

# Health, mental health and housing conditions in England



Harris J, Hall J, Meltzer H, Jenkins R, Oreszczyn T  
and McManus S

Research for the eaga Charitable Trust by the  
National Centre for Social Research



This report presents secondary analyses of the Adult Psychiatric Morbidity Survey (APMS) 2007, focusing on health, mental health and housing conditions in England. These analyses are part of a study funded by the eaga Charitable Trust and undertaken the National Centre for Social Research (NatCen), with advice and support from the UCL Energy Institute, Institute of Psychiatry (IoP) and the Health Sciences Department, University of Leicester. The NHS Information Centre for health and social care commissioned the original survey, with funds from the Department of Health.

APMS 2007 included a structured clinical assessment of mental health that allowed for the reliable diagnosis of common mental disorders such as anxiety and depression. The questionnaire also covered aspects of housing conditions and financial strain related to domestic fuel use, including presence of mould, cutting back on fuel usage, lack of central heating and double-glazing, being cold at home, and fuel-related problem debt or utility disconnection.

This report presents the prevalence of different aspects of poor housing in the English population and identifies which types of household are at greatest risk. It also explores how poor housing conditions and fuel related debt relate to other indicators of poverty, and goes on to examine associations with mental and physical health and disability.

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eaga Charitable Trust (eaga-CT) is a grant-giving trust that was founded by eaga plc in 1993. It currently supports projects and research in two main areas: the relief of fuel poverty and the promotion of energy efficiency; and vulnerable consumers - multiple needs and preferences.



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**For queries about the research**

Sally McManus, Research Director  
National Centre for Social Research  
Email: [sally.mcmanus@natcen.ac.uk](mailto:sally.mcmanus@natcen.ac.uk)  
Telephone: 020 7549 7045  
Website: [www.natcen.ac.uk](http://www.natcen.ac.uk)

Dr Naomi Brown, Trust Manager  
eaga Charitable Trust  
Email: [eagact@aol.com](mailto:eagact@aol.com)  
Telephone: 01539 736477  
Website: [www.eagacharitabletrust.org](http://www.eagacharitabletrust.org)

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The publications officer  
National Centre for Social Research  
35 Northampton Square, London EC1V 0AX  
Telephone: 020 7549 7006  
Email: [info@natcen.ac.uk](mailto:info@natcen.ac.uk)

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The authors take responsibility for any errors or omissions in this report.

Jenny Harris and Sally McManus

## Notes

1. The data presented in this report have been weighted. The weighting is described in Appendix A. Both unweighted and weighted sample sizes are shown at the foot of each table. The weighted numbers reflect the relative size of each group in the population, not numbers of interviews conducted, which are shown by the unweighted bases.
2. The following conventions have been used in tables:
  - no observations (zero value)
  - 0 non-zero values of less than 0.5% and thus rounded to zero
  - [ ] used to warn of small sample bases, if the unweighted base is less than 40.
3. Because of rounding, row or column percentages may not add exactly to 100%.
4. A percentage may be quoted in the text for a single category that aggregates two or more of the percentages shown in a table. The percentage for the single category may, because of rounding, differ from the sum of the percentages in the table.
5. 'Missing values' occur for several reasons, including refusal or inability to answer a particular question and cases where the question is not applicable to the respondent. In general, missing values have been omitted from all tables and analyses.
6. The group to which each table refers is stated at the upper left corner of the table.
7. The term 'significant' refers to statistical significance (at the 95% level) and is not intended to imply substantive importance. **Unless otherwise stated, all differences mentioned in the text are statistically significant at the 95% confidence level.** Standard errors that reflect the complex sampling design and weighting procedures used in the survey have been calculated and used in tests of statistical significance.

# Summary of key findings

## What we know

According to the official definition, a household is fuel poor if it needs to spend more than 10% of its income to heat the home to an adequate level of warmth. In 2007, approximately 2.8 million households in England were in fuel poverty. The causes are multifactorial and include: the energy efficiency of the home, household income, debt, benefits take-up, fuel costs and climate. Fuel poverty does not occur in isolation and may be experienced alongside other aspects of poverty, but how these cluster together in the population is unclear.

Linked to this, poor housing conditions, including cold and damp housing, have been associated with physical health problems and increasingly psychological distress. However, it is not clear to what extent associations with general psychological distress also hold true for common mental disorders of sufficient severity to require health care services and treatment.

## Looking at aspects of fuel related poverty

The Adult Psychiatric Morbidity Survey (APMS) 2007 is part of a survey series that provides the national estimates of community rates of psychiatric disorder in England. The 2007 survey included questions on aspects of fuel related poverty including: self-perceived cold housing, mould in the home, cutting back on fuel usage due to cost and fuel related problem debt or disconnection, alongside questions about characteristics of the property (such as extent of heating and double glazing). Participants were asked about presence in the last year of any doctor diagnosed physical health complaints requiring treatment and their level of functional impairment (disability) and assessed for common mental disorder (including depression and anxiety).

## Insights from a multidimensional approach

Taking a multidimensional approach to fuel related poverty illustrates how different groups experience different aspects.

- People living in flats were worse off than those in other types of dwelling unit. However, those in purpose built flats manifested this in a financial domain (reducing fuel use and experiencing fuel debt), while those in conversions had worse housing conditions (mould and no central heating).
- There was a similar pattern in the association with housing tenure. People who rent their homes were worse off than owner occupiers: but for private renters this is evident in poor housing conditions and for social renters it was experienced in terms of living in a cold home and reducing fuel use.

Having a cold home contributes to social isolation and may be associated with stigma. The room most likely to be cold was the living room and a quarter of people with a cold home reported reluctance to invite people home as a result.

## Lone parent households at risk

Older people living alone fared worse than those living as a couple. This may be linked to the observation that female-headed households tended to fare worse than male-headed households.

A quarter of lone parent households, also often female, reduced their fuel use due to worries about cost. Disabled people also had particularly high rates of experiencing all the aspects of fuel related poverty that were asked about. These associations support calls to extend the Winter Fuel Payment to other vulnerable households.

Lone occupants under the age of 60 were also identified as a vulnerable group. The subjective nature of the aspects measured and the inclusion of fuel related debt as a variable may explain why this younger group was highlighted.

## Wider social policy must tackle both debt and low income

Latent class analysis identified four distinct groups in the population, three characterised by a specific and adverse financial strain context.

- Two groups were marked by severe debt problems: this highlights the need for financial management skills, and for proper funding of debt counselling services like the Citizens Advice Bureau.
- Two groups were marked by an extremely low household income: this highlights the need for income maximisation strategies. In particular, benefit take up was lower than it should have been (given income levels) in the group with higher debt.
- One group was comprised almost entirely of unemployed people with no qualifications, highlighting the relevance of broader social initiatives in employment-focused training.

## A separate focus on heating efficiency and mould also essential

Even after controlling for debt, low income, and socio-demographic factors such as education: living in a home that is cold *independently* predicts both poor physical health and poor mental health. This demonstrates that while income maximisation and debt support schemes are essential, so too are programmes such as Warm Front that focus specifically on improving home heating and insulation efficiency.

Mould also independently predicts poor mental and poor physical health. This demonstrates that while insulating homes is a priority, this must include proper ventilation if an increase in the health conditions associated with mould is to be avoided. This is all the more important given that this study has demonstrated that presence of mould is by far the highest in households with children. Interventions aimed at tackling mould would do well to target this group.

## In conclusion

It is not possible from these data to determine direction of causality or the precise mechanisms by which different aspects of fuel related poverty may exert a negative impact on physical or mental health. However, this report does highlight that fuel related poverty is a key public health issue requiring a multifaceted and cross-sector approach.

## Chapter 2: Introduction

Fuel poverty is linked to poor housing, and the presence of cold and damp housing conditions has been used as a proxy indicator of fuel related poverty. Cold and damp housing conditions have been linked to numerous adverse physical health outcomes. Several studies have demonstrated an association with general psychological distress, but no studies known to the authors have used a robust assessment of mental disorder. A standardised clinical assessment of common mental disorder (CMD) is able to: distinguish specific disorder from general distress; be more resistant to socioeconomic biases in self-reporting of neurotic symptoms;<sup>1</sup> and provide a measure of severity that identifies people likely to benefit from treatment (i.e. those with primary health service need and of key relevance for policy).

The Adult Psychiatric Morbidity Survey (APMS) 2007 is part of a survey series that provides the national estimates of psychiatric disorder in England. The presence of common mental disorder (CMD) in the week prior to interview was assessed using the revised Clinical Interview Schedule (CIS-R), enabling the identification of those with clinically significant neurotic symptoms (such as depression and anxiety). Additionally, the 2007 survey included questions on various aspects of fuel related poverty including: cold housing conditions, mould in the home, cutting back on fuel usage and having fuel related problem debt, alongside questions about the characteristics of the property.

Through various secondary analyses of the APMS 2007 dataset, this study aimed to explore:

- The prevalence of different aspects of fuel related poverty in the English population (Chapter 4),
- How the risk of fuel related poverty varies by housing and household characteristics (Chapters 4 and 5),
- How aspects of fuel related poverty relate to other poverty and financial strain indicators (Chapter 6),
- The associations between fuel related poverty and mental health (Chapter 7), and
- The associations between fuel related poverty and physical health and disability (Chapter 8).

The approach adopted in this study, focusing on aspects of housing conditions and fuel related problem debt/restricted usage, is very distinct from standard definitions of fuel poverty. This is both a limitation and strength of the study. A limitation is that the data presented are not directly comparable to much of the existing fuel poverty research and policy, but a strength is the multidimensional approach taken. Benefits of the multidimensional approach are evident in two key ways. We find that the different aspects of fuel related poverty have very distinct profiles in terms of a) what types of people are effected, a single measure of fuel poverty might mask this variation (see Chapters 4 and 5), and b) in our exploration of how different aspects of poverty, including fuel related poverty, cluster (see Chapter 6).

Our approach cannot provide a prevalence of officially defined fuel poverty. Instead this study aims to describe the distribution of different aspects of fuel related poverty and associations with health.

## Chapter 3: Methodological summary

Interviews for the national APMS 2007 took place over a year, using laptop administered face to face and self-completion modules. These included structured psychiatric assessments and screening instruments for a range of mental disorders, as well as questions about health, treatment and service use, risk factors (including housing and financial strain) and demographics. Interviews lasted an average of 90 minutes.

A stratified random probability sample of households in England was selected. 57% of the 13,171 potentially eligible households took part. In each household, one resident aged 16 or over was selected at random, resulting in 7,461 productive interviews. There was no upper age limit to participation.

## Chapter 4: Fuel related poverty and property characteristics in England

It was beyond the scope of APMS 2007 to measure 'fuel poverty' according to the government definition. APMS 2007 adopted a consensual social indicator approach to fuel related poverty based on the absence of necessities (living in a thermally comfortable and mould free home) and presence of fuel related financial strain.

