76</td>
</tr>
<tr>
<td>% change in cash terms</td>
<td>2005 to 2006</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>2006 to 2007</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>2005 to 2007</td>
<td>43%</td>
<td>41%</td>
</tr>
<tr>
<td>% change in real terms</td>
<td>2005 to 2006</td>
<td>19%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>2006 to 2007</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>2005 to 2007</td>
<td>33%</td>
<td>31%</td>
</tr>
</tbody>
</table>
To calculate the percentage changes in real terms from the percentage changes in cash terms, the all-items annual Retail Price Index (CHAW) has been used. This was 192.0 in 2005, 198.1 in 2006 and 206.5 in 2007. Using alternative prices indices would make little material difference to the figures in the table.

To derive our estimates of 2007 fuel poverty from these price increases, we uprated the fuel cost for each household in the 2005 EHCS in line with rises in unit costs whilst raising household incomes in line with earnings or out-of-work benefit levels (whichever is more applicable).

For fuel costs, different rates of increase were applied for different types of payment method, namely standard credit, direct debit or prepayment.

- For households with electricity as their main fuel system, the changes in electricity prices were used.

- For households with gas fired systems, the changes in gas prices were applied to the heating and water costs plus half of the cooking costs, with the changes in electricity prices applied to the lighting and appliance costs plus the other half of the cooking costs. The results are not materially different if alternative assumptions are applied to the cooking costs.

- For households with other fuel systems, where the rise in unit costs is not known, the average of the change in gas and electricity prices were applied to the heating and water costs plus half of the cooking costs, with the changes in electricity prices applied to the lighting and appliance costs plus the other half of the cooking costs. The results are not materially different if alternative assumptions are made for these households.

Note that it has also been assumed of the scale of price rises has been similar across the whole of England.

For household incomes, assumptions have to be made because the actual changes in household incomes for those in and near fuel poverty between 2005 and 2007 are not known and these assumptions necessarily have to relate to overall changes in earnings, benefit levels, etc. In this context, different rates of increase were applied for each combined employment status of the household reference person and (if applicable) spouse:

- For those where at least one of the adults was working, the change in average earnings was used.

- For those where neither of the adults was working but neither was retired, the change in out-of-work benefit levels was used.

- For those where neither of the adults was working but at least one was retired, the change in the guaranteed level of Pension Credit was used.
Alternative assumptions could have been made but our analysis strongly suggests that these would not have made a material difference to the results. This is because average earnings, the levels of the various out-of-work benefits and the retail price index all rose at a similar rate over the period 2005 to 2007 (the LNMQ average earnings index and the CHAW price index both rose by 8%, and the various out-of-work benefits rose by between 5% and 9%).

OVERALL
Single people aged 60 or over are particularly at risk from rising prices. In 2005, their risk of fuel poverty was little different from younger single adults. By 2007, it is estimated to be substantially higher. The risk for lone parents is also estimated to have risen considerably.
Unsurprisingly, the patterns by number of people in the household are similar to those for household type.
Whilst the overall patterns are unlikely to have changed much between 2005 and 2007, it is estimated that the group whose risk of fuel poverty will have risen the most is social renters of local authority housing.
TYPE OF AREA

All households

Source: EHCS 2005 and BERR energy unit cost data

Households in income poverty only

Source: EHCS 2005 and BERR energy unit cost data
Between 2005 and 2007, the risks of fuel poverty are estimated to have risen considerably for all levels of SAP rating, except for the most energy-inefficient homes (SAP below 30) where the risk could not rise much as it was already very high.
By 2007, almost all households who were both in income poverty and underoccupying were likely to be in fuel poverty.
FLOORSPACE

All households

- 2005
- 2007 estimate

Proportion of households in fuel poverty

Source: EHCS 2005 and BERR energy unit cost data

Households in income poverty only

- 2005
- 2007 estimate

Proportion of households in fuel poverty

Source: EHCS 2005 and BERR energy unit cost data
APPENDIX 5 – NOTES ON SCOTLAND, WALES AND NORTHERN IRELAND

The main paper has shown how fuel poverty varies across different groups in England. This appendix explores how far the findings from the English analysis also apply to Scotland, Wales and Northern Ireland. Each country will be taken in turn.