In England in 2007:

- 4% of people felt unable keep their home warm enough in winter.
- 13% had mould; and 9% had mould in a room other than the bathroom, shower room or toilet.
- 14% of people said worry about cost meant that they had used less fuel than was necessary to heat the home in the past year.
- 3% of people had been disconnected and/or experienced problem debt in the past year in relation to their gas, electricity or other fuel supplier.
- 23% of people experienced at least one of these aspects of fuel related poverty; but less than 0.5% experienced all four.
- 11% of people had no double or triple glazing in their home at all, and 9% had no central heating. 2% of people had neither.

Property characteristics associated with aspects of fuel related poverty:

- Age of property: people living in older homes were more likely to experience poor thermal comfort and mould: almost 1 in 10 (8%) of the oldest properties had poor thermal comfort, and 1 in 7 (14%) had mould.
- Dwelling type: people living in flats tended to fare worse than those living in other types of dwellings. Those living in flat and maisonette conversions were worse off in terms of thermal efficiency, thermal comfort and presence of mould, whereas those in purpose built flats and maisonettes were more likely to experience problem fuel debt and restricted fuel usage.
- Population density: people living in rural areas appeared to have more inefficient housing. However, with regards to poor thermal comfort those in urban and rural areas were at a greater risk than suburban areas, and reducing fuel usage due to worries about cost was highest in urban areas.
- Tenure: for all the aspects of fuel related poverty, owner occupiers were better off than renters. Compared with owner-occupiers, private renters had an increased risk of having mould and were less likely to have central heating; those in social housing were more likely to report a cold home and cutting back on fuel due to worries about cost.

## Chapter 5: Fuel related poverty and household composition

Household composition characteristics associated with fuel related poverty:

- Adults living alone and large families were the most likely to have at least one aspect of fuel related poverty (34% for both), whereas older couples with no children were the least likely (15%).
- Lone adult (aged 16-59) households (7%) and small and large families (both 6%) were most likely to report being cold.
- Mould was most common among families with children, especially large families (23%).
- Households with children and one adult were far more likely than other household types to report using less fuel than needed due to worries about cost.

## Chapter 6: Types of poverty: a latent class analysis

Fuel related poverty does not occur in isolation and is likely to be experienced alongside other aspects of poverty. Using eleven indicators of poverty, this chapter explores how various aspects of fuel related poverty and poverty more generally fit together in the population. The measures used were:

- Being in the lowest equivalised household income quintile,
- Being in receipt of state means tested benefits,
- Having any mould in the property,
- Being unemployed,
- Experiencing a major financial crisis in last 6 months,
- Reporting problem debt with the electricity, gas or other fuel supplier,
- Being disconnected for gas, electricity or other fuel,
- Reporting any other (non-fuel related) problem debt,
- Being unable to keep home warm enough in winter,
- Using less gas, electricity or other fuel than needed due to worry about cost, and
- Having borrowed money from a pawnbroker, moneylender, family or friends.

Latent class analyses (LCA) was used to find subtypes of related cases (or latent classes). Using LCA it is possible to see how participants group into meaningful subtypes according to the eleven measures. Logistic regression models were then used to explore what types of people had increased odds of being in each cluster.

Four clusters were identified and were labelled 'managing on a higher income' (80.3%); 'managing on a low income' (10.4%); 'struggling on a low income (5.0%); and 'struggling on a higher income' (4.3%).

The 'managing on a higher income group' tended to experience few financial strains. Those with increased odds of being assigned to this cluster were:

- Male,
- Older,
- White,
- Married,
- Without children living in the property,
- Living in a rural area (village, hamlet and isolated dwellings),
- Educated to a degree level,
- Owner-occupiers, and
- Living in an area classed as least deprived (according to IMD quintiles).

The 'low income managing group' had a very low level of household income, but also had low levels of problem debt and borrowing. Their vulnerability to the impact of fuel related poverty was manifested by using less fuel than was needed due to worries about cost.

Those with increased odds of being in this group were:

- Female,
- Aged over 24 (particularly aged 45-64),
- Single, divorced or separated,

- South Asian,
- Lone adults with child/children in the household,
- Educated to A-Level standard or less,
- Renters (particularly social renters), and
- Living in areas classed as more deprived (according to IMD).

The 'struggling on a low income' group also had low incomes, but coupled with multiple markers of financial hardship. Problem debt and fuel related poverty were common in this group. Those with increased odds of being assigned to this group were:

- Young (aged 16-24),
- Divorced or separated,
- Without qualifications,
- Renters (particularly social renters), and
- Living in the most deprived areas.

The 'struggling on a higher income' group had comparatively higher incomes, however they still experienced high levels of financial hardship, particularly problem debt and some aspects of fuel related poverty (although not as marked as those struggling on a low income). Those with increased odds of being assigned to this group were:

- The youngest (aged 16-24), and
- Either social or private renters.

This chapter demonstrates two key issues for fuel related poverty research:

- Using any one indicator of fuel related poverty (e.g. cold home, reduced fuel use, fuel debt) on its own will exclude a substantial proportion of people experiencing other aspects of fuel related poverty, and yet
- There is clear scope for simplifying the number of measures required, given how coherently various dimensions of fuel related poverty appear to cluster.

## Chapter 7: Fuel related poverty and common mental disorder

Common mental disorders (CMD) cause considerable distress, not just to the individuals affected by them, but also to families, friends, and working life. They present a considerable public health burden and priority. APMS 2007 used a standardised structured interview to establish the presence of any common mental disorder (CMD), allowing for the identification of clinically significant symptoms. CMDs consist of various types of neurotic disorder, such as depression and anxiety, that are common in the general population. (APMS 2007 found 16.2% of people had a CMD in the past week). This chapter explores how various aspects of fuel related poverty are associated with CMD. The authors are not aware of any other research which has utilised such a comprehensive measure of mental health in relation to fuel related poverty measures.

- 10% of people with CMD reported not being able to keep their home warm enough in winter, compared with just 3% of people without CMD.
- 15% of those with CMD had mould in their home, compared with 8% of people with no CMD.
- 27% of those with CMD said they had used less electricity, gas or other fuel due to worry about cost, compared with 12% of people with no CMD.
- 6% of those with CMD said they were seriously behind in paying for fuel (gas and electricity) bills and/or being disconnected in the past 12 months, compared with 2% of people with no CMD.
- After adjusting for other factors, being unable to heat the home adequately in winter and having a combination of fuel and other types of problem debt remained predictors of CMD.
- A more modest but still significant association was also evident for having mould and using less fuel due to worry about costs. Housing tenure also remained significant, with social renters having an increased odd of having CMD, compared with owner-occupiers.

- Sex, age and marital status all predicted CMD. Women had a modest increase in the odds of having CMD, as did middle aged people, and those who were not married.
- Other factors to remain significant were area level deprivation and having borrowed money (from one or more problem source). However, income was not significantly associated with CMD after adjusting for other factors.

## Chapter 8: Fuel related poverty, physical health and disability

This chapter compares aspects of fuel related poverty among people with and without physical health complaints and disability, and examines whether these remain predictors of poor physical health after adjusting for other factors.

- Compared with those without health problems those with any physical health condition were more likely to have a cold home (5%, compared with 3%), mould (10%, compared with 7%) and use less fuel due to worries about cost (16%, compared with 13%).
- Compared with those without bronchitis, emphysema or asthma, people with respiratory health problems were more likely to have cold homes (7%, compared with 4%), mould (12%, compared with 9%), restrict their fuel usage (20%, compared with 14%) and have problem fuel debt or be disconnected (5%, compared with 2%).
- Disabled people were at a greatly increased risk of experiencing all aspects of fuel related poverty, for example 12% of people with three or more functional impairments had been disconnected or were in fuel debt, compared with 2% of people with no impairment.
- Logistic regression analysis showed that of the factors that remained significantly associated with different aspects of poor physical health - after controlling for a range of socioeconomic variables - several were fuel poverty related. These included the presence of mould, being unable to keep the home warm, and being in fuel debt. It is interesting to note that being in fuel debt was independently associated with having a respiratory illness, while being in other types of debt was not found to be a significant predictor.
- Renting a property from a social landlord and living in an urban environment were also associated with poor physical health.

### Summary of key findings

Overall, 4% of people indicated that they were unable to keep their home warm enough in winter, 9% had mould in their home (excluding those with mould only in the bathroom, shower room or toilet). 14% reported that they had used less electricity, gas or other fuel than was necessary to heat the home due to worries about cost and 3% reported having been disconnected and/or experienced problem debt in the past year in relation to their gas, electricity or other fuel supplier (Chapter 4).

This report found key associations between household and property characteristics and being in fuel related poverty. Families with children were at particular risk of experiencing aspects of fuel related poverty (Chapter 5), as were people living in flats and maisonettes and those who were living in privately or socially rented accommodation (Chapter 4). The findings demonstrate how fuel related poverty can manifest differently in different groups, and that these groups are associated with different kinds of other financial hardship or deprivation (Chapter 6).

This report adds to previous research that has found links between aspects of fuel poverty and poor physical health (Chapter 8). Compared with those without health problems, those with any physical health problem were more likely to be unable to heat their home adequately in winter, have mould and use less fuel due to worries about cost. After adjusting for other socio-economic factors, factors that remained associated with having physical health problems included several related to housing. Disabled people had particularly high rates of experiencing all these aspects of fuel related poverty.

Importantly, this study is unique in being the first (that the authors are aware of) to demonstrate an association between poor mental health (using an epidemiological and structured clinical assessment) and measures indicative of fuel related poverty. Those with a common mental disorder (CMD) were more likely to experience all aspects of fuel related poverty (Chapter 7). After adjusting for other factors, being unable to adequately heat the home in winter, having a combination of fuel and other types of problem debt, having mould and using less fuel due to worry about costs were all found to be predictors of CMD.

It is not possible from these data to determine direction of causality or the precise mechanisms by which different aspects of fuel related poverty may exert a negative impact on physical or mental health. However, this report does highlight that fuel related poverty is a key public health issue requiring a multifaceted and cross-sector approach.

## References and notes

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## 2.1 Background

A household is classified as fuel poor if it needs to spend more than 10% of its income on heating the home to an adequate level of warmth (21°C in the living room and 18°C in other occupied rooms).<sup>1</sup> The causes of fuel poverty are multifactorial and include the energy efficiency of the home, household income, debt, benefits take-up, fuel costs and climate.<sup>2,5</sup> An estimated 2.4 million households in England were in fuel poverty in 2006, around 11.5% of all households. The great majority (around 1.9 million) contain children or people who are elderly, sick, or disabled. The number of households living in fuel poverty rose to 2.8 million in 2007<sup>3</sup> (the year in which APMS was conducted), and was projected to rise again to 3.6 million in 2008.<sup>4</sup> Energy price rises coupled with recent reductions in household income levels serve to further compound the problem.<sup>5</sup>

A number of Government initiatives have been devised with the aim of trying to eradicate fuel poverty, including Warm Front which provides grants for heating and insulation improvements to eligible households. However, this scheme has recently been criticised for failing to reach enough people in fuel poverty or the greatest need.<sup>6</sup> The UK Fuel Poverty Strategy set targets to end fuel poverty for vulnerable households by 2010 and all households by 2016, targets which it is now widely acknowledged are unlikely to be met.

The relationship between fuel related poverty and other types of poverty is contentious as households on a higher income can be said to be in fuel poverty if they need to spend more than 10% of their income on heating. As mentioned, the UK's Strategy identifies income as one of the three determinants of fuel poverty, yet the precise pathways between poverty, fuel poverty, poor housing and poor health remain unclear.

Fuel poverty is linked to poor housing conditions, and the presence of cold and damp housing conditions has been used as a proxy indicator of household fuel poverty.<sup>7</sup> The considerable problem of excess winter deaths in the UK is clearly linked to poor housing conditions<sup>8</sup> and may well be associated with fuel poverty.<sup>9</sup> Cold housing has been linked to poorer health, for instance improvements in thermal quality have been associated with improved respiratory health.<sup>10</sup> Mould grows in damp housing conditions, and damp has been linked to poorer health generally<sup>11</sup> and specifically to respiratory symptoms, blocked nose, breathlessness and asthma, nausea and vomiting, backache and fainting in adults.<sup>11,12</sup>

Although a number of studies have explored associations with physical health, there is a lack of robust research exploring fuel poverty's associations with mental disorder.<sup>13</sup> Several studies have demonstrated links with general 'bad nerves'<sup>11</sup>, emotional problems,<sup>14</sup> psychological wellbeing<sup>15</sup> and depressive symptoms<sup>16</sup> but no study known to the authors has used a recognised, systematic, epidemiological assessment of mental disorder to test these associations. Such a study is required as it is unclear to what extent the associations translate to symptoms that are clinically significant (at a level potentially amenable to treatment, perhaps requiring the intervention of primary health care service and therefore of greatest relevance to policy). Use of general self-rated health screens have also been found to underestimate the gap between socioeconomic groups.<sup>17</sup>

## 2.2 Adult Psychiatric Morbidity Survey (APMS)

The Adult Psychiatric Morbidity Survey (APMS) 2007 is part of a survey series that provides national estimates of psychiatric disorder in England. It was commissioned by the NHS Information Centre for health and social care with funds from the Department of Health. In 2007, it included a new module of questions on various aspects of fuel related poverty, including cold housing conditions, mould in the home, cutting back on fuel usage and having fuel-related problem debt, alongside other questions about characteristics of the property (age, glazing, heating etc).

Using a series of items which focus on aspects of housing conditions and fuel related problem debt and restricted usage is a very distinct approach to using the standard definition of fuel poverty. Our approach presents both limitations and strengths for this piece of research. The findings are limited in not being directly comparable to much of the existing fuel poverty research (although comparable to much of the health related literature) and not relevant to establishing prevalence of fuel poverty according to the formal definition. However, a strength of this approach is the light it sheds on the highly multidimensional nature of fuel related poverty, in terms of:

- How different aspects of fuel related poverty effect very different groups of people - a single measure would mask this variation (see Chapters 4 and 5), and
- How different aspects of poverty - including fuel related poverty - cluster together in the population (see Chapter 6).

While official estimates are better placed to establish the overall level of and trends in fuel poverty, this study has a wealth of contextual information that enables relative rates of fuel related poverty among different sub-groups to be explored.

## 2.3 Health, mental health and housing: secondary analysis

eaga Charitable Trust has grant funded the secondary analyses of the APMS 2007 dataset presented in this report. Researchers and statisticians in the Health Research Group and the Survey Methods Unit at the National Centre for Social Research (NatCen) have led on this work. Guidance and support have been provided by a steering group of diverse area experts, including: Prof Howard Meltzer (Department of Health Sciences, University of Leicester), Prof Rachel Jenkins (Institute of Psychiatry, Kings College), and Prof Tadj Oreszczyn, Dr Hector Altamirano and Dr Alex Summerfield (UCL Energy Institute, University College London). A health surveys expert (Sam Clemens) and a survey methodologist (Bob Erens) also participated in the steering group and contributed to this report.

## 2.4 Aims of the research

Through various secondary analyses of the APMS 2007 dataset and by using a number of different indicators of fuel related poverty, this study aims to examine:

- The prevalence of different aspects of fuel related poverty in the English population (Chapter 4),
- How the risk of different aspects of fuel related poverty varies by housing characteristics (Chapter 4),
- Which household units are associated with the highest rates of each aspect of fuel related poverty (Chapter 5),
- How indicators of fuel related poverty relate to other poverty and debt indicators (Chapter 6),
- The associations between fuel related poverty and mental health (Chapter 7), and
- The associations between fuel related poverty and physical health (Chapter 8).

## 2.5 Scope of the study and reporting style

This report is intended for a general readership, and so where possible avoids presenting detailed statistical analyses in the main text. In the text, unless otherwise stated, the results are expressed as percentages of the entire sample and only statistically significant associations are mentioned. We use 95% probability as our minimum level for statistical significance (i.e.  $p=0.05$ ). A description of the analysis techniques used and detailed data tables are presented in the appendices.

All data is cross-sectional, and so while it is possible to explore associations it is not possible to infer the direction of causality.

### References and notes

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- 2 All Party Parliamentary Group on Debt and Personal Finance, and the All Party Parliamentary Group on Poverty (2007). *Tackling fuel poverty: the next steps*.
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## 3.1 Survey design

Fieldwork for the national Adult Psychiatric Morbidity Survey (APMS) 2007 was carried out from October 2006 to December 2007, covering a full year and enabling month of interview to be controlled for in the analysis. Interviews were conducted by trained NatGen interviewers using a combination of laptop administered face to face and self-completion modules. These included structured psychiatric assessments and screening instruments for a range of mental disorders, as well as questions about other topics, such as general health, treatment and service use, risk factors (including housing and financial strain) and demographics. Interviews lasted an average of 90 minutes.

## 3.2 Survey response

A stratified random probability sample of households was selected from the Post Office's Postcode Address File, which contains all the addresses in England. The national field force of interviewers visited each property to establish eligibility. 57% of the 13,171 potentially eligible households took part. In each participating household, one person aged 16 or over was selected at random, resulting in 7,461 productive interviews. There was no upper age limit to participation. Data were weighted to take account of selection bias and survey non-response so that the results were representative of the household population aged 16 and over.

Methodological detail is given in Appendix A, as well as in the main survey report.<sup>1</sup>

## 3.3 Access to the data

As with the previous general population surveys in the psychiatric morbidity survey series, a copy of the 2007 dataset has been deposited at the UK Data Archive. Copies of anonymised data files can be made available for specific research projects. Information on this process is available at the data archive website ([www.data-archive.ac.uk](http://www.data-archive.ac.uk)).

## 3.4 Ethical clearance

Ethical approval for APMS 2007 was obtained from the Royal Free Hospital and Medical School Research Ethics Committee (MREC).

## 3.5 Appendices

The appendices to this report provide detailed tables and information not covered in the main text of the report. A full account of the sample design and methods is provided in Appendix A, an outline of the latent class analysis approach is in Appendix B, and the full tables that accompany the substantive chapters are in Appendix C.

## References and notes

- 1 McManus S, Meltzer H, Brugha T, Bebbington P, Jenkins R (eds) (2009). *Adult Psychiatric Morbidity in England 2007: results of a household survey*. The NHS Information Centre.

# Fuel related poverty and property characteristics in England

# 4

## 4.1 Purpose

The Adult Psychiatric Morbidity Survey (APMS) 2007 sample is representative of the population in terms of the housing characteristics of people living in England (see Appendix A and Appendix C, Tables 1.3 to 1.6 for comparisons with the Survey of English Housing and other national datasets). Weighting was applied to correct for any non-response and selection bias, including ensuring that lone adult households were not over-represented in the weighted dataset. This chapter explores how the prevalence of different markers of fuel related poverty varied with property characteristics and provides some context for the rest of the report.

The data discussed here are presented in Tables 4.1 to 4.20 in Appendix C.

## 4.2 Background

The Government definition of fuel poverty is where a household needs to spend more than 10% of its income on all domestic fuel use, including appliances, to heat the home to an adequate temperature. APMS 2007 was primarily a study of mental health and its risk factors: it was beyond the scope of the survey to collect the specific data required for the official measurement of fuel poverty, nor was it possible to measure actual expenditure on fuel or to take temperature readings in respondents' properties. Instead, we have used the information collected on APMS 2007 to adopt a consensual social marker approach to 'fuel related poverty', as proposed by Healy:

*'The absence of certain items regarded as essential household attributes (or socially perceived necessities) may be considered indicators of fuel poverty... a damp-free home ...and the presence of damp act as indicators of fuel poverty'.*

The indicators, or aspects, of fuel related poverty profiled in this chapter are:

- The inability to heat the home to a comfortable level in winter (sometimes referred to as thermal comfort),
- Presence of mould in the home (which can indicate damp conditions),
- Reduced fuel consumption due to worries about cost, and
- Problem debt and disconnection related to fuel use.

A summary variable based on meeting one or more of the above is also used.

This summary variable is used only in order to present the proportion of people experiencing at least one of these particular aspects of fuel related poverty and to provide context. However, caution should be used with respect to this measure because it is likely to overestimate the experience of fuel related poverty in the population (for instance, mould results from a variety of causes other than fuel related poverty reasons, such as inadequate ventilation).

In addition, to give a general indication of the quality of properties' insulation and heating, the following features were used:

- Extent of double or triple glazing, and
- Presence of a central heating system.

These may be viewed as risk factors for being in fuel related poverty rather than markers of it: for example, lack of double glazing may be common in wealthier conservation areas. However if income and other socio-economic factors were controlled for, lack of double glazing and central heating in a home would still be expected to be associated with a higher level of fuel poverty.

The characteristics of the property profiled in this chapter are:

- Age of the property (as estimated by the respondent),
- Type of dwelling (e.g. detached, semi-detached),
- Housing tenure (owner occupiers, social or private renters), and
- Population density of the area (whether urban, rural or suburban area).

This chapter, which seeks to identify what types of property are associated with a greater risk of fuel related poverty, also provides context for the subsequent chapters in this report.

## 4.3 Window glazing and central heating

While most people living in private households in England live in accommodation that has at least some windows' double or triple glazed and central heating that is working, our findings demonstrate that a substantial minority lack at least one of these. In particular, people living in flats or maisonettes, and those who privately rent their accommodation are most at risk of lacking these.

### 4.3.1 Window glazing

Window glazing is just one of a range of possible markers of the energy efficiency of a home. According to the Energy Saving Trust up to 20% of the heat lost from a home escapes from windows,<sup>2</sup> and double or triple glazing helps to retain warmth more efficiently than single glazed windows. Other forms of insulation - such as roof and wall cavity - might well have a greater overall impact of the thermal efficiency of a home. However in a survey reliant on self-report data, it was felt that presence of double or triple glazing was an easily recognisable measure on which more reliable data could be gathered, especially where the survey participant was not the head of the household (for instance, where younger adults are living at home with parents). Participants were asked if their home had any double or triple glazing, and if it did, on what proportion of windows.

**One person in nine (11%) lived in a property without any double or triple glazed windows.**

Not having any double or triple glazing was most common among those living in:

- Rural areas (where 13% of people live in properties without double glazing),
- The oldest properties (29% of people living in properties built before 1900),
- Flats and maisonette conversions (41%), and
- Privately (23%) and socially (20%) rented accommodation (see Figure 4.1).