SCOTLAND

The most recent data for fuel poverty in Scotland is for 2005/06, collected by the Scottish House Condition Survey, and the statistics below that refer to fuel poverty rates by household characteristic are therefore for 2005/06. However, the supporting dataset is not yet available and therefore any comments about the relationship between fuel poverty and income poverty are limited to an internal analysis undertaken by the Scottish Executive which has been made available to us. Furthermore, although the datasets for 2003/04 and 2004/05 are available, small sample sizes combined with household income in bands rather than actual amounts mean that it is not possible to say anything from them about how the risk of fuel poverty for those in income poverty varies by household characteristic.¹

The overall rate of fuel poverty in Scotland was 24% in 2005/06, 18% in 2004/05 and 15% in 2003/04. The 2005/06 rate is much higher than that in England. The estimated rise between 2003/04 and 2005/06 is also much higher than that in England: a rise from 13% to 24% in Scotland compared to a rise from 6% to 7% in England.

In an internal memo, the Scottish Executive has estimated that, in 2005/06, 62% of households in income poverty were also in fuel poverty and that around 53% of households in fuel poverty were also in income poverty.² Our analysis of the 2004/05 dataset came up with similar proportions. Given the high levels of fuel poverty in Scotland, these overlaps are consistent with those found in England.

Once the higher overall rate is taken into account, the pattern of fuel poverty between groups in Scotland is similar to that in England for some factors, but quite different for others.

¹ Also note that the household income in the Scottish House Condition Survey only covers the income of the highest income households and spouse/partner, with income data not being collected for any other people in the household. This means that income is underestimated for multiple adult households.
² The Scottish Executive memo also provides some analysis of the overlap by age group. This suggests that the proportion of households in fuel poverty who are also in income poverty is similar for both those under and over the age of 60. However, it also suggests that the proportion of households in income poverty who are in fuel poverty is much higher for those over the age of 60 than for those under 60.
Like in England, single-person households are at greater risk than larger households. In 2005/06, an estimated 45% of single pensioners and 25% of working-age singles were in fuel poverty compared with 10-15% for most other household types. Unlike in England, though like in Northern Ireland, pensioner couples were also a very high risk group in 2005/06, at similar risk to single pensioners and at much greater risk than singles of working age.

Like in England, households in energy inefficient housing are at high risk of fuel poverty. Although there is no published data for 2005/06 as yet, around two fifths of households with a SAP rating below 40 were in fuel poverty averaging across 2003/04 and 2004/05.

Like in Wales and Northern Ireland, but unlike in England, households in rural areas are much more likely to be in fuel poverty than those in urban areas: around 35% compared with 20% in 2005/06 and 30% compared to 15% in 2003/04 and 2004/05 averaged.

Like in England, there is no obvious relationship at all between the deprivation of the area and the risk of fuel poverty. Although there is no published data for 2005/06 as yet, averaging across 2003/04 and 2004/05, as many households in the least deprived fifth of areas were in fuel poverty as in the most deprived fifth.

WALES

The latest fuel poverty data for Wales relates to 2004. These were presented in a comprehensive report on fuel poverty that was recently been published by the Welsh Assembly Government. We have also been given access to the underlying dataset. From an income perspective, however, there are at least three issues with it. First, whilst the income data is complete for those households in the fuel poverty dataset, these only represent around a third of total households surveyed in the overarching Living in Wales survey and it is known that almost two-thirds of those surveyed by Living in Wales did not respond to the household income questions. It is unclear whether this pattern of response/non-response was random or not. Second, even if the pattern of non-response was random, the resulting dataset (around 2,500 records) is very small, making any analysis by income sub-group (e.g. those in income poverty) very problematic. Third, the income data collected by the Living in Wales Survey is actually gross income (i.e. before taxes are deducted) rather than net income (as required for the fuel poverty calculations). For all these reasons, the material below is therefore limited to some overall observations about how the rates of fuel poverty vary by household characteristic.