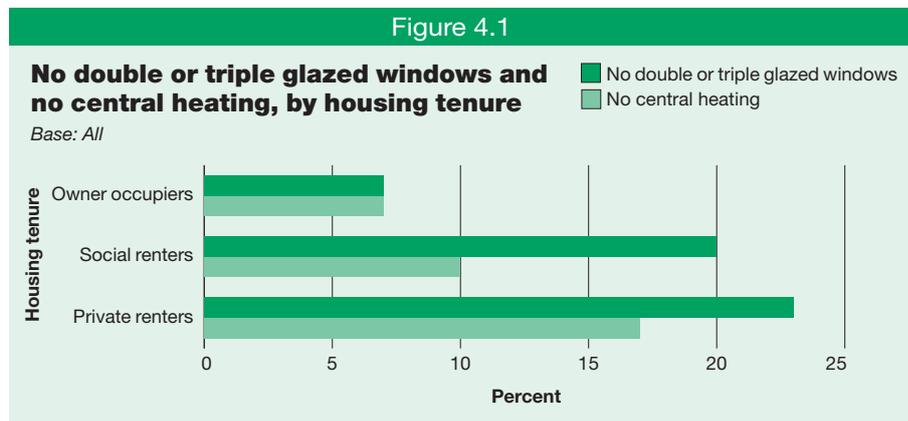
Those people most likely to have all their windows double or triple glazed were living in:

- Suburban (town and fringe) areas (where 81% of people live in properties with all windows doubled glazed),
- The newest properties (98% of people living in properties built after 2002),
- Detached (82%) and semi-detached (80%) properties, and
- Owner occupied homes (80%).

Tables 4.1 to 4.4

### 4.3.2 Central heating

Presence of central heating is one possible indicator of whether a household has an efficient heating system. It should be noted that central heating systems vary markedly and that a very small proportion of modern homes may be designed not to require a central heating system. However, as with double or triple window glazing, asking about this provided an easily recognisable and, therefore, a reliable measure for a self-report survey. It is not, however, the most accurate indication of whether a property has an efficient heating system.



**One person in eleven (9%) lived in a property without central heating.**

Having no central heating in the property was most common among those living in:

- Rural areas (where 14% of people live in a property with no central heating),
- The oldest (before 1900, 12%) and newest properties (since 1977, 11% to 12%),<sup>3</sup>
- Purpose built flats and maisonettes (23%), and
- Privately rented accommodation (17%) (see Figure 4.1).

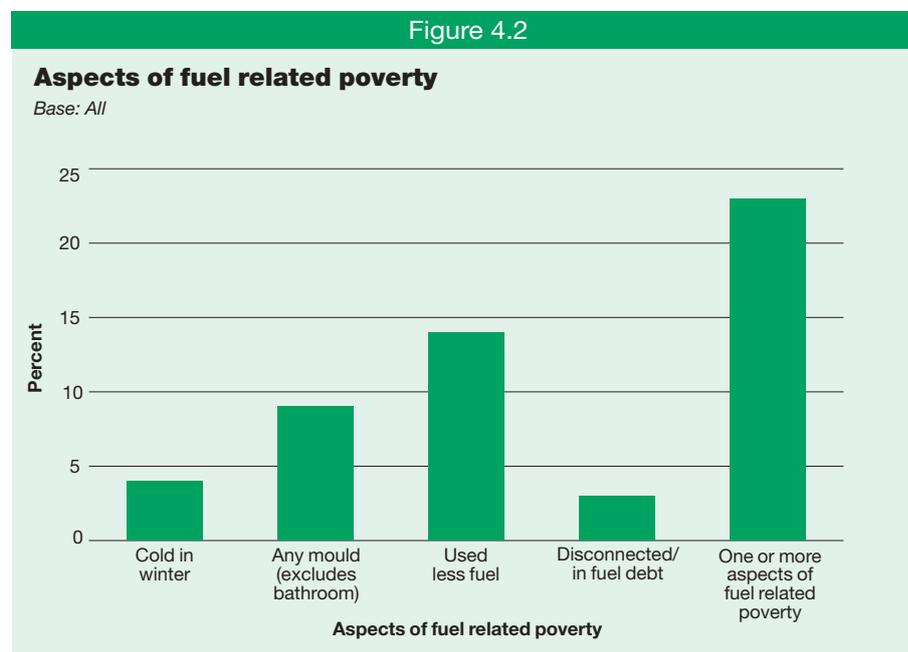
Whereas having central heating in the property was most common among those living in:

- Urban and suburban area (where 92% of people have central heating in their home),
- Properties built between 1900 and 1976 (93% to 94%),
- Detached (96%) and semi-detached houses (96%), and
- Owner occupied homes (93%).

Tables 4.5 to 4.8

**Overall, just 2% of people lived in a property with no double or triple glazed windows and no central heating at all. 7% of people had double or triple glazing only and 9% of people had central heating only.<sup>4</sup>**

Tables 4.9 to 4.12



## 4.4 Thermal comfort

Participants were asked whether they were able to keep their home warm enough in the winter, providing a very basic assessment of their self-perceived thermal comfort. As noted in Appendix A, likelihood of reporting being cold at home in winter was associated with the month of year in which the interview took place, with recall and recency effects leading to

increased reporting in the winter months. This is worth bearing in mind when making comparisons between different studies.

**Overall, 4% of people reported that they were unable to keep their home warm enough in winter (poor thermal comfort).**

Had interviewing taken place only in winter this figure would have been higher.

Of those who reported difficulties keeping their home warm in the winter: a third (33%) said all the rooms in their home were not warm enough; 39% said their living room was not warm enough; 29% said an adult's and 14% said the children's bedroom were not warm enough (multiple responses were allowed). Others cited the kitchen (25%) and/or bathroom (16%) as being too cold.

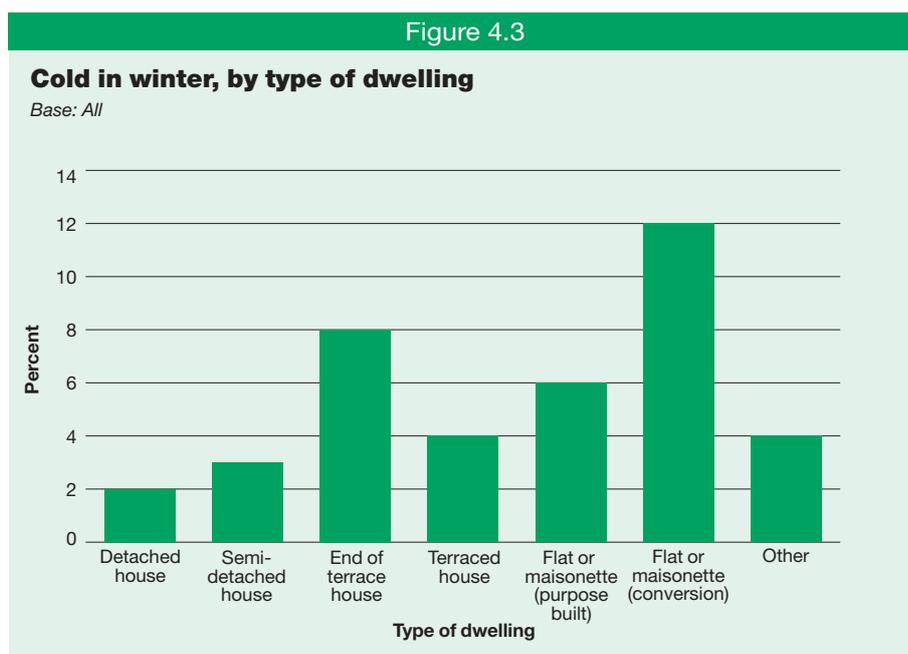
Table 4.20

**Furthermore, of those who said that they were unable to keep their home warm enough in winter, a quarter (25%) said that as a result they had felt reluctant to invite family and friends over.** This suggests that poor thermal comfort also has direct links with social isolation.

Tables 4.19

Rates of self-perceived poor thermal comfort were highest among those living in:

- Urban (4%) and rural (4%) areas,
- The oldest properties (8%),
- Converted flats and maisonettes (12%), and end of terrace houses (8%) (see Figure 4.3),
- Socially (10%) and privately (7%) rented accommodation,
- Properties with no double or triple glazed windows (11%), and
- Properties with no central heating (13%).



Self-reported poor thermal comfort was less common among people living in:

- Suburban areas (where 1% of people reported poor thermal comfort),
- The newest properties (2%),
- Detached (2%) or semi detached (3%) houses, and
- Owner occupied dwellings (2%).

Tables 4.13 to 4.18

## 4.5 Mould

The presence of damp in a house has also been identified as a marker of an energy inefficient home and an accessible indicator of fuel related poverty.<sup>1</sup> Damp is one of the main causes of mould in a house (other causes of mould include high humidity, inadequate ventilation, and inadequate heating). Mould spores are associated with numerous physical

health problems including asthma and allergies.<sup>5</sup> Mould is a sign of damp in a house that can be more readily identified by participants compared to other signs requiring professional expertise, therefore participants were asked if they had any mould in their home over the last 12 months and in which rooms the mould was present. From this it was possible to calculate the prevalence of mould in any room in the house (a more inclusive estimate) and the prevalence of mould excluding those who reported it only in the bathroom, shower room or toilet (a more conservative estimate).

**13% of people reported at least some mould in their home, and 9% of people reported mould in a room other than the bathroom.**

Of those who had any mould in their home: 4% said they had mould in every room in the property; 32% had mould in adults' bedrooms; 20% in the living room and 14% reported this as a problem in children's bedrooms (multiple responses were allowed). Others cited the kitchen (17%) and/or bathroom (16%) as having mould. **Tables 4.20**

Mould<sup>6</sup> in a room other than the bathroom was more likely to be reported by people living in:

- The oldest properties (where 14% of people reported mould),
- Flat and maisonette conversions (17%), end of terrace (12%), terraced houses (11%), and purpose built flats and maisonettes (12%),
- Privately rented (15%) and socially rented (13%) accommodation,
- Properties with no double or triple glazed windows (15%), and
- Properties with no central heating (14%).

Lowest rates of mould were reported by those living in:

- The newest properties (9%),
- Detached (7%) and semi detached houses (8%), and
- Properties owned by the occupants (7%).

**Tables 4.13 to 4.18**

## 4.6 Fuel usage and debt

Recent research identifies debt as a greater risk factor for the stresses of financial strain than low income.<sup>7</sup> APMS included questions about various aspects of fuel related debt pressures: reduced fuel consumption due to worries about cost, problem fuel debt (that is, being seriously behind in paying in the time allowed for electricity, gas or other fuel), and being disconnected for electricity, gas or other fuel in the past year. The latter two variables were combined into an overall measure of fuel debt/disconnection.

**14% of people reported that they had used less electricity, gas or other fuel than needed in the past year, due to worries about cost.**

Cutting back on fuel usage due to cost worries was more likely among those living in:

- Urban areas (where 16% of people used less fuel than needed),
- Purpose built flats and maisonettes (22%), terraced (18%) and end of terrace (17%) houses, and flat and maisonette conversions (16%), and
- Socially (7%) and privately (5%) rented accommodation.