3 The Scottish data defines household types in terms of different types of ‘family’. This could mean one of two things: either, they are looking at the family type of the highest income adult (or oldest adult) in the household and then describing the whole household as being of this type; or, they are simply using the word ‘family’ as a synonym for ‘household’.

4 The equivalent proportions for 2003/04 and 2004/05 averaged were 35% of single pensioners in fuel poverty and 20% of working-age singles.
The overall rate of fuel poverty in Wales was 11% in 2004, making it somewhat higher than England, but still much lower than in either Scotland or Northern Ireland.

As in England, single-person household are at greatest risk; for example, a fifth of working-age singles were in fuel poverty, compared to a tenth of couples without children.

Households in rural areas were much more likely to be in fuel poverty than those in urban areas – 16% compared to 7%. This is a similar to pattern to that in Scotland and Northern Ireland but different from that in England, where the urban/rural differential is only small.

As in the other countries, low energy efficiency leads to a higher risk of fuel poverty: 44% of properties with a SAP rating of under 35 were fuel poor, compared to 6% of those with a SAP of between 35 and 65.

NORTHERN IRELAND

The latest fuel poverty data for Northern Ireland relates to 2004. We have been given access to some of the fields from the 2004 data. These are, however, limited in scope, and do not include income data of sufficient detail to determine whether or not a household was in income poverty. The material below is therefore limited to some overall observations about how the rates of fuel poverty vary by household characteristic.

The overall rate of fuel poverty in Northern Ireland was 24% in 2004, making it similar to that in Scotland but much higher than that in either England or Wales.5

The patterns of which groups are at the highest risk of fuel poverty in Northern Ireland were broadly similar to those in the other countries (this is relative to other groups in Northern Ireland – in absolute terms, most groups in Northern Ireland are estimated to be at much higher risk of fuel poverty than any groups in England). For example, around a third of single-person households were in fuel poverty compared to a fifth of other household types. And over half of all households in accommodation with a SAP rating below 40 live in fuel poverty, compared to around one sixth of other households.

There were, however, some noticeable differences:

• Like in Scotland but unlike in England, pensioner couples were a very high risk group in 2004, at similar risk to single pensioners and at much greater risk than singles of working age: two-fifths compared to a quarter.

• Like in Scotland and Wales but unlike in England, rural households were at noticeably higher risk of fuel poverty than urban households: a third compared to a fifth.

5 In 2001, it was estimated to be as high as 33%. 

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In this context it is worth noting that the results by household type for 2004 were dramatically different than those for 2001. For example, lone parents were estimated to be the group at highest risk of fuel poverty in 2001 (70% in fuel poverty) but had apparently become a below-average risk group (20% in fuel poverty) by 2004. Although the sample sizes in the Northern Ireland survey are rather small, they should not result in such dramatic changes from year to year. So, either the situation was in Northern Ireland was transformed between 2001 and 2004 or there are some major quality problems with the data.
This appendix describes a mathematical model that has been constructed to explain the reasons for differing fuel costs for different groups in the population. The model is a regression model using data from the 2004 EHCS.

Initially, 30 variables were included, covering a variety of aspects relating to type of fuel, size of dwelling, occupancy, energy efficiency, location, house type and method of payment. Not all of these variables were found have a significant effect on the total cost of fuel. For example, type of fuel was found to have no additional affect other than that accounted for in the SAP rating and the age of the household was not found to be significant.

The table below shows the variables that were ultimately shown to be significant.6

<table>
<thead>
<tr>
<th>Factor</th>
<th>Name</th>
<th>Type</th>
<th>Estimated coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>(Constant)</td>
<td></td>
<td>6.02</td>
</tr>
<tr>
<td>Area of home</td>
<td>Log of area</td>
<td>Energy usage</td>
<td>0.41</td>
</tr>
<tr>
<td>SAP rating</td>
<td>Log of SAP rating</td>
<td>Energy usage</td>
<td>-0.35</td>
</tr>
<tr>
<td>Region (south and eastern regions have lower costs than north and west)</td>
<td>Household in South or East (Yes/No)</td>
<td>Location</td>
<td>-0.11</td>
</tr>
<tr>
<td></td>
<td>Household in North or West (Yes/No)</td>
<td>Region</td>
<td>-0.07</td>
</tr>
<tr>
<td>Rurality</td>
<td>Very rural household (Yes/No)</td>
<td>Location</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Village (Yes/No)</td>
<td>Urban-rural</td>
<td>0.04</td>
</tr>
<tr>
<td>Type of house (detached, semi detached and end terraces have higher costs)</td>
<td>Detached, semi detached or end terrace house (Yes/No)</td>
<td>House type</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Low rise accommodation (Yes/No)</td>
<td>House type</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>Converted, midrise or bungalow (Yes/No)</td>
<td>House type</td>
<td>0.04</td>
</tr>
<tr>
<td>Number of people in the household</td>
<td>Number of people</td>
<td>Energy usage</td>
<td>0.06</td>
</tr>
<tr>
<td>Whether the home is under-occupied</td>
<td>Household underoccupied (Yes/No)</td>
<td>Energy usage</td>
<td>-0.05</td>
</tr>
<tr>
<td>Method of payment (direct debit is cheapest)</td>
<td>Payment by direct debit (Yes/No)</td>
<td>Payment means</td>
<td>-0.05</td>
</tr>
<tr>
<td>Whether or not the household is working</td>
<td>Working household (Yes/No)</td>
<td>Energy usage</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

The model was actually designed to estimate the logarithm of the total cost of fuel. This means that the smaller coefficients – essentially all bar the constant – can be interpreted as percentage changes to the total cost.

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6 The p-value – the probability of a variable being included in the model when it should not be is the usual measure of significance. A p-value under 1% would normally be seen as more than adequate to prove the significance of a variable. The p-values associated with these variables were very were lower than this – in fact, indistinguishable from 0.
For example, take the variable ‘household in south or east’. The co-efficient value is -0.11, which means that a household in the South or East will, all else equal, have a 11% lower fuel bill than a household elsewhere in the country. Alternatively, the co-efficient for the number of occupants is only 0.06. This means that, on average, for each person added to the household (assuming the accommodation itself is the same size), fuel bills only go up by 6%.

Of the list in the table above, some of the factors affect fuel cost in a very direct and obvious way:

• As the area of the home rises, so does the amount of fuel required to heat it.

• As SAP rating rises, indicating an increase in energy efficiency, the amount of fuel required, all else equal, decreases.

• The number of people in the household impacts fuel use in that more occupants mean that more lighting and heating is required.7

• Conversely, under occupancy means that less fuel is required to heat the space.

• Households where no one is working, and are therefore occupied all day, are heated for longer.

• The overall cost of fuel is affected by the method of payment – direct debit is cheapest, pre-payment the most expensive.

By contrast, it is much less immediately clear why factors such as region, rurality and type of house should affect fuel costs. Note that these effects are over and above those arising because of correlation with other factors. For example, if the only impact of ‘rurality’ was because rural homes tended to be larger and less energy efficient than other homes, this would tend to manifest itself in the area and SAP factors rather than in the rural factors. So, the fact that the rural variables are significant suggests that other factors are also at play. For example, it could be that homes in rural areas are generally more exposed and thus, all else equal, require more fuel.