Reduced fuel consumption due to cost worries was less common among people living in:

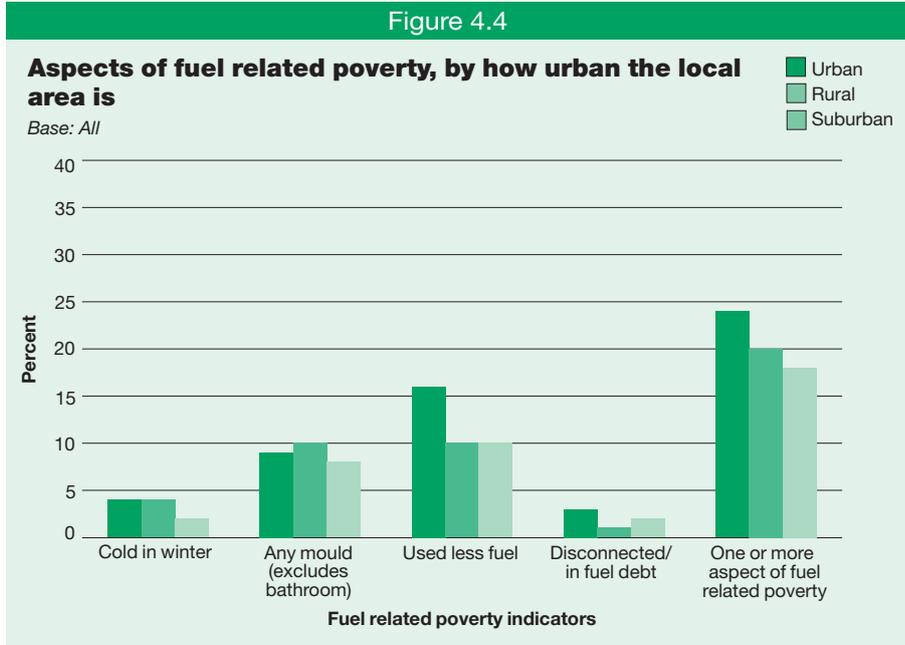
- Suburban and rural areas (both 10%),
- The newest houses (10%),
- Detached houses (9%) and other types of dwellings (5%), and
- Owner occupied homes (1%).

**Overall, 3% of people reported having been disconnected and/or experienced problem debt in the past year in relation to their gas, electricity or other fuel supplier.**

Rates of disconnection and/or fuel debt were highest among those living in:

- Purpose built flats and maisonettes (7%), and
- Socially (7%) and privately (7%) rented accommodation.<sup>1</sup>

Figure 4.4

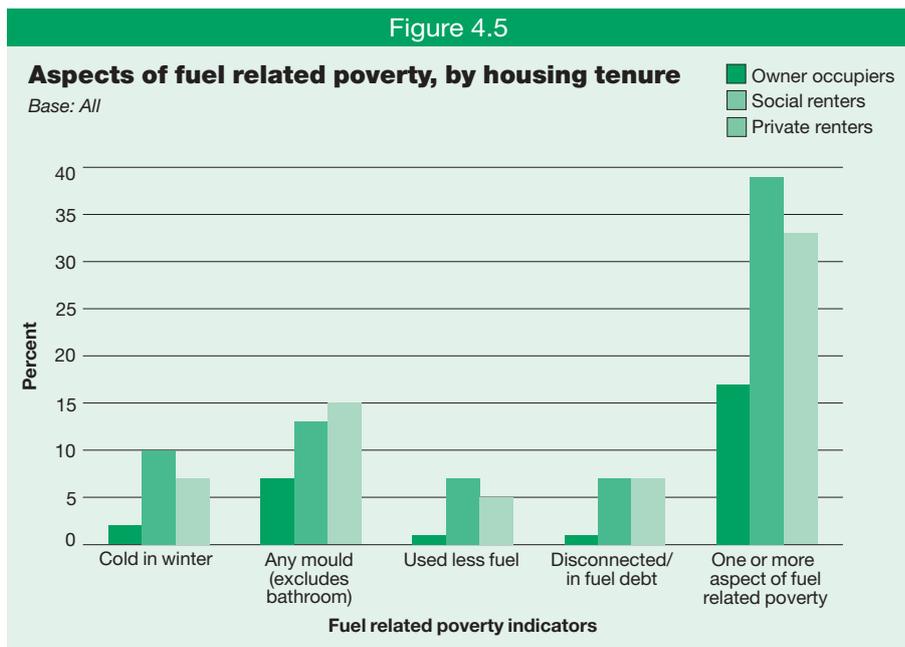


Fuel disconnection and/or debt was least common among those living in:

- detached (1%) and semi-detached houses (2%), and
- owner occupied accommodation (1%).

Tables 4.13 to 4.18

Figure 4.5



## 4.7 At least one of these aspects of fuel related poverty

Living in a cold home, the presence of mould in the home (other than bathroom, shower room or toilet), using less fuel than needed and being in fuel debt/disconnected were combined into a single variable to identify everyone exposed to at least one of these aspects of possible fuel related poverty.

**Overall, 23% of people reported experiencing at least one aspect of fuel related poverty consisting of 17% experiencing only one indicator, 6% with two or three, and less than 0.5% with all four (data not shown).**

## 4.8 Discussion

In this study, about one person in fifty was identified as currently living in a home with no double window glazing and no central heating: about one in six lacked at least one of these and one in ten had mould. About one person in 20 reported poor thermal comfort in the winter months, and one in seven used less fuel than they needed to in the past year due to cost concerns. Overall, a quarter of people experienced one or more of these fuel related adverse circumstances.

This chapter demonstrates that certain types of housing environment are particularly associated with these indicators of fuel related poverty. Clearly, a factor explaining many of these associations is the fact that housing environment is associated with socio-economic status; for example on average people living in flats have a lower income than those living in houses. However profiling which does not control for confounding factors is still necessary in order to understand the composition of the affected population. Risk factors are examined in isolation, using regression modelling which controls for confounding variables, in subsequent chapters of this report.

People living in flats tend to fare worse than those living in other types of dwelling. The aspects of fuel related poverty associated with living in a flat varied with whether the flat was purpose built or a conversion. People living in conversions were worse off in terms of thermal efficiency, thermal comfort and mould, whereas those in purpose built flats and maisonettes were more likely to experience problem fuel debt and restrict their fuel usage, measures more closely linked to financial strain.

Associations between aspects of fuel related poverty and housing tenure have been observed elsewhere.<sup>8</sup> The lack of enforcement of regulations for landlords to provide a minimum standard of private rented accommodation means that tenants may live in sub-standard conditions, particularly in areas where housing quality is already poor. Furthermore, those who are renting privately may be less inclined or able to invest in improving the efficiency of a property that they are renting, and higher rates of mould may be a result of inefficient heating and insulation. For landlords there is little incentive to invest in such measures when tenants are responsible for their own energy bills, despite the possibility that long-term maintenance problems may result.

Providers of social housing have requirements to meet minimum standards, and so problems relating to insulation and heating inefficiencies and mould should be less apparent among this group, despite the likelihood of having lower incomes. However, social renters' lower income is evident in the high proportion cutting back on fuel usage and in being more likely to report living in a cold home. This study confirms that while private renters were more likely to have single window glazing, no central heating and mould, those in socially rented homes were more likely to have poor thermal comfort, cut back on fuel usage and be in debt/disconnected. Recent initiatives have sought to provide extra funds to insulate social homes in certain regions, which may go some way towards improving the poorer levels of thermal comfort and reduced fuel usage evident in this group.<sup>9</sup>

Previous work has identified owner occupiers as also at risk of fuel related poverty.<sup>10</sup> Our analysis suggests that, for all the indicators of fuel related poverty used in this project, owner occupiers were consistently better off than people who rented their accommodation.

Other studies have also identified people living in rural areas to be at increased risk of fuel related poverty,<sup>11</sup> although it has been found that urban dwellers are at increased risk of mould.<sup>10</sup> According to this analysis those in rural areas may be at increased risk for some aspects of fuel related poverty (such as less efficient housing) but those in urban areas might have an equal or higher risk for other aspects (such as poor thermal comfort and cutting back on fuel). In addition, no significant difference between urban and rural areas were found for presence of mould, although rates were lower in town and fringe (suburban) areas.

Some of the variation by whether the area was urban, rural, or suburban could partly be explained by the average age of properties in each area, plus restrictions placed on those

living in conservation districts. Our findings support the associations reported elsewhere<sup>12,13</sup> that older homes tend to be less thermally efficient, and are more likely to have poor thermal comfort and mould.

As mentioned earlier, observed relationships, such as those presented in this chapter, describe the proportions experiencing the aspects of fuel related poverty captured by our specific measures of convenience. These are useful for understanding the extent of a problem in society. It is important to note some of the observations reported in this chapter are likely to be an artefact of more complex interactions with extraneous variables (such as income and social economic status). To explore the relationship between different covariates whilst controlling for confounding factors requires multivariate analyses, which are undertaken in Chapters 6, 7 and 8.

This chapter demonstrates some of the benefits of using a consensual indicator approach in helping to explore different aspects of fuel related poverty and associations that might be missed by methods based on income or other characteristics alone. The indicators used in this chapter are based on peoples' subjective reports as opposed to objective (yet perhaps arbitrary) definitions and thresholds of income and expenditure. Such an approach is useful in attempting to identify the multifactorial nature of fuel related poverty as defined by people's social experience. However, limitations have been identified with such an approach particularly relating to the margin of error associated with individuals' assessments regarding their personal circumstances.<sup>1</sup>

Nevertheless the findings presented in this chapter offer support to the notion that fuel related poverty is a problem for a substantial minority of the population and that it is more common among people living in certain types of housing environment.

## References and notes

- 1 Healy JD (2004). *Housing, fuel poverty and health. A Pan-European Analysis*. Ashgate.
- 2 <http://www.energysavingtrust.org.uk/Energy-saving-products/Glazing>, accessed 24.02.09
- 3 Although the finding that 11% of the newest properties did not have central heating, may seem counter intuitive, the definitions used might neglect the impact of likely improved insulation techniques such as filled cavity walls, and also may reflect use of alternative but efficient heating methods.
- 4 The window glazing and central heating variable were combined to provide an scale of the properties insulation and heating conditions according to the presence of any double or triple glazed windows, and any central heating system. This produced the following four-point scale indicating;
  - Households with both double or triple glazed windows and central heating,
  - Households with double or triple glazed windows only (and no central heating),
  - Households with central heating only (and no double or triple glazed windows), and
  - Households without double or triple glazed windows and central heating.
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## 5.1 Purpose

This short chapter explores who is fuel poor by looking at the prevalence of different aspects of fuel related poverty by household composition.

The data discussed here is presented in Tables 5.1 to 5.4 in Appendix C.

## 5.2 Background

National Energy Action (NEA) has highlighted that the impact of soaring fuel prices is felt most by particular types of household; focusing on the vulnerability of older people and families with children:<sup>1</sup>

*‘For those who are very vulnerable – older people, families with young children – they are feeling the cold weather particularly hard and their energy bills have gone up since last January by an average £360. We recommend the winter fuel payment be extended to the 1.6 m families with children.’<sup>2</sup>*

This chapter presents the prevalence of the different aspects of fuel related poverty outlined in Chapter 4, by family and household composition characteristics.