The next step was to combine these coefficients with the average of the variables for different groups to explain the differences. Below is a worked example, showing the difference in fuel cost between rural households in income poverty and other households in income poverty.

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7 In fact, this follows directly from the model used to estimate fuel costs, where heating, lighting and water heating are all related to the number of people in the house.
<table>
<thead>
<tr>
<th></th>
<th>Non rural</th>
<th>Rural</th>
<th>Difference (rural minus non rural)</th>
<th>Co efficient (from table above)</th>
<th>Effect on fuel cost (Difference multiplied by coefficient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of log of area</td>
<td>4.20</td>
<td>4.28</td>
<td>0.09</td>
<td>0.41</td>
<td>3%</td>
</tr>
<tr>
<td>Average of log of SAP rating</td>
<td>3.90</td>
<td>3.52</td>
<td>-0.38</td>
<td>-0.35</td>
<td>13%</td>
</tr>
<tr>
<td>Proportion in South and East</td>
<td>0.49</td>
<td>0.66</td>
<td>0.17</td>
<td>-0.11</td>
<td>-2%</td>
</tr>
<tr>
<td>Proportion in very rural areas</td>
<td>0.00</td>
<td>0.15</td>
<td>0.15</td>
<td>0.1</td>
<td>1%</td>
</tr>
<tr>
<td>Proportion of detached, semi detached and end terrace</td>
<td>0.40</td>
<td>0.53</td>
<td>0.14</td>
<td>0.08</td>
<td>1%</td>
</tr>
<tr>
<td>Proportion in North and West</td>
<td>0.42</td>
<td>0.29</td>
<td>-0.13</td>
<td>-0.07</td>
<td>1%</td>
</tr>
<tr>
<td>Average number of occupants</td>
<td>2.72</td>
<td>2.42</td>
<td>-0.30</td>
<td>0.06</td>
<td>-2%</td>
</tr>
<tr>
<td>Proportion under occupied</td>
<td>0.13</td>
<td>0.22</td>
<td>0.09</td>
<td>-0.05</td>
<td>0%</td>
</tr>
<tr>
<td>Proportion using direct debit</td>
<td>0.06</td>
<td>0.09</td>
<td>0.03</td>
<td>-0.05</td>
<td>0%</td>
</tr>
<tr>
<td>Proportion of low rise</td>
<td>0.20</td>
<td>0.08</td>
<td>-0.12</td>
<td>-0.04</td>
<td>0%</td>
</tr>
<tr>
<td>Proportion of converted, mid rise or bungalows</td>
<td>0.37</td>
<td>0.39</td>
<td>0.02</td>
<td>0.04</td>
<td>0%</td>
</tr>
<tr>
<td>Proportion of village</td>
<td>0.00</td>
<td>0.21</td>
<td>0.21</td>
<td>0.04</td>
<td>1%</td>
</tr>
<tr>
<td>Proportion working</td>
<td>0.27</td>
<td>0.31</td>
<td>0.04</td>
<td>-0.02</td>
<td>0%</td>
</tr>
<tr>
<td>Total difference in fuel cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17%</td>
</tr>
</tbody>
</table>

The two factors that explain the most of the difference between low income rural and other households are the log of the SAP rating and the log of the Area (see right hand column)\(^8\):

- On average, the log of the SAP rating in a rural area is 0.38 lower than the average log of SAP rating elsewhere. This –0.38, when multiplied by the coefficient for SAP rating of –0.35 gives us 0.13. This means that fuel costs in rural houses are 13% higher on average due to low SAP ratings.

- On average, the log of the area of a rural house is 0.09 higher than that of a house elsewhere. This 0.9, multiplied by the coefficient of 0.41, gives us 0.03 meaning that rural houses, on average, spend 3% more on fuel due to their size.

\(^8\) Small differences in logs equate (roughly) to percentage differences in the actual variable being measured. So, for example, on average, a rural household lives in a house 9% bigger than a house elsewhere.