Household type was classified into seven categories depending on the number and ages of the occupants:

- One adult (16-59), no children,
- Two adults (16-59), no children,
- Small families (one or two adults and one or two children),
- Large families (one or more adults and three or more children, or three or more adults and two children),
- Large adult households (three or more adults and one child, or three or more adults and no children),
- Two adults, one or both aged 60+, no children, and
- One adult, aged 60+, no children.

Households were also classified into those with or without children, as follows:

- One adult and child(ren) present (usually a lone parent household),
- Two or more adults and child(ren) present (usually, but not always, two parent households), and
- No children present in the household.

Analysis was also undertaken looking at whether the aspects of fuel related poverty experienced by men and women are different. Fuel poverty is determined at a household level, so both the sex of the respondent and sex of the household reference person were considered. The household reference person is the resident in who’s name the property is owned or rented, or in the case of joint responsibility, the one with the higher income. It is a current way of identifying the equivalent of the ‘head of household’.

## 5.3 Results

### 5.3.1 Cold home

Rates of poor thermal comfort were highest among lone adults aged 16-59 (7%) and small and large families (both 6%), and least prevalent among older adult couples (2%). Higher rates were found among households with a lone adult and children (10%), compared with those with two adults and children or no children (4% for both). **Tables 5.1 and 5.2**

### 5.3.2 Mould

Mould was most common among large families (18%) and small families (12%) and least common in older adult households (5% for couples, 3% for those living alone). Rates for one adult and two adult households with children were the same (both 13%), and higher than found for households with no children (7%). **Table 5.1 and 5.2**

### 5.3.3 Fuel usage and problem debt

Younger adults living alone were most likely to be using less domestic fuel due to worries about cost (24%) and to be disconnected/ in fuel debt (8%), whereas older adult couples were least likely to experience this (10% used less fuel and 0% were disconnected/ in fuel related debt).

Households with children and one adult were far more likely to report using less fuel than needed due to worries about cost (23%, compared with 15% with at least two adults and children and 14% with no children). They were also more likely to be disconnected/have fuel related debt: 9% of households with children and a single adult had compared with 3% for both those with at least two adults and children, and those with no children. **Table 5.1 and 5.2**

### 5.3.4 Aspects of fuel related poverty by sex

Overall, women were slightly more likely than men to report using less fuel than needed due to concerns about cost and to report being unable to keep the home warm enough in winter. However when this analysis was repeated based only on the sex of the household reference person (i.e. the person with responsibility for the property, or where the property is owned/rented jointly, the one with the higher income), the association with sex became stronger. 20% of female heads of household reported using less fuel, compared with 14% of male heads of household. **Tables 5.3 and 5.4**

## 5.4 Discussion

These findings suggest that younger adults living alone (possibly in under occupancy) and families (particularly those headed by one adult and/or by a woman) are more likely than other types of households to experience most of the aspects of fuel related poverty measured in this study. Mould was strongly associated with presence of children in a household, but not with being an adult living alone. Lone parent households have been identified as an at risk group in previous research in this area.<sup>3</sup> Furthermore because the association with sex is even stronger for households headed by a woman, it is unlikely that this findings is an artefact of women being simply more likely to report negative circumstances compared with men. Instead it may reflect the overall socio-economic disadvantage (and lower incomes) of those households headed by women. Further work is needed to clarify these associations with sex.

The lower rates found among older adults are noteworthy, and these may well be an artefact of the subjective nature of some of the measures used. For instance, while older people are generally less likely to have any debt, they may also have different expectations with regards heating the home. Furthermore, it is likely that had an approach to measurement based on income and expenditure been used, this would have shown a different association with age. Because older adults tend to have a fixed income, the proportion needing to be spent on

heating the home during a time of rising prices would increase. Our findings are also compounded by the under representation of the poorest elderly in household surveys. Many of the most deprived older people will reside in care or residential homes, whereas those in private households may be the more affluent and better supported healthy survivors. The analysis also revealed that older couples fare better than older people living alone, although this may partly be explained by the fact that older people living alone are more likely to be women. It should also be acknowledged that the adverse impacts of being in fuel poverty, such as poor health and social isolation, are likely to be greatest among those in the oldest age group, as well as in those with more than one child. The findings relating to older adults would also benefit from further exploration.

These findings do lend support to the notion that families with children, in particular families headed by a lone adult or a woman, are at increased risk of experiencing fuel related poverty and it is right that they should be a major focus for policy.

### References and notes

- 1 Bradshaw, J. (2009). Who is fuel poor? *Poverty*, 131: 9-11.
- 2 Jenny Saunders chief exec of NEA:BBC News 10/1/2009: Warning of fuel poverty failure.
- 3 Barnes M, Butt S, Tomaszewski W (2008). *The Dynamic of Bad Housing: the impact of bad housing on the living standards of children*, eaga Charitable Trust.

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# Types of poverty: a latent class analysis

# 6

## 6.1 Purpose

Fuel poverty does not occur in isolation and may be experienced alongside other aspects of financial hardship or deprivation. This chapter asks how various indicators of poverty, including fuel related poverty, fit together in the population.

Using eleven indicators of poverty and financial strain (covering household income, problem debt, receipt of benefits, and housing tenure and conditions) we used latent class analysis to identify clusters of people according to the profile of their financial and housing situation. We describe the characteristics of each cluster and identify the key dimensions by which the clusters differ from each other.

For the data referred to in this chapter, see Tables 6.1 and 6.2 in Appendix C.

## 6.2 Background

Poverty can be measured in many ways, and different methods of measurement will capture different aspects of poverty. There are more than 100 statistical indicators of poverty available from British national surveys and other data sources.<sup>1</sup> Which indicators are used will impact on the profile of people who are 'poor' that is produced, and potentially who is targeted by policy.

Society is not simply made up of people 'in poverty' and those 'not in poverty'. People experience different dimensions of poverty at different stages in their lives, and they respond to situations of financial strain in different ways. Different individuals and households also vary in terms of financial management skills and attitudes towards expenditure.

In this chapter the ways in which various indicators of fuel poverty might fit into this complex picture are examined. Fuel poverty is difficult to measure and sometimes proxy indicators, such as living in a cold home, being on a low income, or being in fuel debt, may need to be used. However there are consequences to focusing on one indicator of fuel poverty rather than another. Not everyone on a low income experiences fuel poverty, or experiences it in the same way, and fuel poverty can also be experienced by people on higher incomes (for example, where expenditure on fuel needs to exceed 10% due to low occupancy and inefficient heating and insulation).<sup>2</sup>

The Adult Psychiatric Morbidity Survey (APMS) 2007 provides a unique opportunity to profile the varying degrees and nature of different types of poverty experience, and to gauge how fuel poverty indicators fit into this structure.

## 6.3 Our approach

### 6.3.1 Latent class analysis

The approach used in this chapter is latent class analyses (LCA). LCA is a statistical technique for finding subtypes of related cases (or latent classes) from multiple categorical

data. Using LCA it is possible to see if the sample of APMS 2007 participants can be grouped into meaningful subtypes according to the eleven measures of fuel poverty and financial strain.

The eleven measures used were:

- Being in the lowest equivalised household income quintile (annual income of less than £10, 575),<sup>3</sup>
- Being in receipt of any benefits,<sup>4</sup>
- Having any mould in the property,
- Being unemployed,
- Experiencing a major financial crisis in last 6 months,<sup>5</sup>
- Reporting problem debt with the electricity, gas or other fuel supplier,
- Being disconnected for gas, electricity or other fuel,
- Reporting any other (non-fuel related) problem debt,
- Being unable to keep home warm enough in winter,
- Using less gas, electricity or other fuel than needed due to worry about cost, and
- Having borrowed money from a pawnbroker, moneylender, family or friends.

Deciding on the final cluster solution is an iterative process and open to different interpretations, therefore a detailed account of LCA and how it was used is provided in Appendix B and Appendix C Table 6.1.

### 6.3.2 Logistic regression

The final clusters and possible predictors of class membership were explored by constructing logistic regression models. This approach is advantageous in that it allows each factor to be considered separately by controlling for the effects of other, sometimes related, factors. The model allows for an evaluation of the strength of the relationship between each variable and class membership. The model identifies associations, not causes; in other words, factors which identify people with an increased or decreased risk of being in a particular latent class.<sup>6</sup>

The variables included in the regression model were:

- Sex,
- Age,
- Ethnicity,
- Marital status,
- Household composition,
- Urban/rural area,
- Highest educational qualification,
- Month of interview,
- Government Office Region,
- Housing tenure, and
- Index of Multiple Deprivation (IMD).<sup>7</sup>

Only significant associations are discussed in the text. Further information on the logistic regression method is provided in Appendix A and Appendix C Table 6.2.

## 6.4 Results

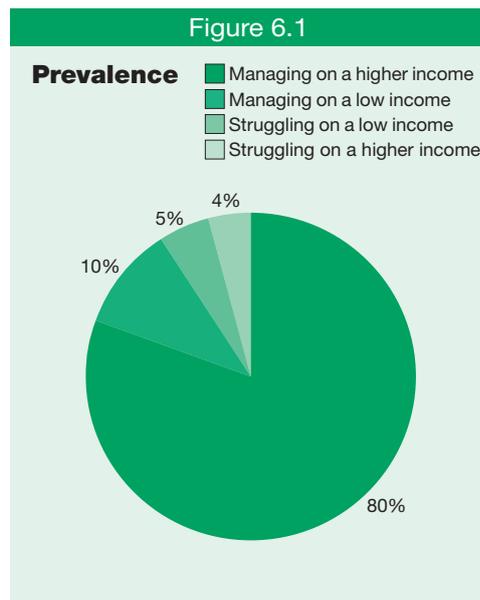
### 6.4.1 Prevalence of the clusters

We found four distinct clusters of people, which we have labelled as:

- ‘Managing on a higher income’,
- ‘Managing on a low income’,
- ‘Struggling on a low income’, and
- ‘Struggling on a higher income’.

The overwhelming majority of participants formed the ‘managing on a higher income’

cluster (80%). 10% of participants were assigned to the ‘managing on a low income’ cluster, 5% to the ‘struggling on a low income’ group and 4% to the ‘struggling on a higher income’ group.



## 6.4.2 Description of the clusters

### *Managing on a higher income*

**This group was called ‘managing on a higher income’ because people assigned by the analysis programme to it tended to experience few financial strains and were unlikely to be in the very lowest income quintile.**

Nearly all of the people (91%) assigned to this cluster had an annual household income in excess of £10,575, and less than a fifth (17%) were in receipt of any means tested state benefits. Their income level could still be very low, but that was rare.

None of these people were seriously behind in paying for gas, electricity or other fuel bills, and nearly all (99%) had no other problem debt. Only 6% had used less fuel than they needed due to worry about cost. Nearly all of these people had not borrowed any money in the last year from pawnbrokers, moneylenders, family or friends (97%) and financial crisis in the last 6 months was rare (only 1% had experienced this).

Just 1% reported being unable to keep their home warm enough in winter and 11% reported having mould in their home.

**Table 6.1**

Multivariate logistic regression analysis showed that cluster membership was independently associated with sex, age, ethnicity, marital status, local area population density, education, housing tenure and IMD.

Those with increased odds of being assigned to the managing on a higher income cluster were:

- Male,
- Older,
- White,
- Married,
- With no children aged under 16 living in the property,
- Living a rural area (village, hamlet and isolated dwellings),
- Educated to a degree level,
- Owner-occupiers, and
- Living in an area classed as least deprived according to the IMD quintile.

**Table 6.2**

The rest of the population was found to divide into three subgroups, each characterised by a distinct pattern according to the eleven socio-economic variables and each could be considered to represent a different manifestation of financial strain.

### **Managing on a low income**

**This group was labelled ‘managing on a low income’ because almost everyone assigned to this cluster had a very low level of household income, but also had low levels of problem debt and borrowing. They are considered to be managing only in a financial sense: they were still vulnerable to the impact of fuel related poverty and a proportion seemed to ‘manage’ their fuel consumption by using less than they needed due to worries about cost.**

Most of the people (72%) assigned to this cluster had an annual household income of less than £10,575, and nearly all (92%) received means tested state benefits.<sup>4</sup>

The majority had not borrowed money from a pawnbrokers, moneylenders, family or friends (93%) or experienced a major financial crisis in the past year (99%).

Less than 0.5% were seriously behind in paying for gas, electricity or other fuel bills, and nearly all had no other problem debts (1%).

However, a third (34%) had used less fuel than they needed due to worry about cost, a fifth (19%) reported being unable to keep their home warm enough and a fifth (20%) had mould in their home.

**Table 6.1**

Multivariate logistic regression analysis showed membership of this cluster was independently associated with sex, age, ethnicity, marital status, local area population density, education, housing tenure and IMD.

Those with increased odds of being in the managing on a low income group were:

- Female,
- Aged over 24 (particularly 45-64),
- Single, divorced or separated,
- South Asian,
- Lone adults with child/children in the household,
- Educated to A-Level standard or less,
- Renters (particularly social renters), and
- Living in areas classed as more deprived (according to IMD).

**Table 6.2**

### **Struggling on a low income**

**The people assigned to this cluster had very low levels of income coupled with multiple markers of financial hardship. Problem debt and fuel poverty was heavily evident in this group.**

Nearly all (96%) had an annual household income of less than £10,575 and most were in receipt of benefits (87%).

This group had the highest rate of major financial crisis (9% in the last 6 months).

Two-thirds (66%) had borrowed money in the last year from pawnbrokers, moneylenders, family or friends.

A quarter (28%) were seriously behind with electricity, gas or other fuel bills, and three quarters (78%) were seriously behind with other types of debts. Half (51%) had used less fuel due to worry about cost.

A third (30%) reported being unable to keep the home warm enough and a third (33%) reported having mould in their home.

**Table 6.1**

Multivariate logistic regression analysis showed membership of the struggling on a low income group to be independently associated with age, marital status, lone parent status, education, and housing tenure.

Those with increased odds of being assigned to this group were:

- The youngest (aged 16-24),
- Divorced or separated,
- Lone adults with children,
- Without qualifications,
- Renters (particularly social renters), and
- Living in areas classed in the most deprived IMD quintile (although this was not quite significant overall).

Table 6.2

### **Struggling on a higher income**

**People in this cluster were unlikely to be in the very lowest income quintile but still experienced financial strain, particularly problem debt but also some aspects of fuel related poverty.**

All people in this cluster had an annual household income of at least £10,575 and about half (47%) received benefits.

A third (30%) were seriously behind with electricity, gas or other fuel bills, and the majority (78%) were seriously behind with other debts.

This group had the second highest rate of major financial crisis (4%) and of borrowing money in the last year from pawnbrokers, moneylenders, family or friends (61%).

Half (49%) used less fuel due to worry about cost. 12% reported being unable to keep their home warm enough and a third (31%) reported having mould in their home.

Table 6.1

There was a less homogenous demographic profile for this group than for the other three clusters, suggesting that people with a wide range of socio-demographic characteristics are vulnerable to slipping into debt related problems. Multivariate logistic regression analysis showed that membership of this struggling on a higher income group was only independently associated with age and housing tenure.

Those with increased odds of being assigned to this group were;

- The youngest (aged 16-24), and
- Either social or private renters.

Table 6.2

## **6.5 Discussion**

Four distinct groups of people emerged from the latent class analysis of the eleven indicators of poverty and financial strain: those who were 'managing on a higher income' (with a relatively higher income and no debt); those who were financially 'managing on a low income' (very low income but no problem debt); and two groups who were 'struggling'. Strugglers divided into those on a very low income with high reliance on benefits and those with a relatively higher income.

Both groups of strugglers experienced very high levels of problem debt and borrowing. Both groups of strugglers also reported high rates of using less fuel than needed, having mould in the home, and specifically of being in fuel debt. However people who were managing on low incomes, who avoided getting into fuel debt, did experience other aspects of fuel related poverty. A third of this group reduced their use of fuel due to cost worries, and a fifth live in cold housing or housing with mould (possibly in part as a result of restricting usage of fuel to heat the home).

The members of the managing groups tended to be older than the strugglers. The findings support previous research which has found older people tend to be more financially risk adverse generally and have less problem debt specifically.<sup>8,9</sup> This may in part be to do with better household and financial management skills. It may also reflect a greater inclination to reduce heating, an outcome only partly reflected in our data due to the impact of different expectations around what constitutes heating sufficiency.

The approach adopted in this chapter helps to unravel the complex associations between income, financial hardship, fuel related poverty and problem debt.

Using low household income as a proxy indicator for fuel poverty would capture those ‘low income managers’ and the ‘low income strugglers’, but the ‘higher income strugglers’ would be excluded. Plus some people who are ‘managing on a lower income’ would be inappropriately included in such a measure.

Likewise, using ‘being in fuel debt’ as a proxy indicator of fuel poverty would capture the strugglers, but exclude those who are *financially* managing on a very low income while suffering other social and physical consequences of fuel poverty. In particular, older people who may be experiencing fuel poverty have a higher likelihood of being neglected using such an approach.

This chapter has demonstrated that while there is an array of poverty indicators available, there is scope for clustering these to produce a much smaller number of distinct groups of people in poverty. However, these groups still differ in various ways. Over-simplifying the proxy measurement of fuel poverty could lead to the exclusion of distinct and non-random component groups of those affected.

Previous research has identified change in financial circumstance as a key predictor of problem debt, suggesting indebtedness often reflects necessity not lack of financial capability.<sup>10</sup> However, whilst not explicitly testing this hypothesis the findings presented in this chapter suggest that while members of the two ‘struggling’ groups did experience high levels of financial crisis, the proportions experiencing this were relatively small suggesting that other factors may be more important.

This chapter presents some findings with important policy implications. We found that those on a low income but managing were vulnerable to particular aspects of fuel poverty, such as reducing fuel use due to financial worries and living in a cold home. This group tended to be older, so perhaps more targeted encouragement is required to give this group ‘permission’ to spend their winter fuel payment on heating their home and ensure income maximisation (for instance making sure they are claiming all the benefits and allowances that they are entitled to). Because this group tended to be older, communications formats found acceptable to older age groups should be utilised.

There was a very strong association between being a low income struggler and a lone parent living with children. This cluster was characterised by the highest rates of financial crises and borrowing from unreliable and ad hoc sources (such as pawn brokers and unofficial moneylenders). This context may imply that emergency support may often be needed at short notice and that income maximisation (for instance making sure they are claiming all the benefits and allowances they are entitled to) should be a focus. Given the very low rates of education and the high rates of unemployment associated with membership of this group, employment related training and support might also be required if the longer term housing characteristics of the group are to be sustained. They may also benefit from being helped to access services to further develop their financial planning skills to help with getting the most from their very low income, as well as encouragement to heat their home.

Due to their profile, (that is, not being in the very lowest income quintile and generally being younger) the higher income strugglers were generally less likely to be eligible for benefits or allowances (such as a Warm Front grant). It is likely that this group struggle to balance their monthly out-going payments and in-coming wages/salary. Due to their relatively higher – although potentially still low – income this group may anticipate difficulties accessing services and financial help if they perceive these to be targeted at those on a lower income. Interventions should be marketed to ensure eligibility is clear.

## References and notes

- 1 See: <http://www.poverty.org.uk/>.
- 2 Palmer G, McInnes T & Kenway P (2008). *Cold and poor: An analysis of the link between fuel poverty and low income*. New Policy Institute.
- 3 It should be noted that this figure is also very close to the often used definition of poverty, having an income 60% below the national median.
- 4 Excluding maternity or state pensions.
- 5 Includes: being sacked or made redundant, looking for work without success for more than one month, major financial crisis like losing three months of income.
- 6 Analyses are presented in Table 6.2 and Figures 6.2 and 6.3. Variations in risk are expressed as odds ratios and expressed as relative to a reference category, which is given a value of 1. Odd ratios greater than 1 indicate higher odds (increased risk), and odds ratios less than 1 indicate lower odds (reduced risk). Also shown are 95% CI for the odds ratio. Where the interval does not include 1, this category is significantly different from the reference category.
- 7 IMD is a measure of multiple deprivation at the small area level. For this analysis we divided IMD score into quintiles, see: <http://www.communities.gov.uk/archived/general-content/communities/indices/indicesofdeprivation/216309/>
- 8 Paison A (1996). Does the degree of relative risk aversion vary with household characteristics? *Journal of Economic Psychology*, 17(6): 771-787.
- 9 Kempton E, McKay S & Willitts M (2004). *Characteristics of families in debt and the nature of indebtedness*. Corporate Document Services.
- 10 McKay S (2005). Envy. Debt: envy, penury or necessity? In Stewart, I. & Vaitilingam, R. (ed.) *Seven Deadly Sins. A new look at society through an old lens*. ESRC.

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# Fuel related poverty and common mental disorder

# 7

## 7.1 Purpose

This chapter explores to what extent various aspects of fuel related poverty are associated with poor mental health, specifically presence of common mental disorders (CMDs) such as anxiety and depression.

The Adult Psychiatric Morbidity Survey (APMS) 2007 used a standardised structured interview to establish presence of CMD in the past week. The authors are not aware of other research which has utilised a comprehensive measure of mental health in relation to fuel related poverty in a large general population sample. This study provides a measure of common mental disorder that includes both depression and anxiety related disorders. It also incorporates a severity score that indicates whether or not a case is likely to be amenable to treatment, thereby identifying the population of greatest public health and service use relevance. Other studies have tended to use generalised screens for depressive or non-specific symptoms that establish emotional or psychological distress rather than diagnostic disorders.

See Tables 7.1 and 7.2 in Appendix C for the data referred to in this chapter.

## 7.2 Background

### *Fuel poverty and poor mental health: what is known?*

While there is an established evidence base for the link between poor physical health and fuel poverty, there is a lack of robust research exploring fuel poverty's associations with poor mental health.<sup>1,2</sup>

The associations between poverty in general and poor mental health are long established and well documented.<sup>3,4,5</sup> Most recently, problem debt has been identified as associated with both income level and mental disorder, and found to account for much of the association between the two.<sup>6</sup>

Aspects of the housing environment that have been associated with poor mental health include dwelling type (with those in single family dwellings generally doing better than those in multiple-unit dwellings, such as blocks of flats),<sup>7</sup> and tenure (with owner-occupiers doing better than renters).<sup>8</sup> Some research has looked specifically at living in cold and damp housing conditions.<sup>9,10,11</sup> The Riveria Housing and Health Survey in Devon, a study funded by the eaga Charitable Trust, found associations between poor housing - including mould and cold conditions - and mental health and wellbeing.<sup>12</sup> However, this and similar studies used general assessments of psychological distress such as the General Health Questionnaire (GHQ) 30<sup>9,10</sup> or GHQ12<sup>12</sup>. Another study of eight European (non UK) cities found that damp and mould were associated with four depressive symptoms (sleep disturbance, decreased interest in activities, low self-esteem and decreased appetite) but used only a short screen for depressive symptoms.<sup>13</sup> Furthermore, it did not explore what other aspects of fuel related poverty may be associated with poor mental health.

Existing research in this area, therefore, has encountered two main limitations with its measure of mental health:

- Firstly, general health screens are unable to discriminate between people with a clinically significant level of neurotic symptoms (likely to warrant treatment and therefore of key policy interest) and those experiencing some general emotional or psychological distress. They have also tended to focus on one domain of mental health, such as symptoms of depression, and not other disorders. There is some evidence that socioeconomic factors are associated with type of disorder, so focusing on depression and excluding anxiety may bias the socio-economic profile of the results.
- Secondly, people from more socially disadvantaged groups have been found to under-report stigmatised psychiatric symptoms compared with people of higher socioeconomic status.<sup>14</sup> This affects generalised screens more than structured assessments of mental disorder.<sup>15</sup>

### Common mental disorder (CMD)

Common mental disorder (CMD) comprises of different types of depression and anxiety which impair emotional and physical well-being and behaviour, and frequently co-exist. These disorders not only result in considerable distress for the individual with the condition, but can also affect their family, friends, and working life. CMD presents a substantial public health and economic cost. It accounts for one-fifth of all general practice consultations and one-third of days lost from work due to poor health in the UK.<sup>16,17</sup>

APMS estimated that in 2007, 16.2% of adults in England had one or more CMD in the week prior to interview. Reducing the prevalence of these disorders is a key public health priority.<sup>18</sup> The focus of this chapter is on CMD rather than other rarer types of mental disorder (such as psychoses and personality disorder) because of the wider reaching policy implications in relation to fuel poverty.

## 7.3 Our approach

### Clinical Interview Schedule-Revised

CMD was assessed using the Clinical Interview Schedule - Revised (CIS-R)<sup>19</sup> to ICD-10 diagnostic criteria (International Classification of Disease, World Health Organisation, 1990). It takes between 15 and 30 minutes to complete and includes 14 sections, each on a different neurotic symptom.

An overview of the CIS-R and the disorders that it can diagnose is provided in Figure 7A. (For more detail about CMD and how the CIS-R is scored, see the main survey report).<sup>22</sup>

Figure 7A

#### An overview of revised Clinical Interview Schedule (CIS-R)

The CIS-R:

- Is interviewer administered
- Covers non-psychotic symptoms in the week prior to interview
- Categorises symptoms into 6 types of CMD:
  - Generalised anxiety disorder,
  - Depressive episode,
  - Phobia,
  - Obsessive compulsive disorder,
  - Panic disorder, and
  - Mixed anxiety and depression.

### Statistical approach

Associations between aspects of fuel related poverty<sup>20</sup> and CMD were explored for men, women and all adults. There were no significant interactions by sex (i.e. the patterns of

association were the same for men and women), so the findings discussed here relate to the total sample combined. Associations are age-standardised to allow for comparisons between groups after adjusting for the effects of differences in their age distributions. Table 7.1 in Appendix C presents the detailed results.

Multivariate logistic regression models were also used to examine the associations between CMD and the aspects of fuel related poverty after adjusting for each other and other variables that might be associated with CMD.

The model identifies associations, not causes, that is, factors which identify people with an increased or decreased risk of having CMD. These variations in risk are expressed as odds ratios and relative to a reference category, which is given a value of 1. Odd ratios greater than 1 indicate higher odds (increased risk), and odds ratios less than 1 indicate lower odds (reduced risk).

The variables included in the models are listed below (only significant findings are discussed in the text and Table 7.2 in Appendix C):

#### **Aspects of fuel related poverty**

- Cold home,
- Mould present in home,
- Problem fuel debt or disconnected, and
- Using less fuel than needed due to worries about cost.

#### **Housing/area level indicators**

- Area population density (whether urban, rural or suburban),
- Index of Multiple Deprivation (IMD),<sup>21</sup>
- Property type (such as detached, semi-detached, purpose built flat), and
- Housing tenure (owner-occupier, social or private renter).

#### **Income, borrowing and socio-demographic factors**

- Equivalised household income,<sup>22</sup>
- Other (non-fuel) problem debts,
- Number of sources (pawnbrokers, moneylenders, family or friends) borrowed money from (0, 1, 2 or more),
- Age, and
- Sex.

## **7.4 Results**

All four aspects of fuel related poverty considered in the study were strongly associated with presence of CMD.

### **7.4.1 Mould and cold housing**

**People with CMD were more likely to report being unable to keep their home warm enough in winter and to report the presence of mould in their home.**

10% of people with CMD reported not being able to keep their home warm enough in winter, compared with just 3% of people without CMD.

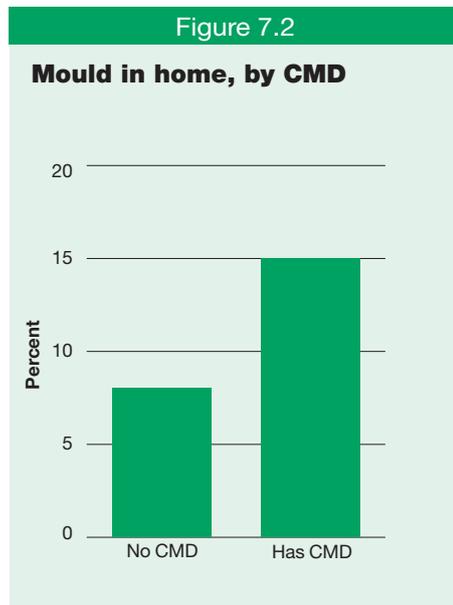
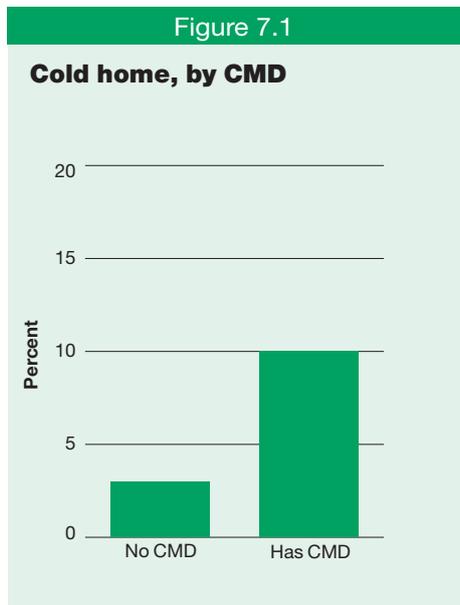
15% of people with CMD said they had mould in their home, compared with 8% of people with no CMD.

**Figures 7.1 and 7.2 and Table 7.1**

### **7.4.2 Financial strain**

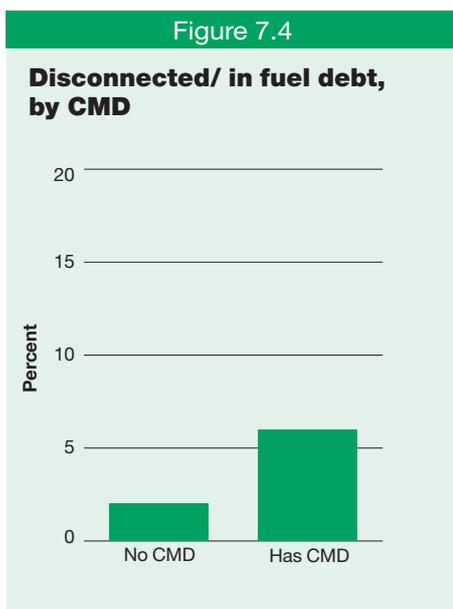
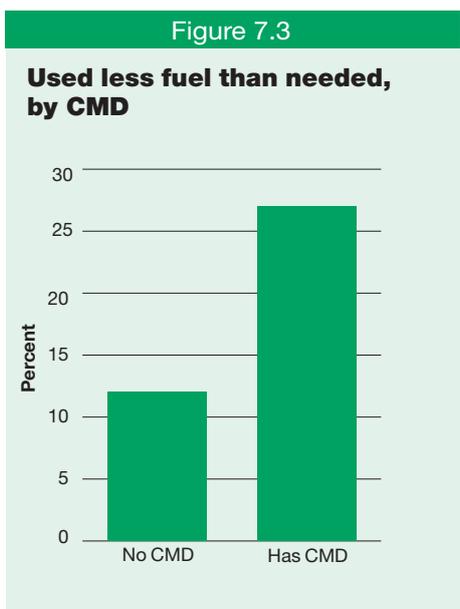
**People with CMD were far more likely to report fuel related financial strain than people without a CMD.**

27% of people with CMD said they had used less electricity, gas or other fuel due to worry about cost, compared with 12% of people without CMD.



Overall, the prevalence of being seriously behind in paying for fuel (gas and electricity) bills and/or being disconnected was relatively low. Still, those with CMD were again more likely to report that this had happened to them in the past 12 months (6%, compared with 2% for no CMD).

**Figures 7.3 and 7.4 and Table 7.1**



### 7.4.3 Predictors of CMD

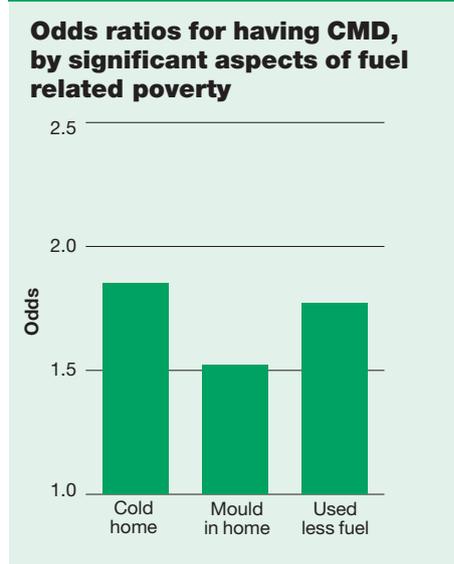
**After adjusting for other potentially confounding factors, three of the four aspects of fuel related poverty tested remained significantly associated with CMD.**

Odds ratios for an increased risk of CMD were found for being unable to adequately heat the home in winter (OR 1.85), presence of mould in the home (OR 1.52) and for using less fuel due to worry about costs (OR 1.77). However, the univariate association between fuel debt and CMD was no longer significant in this multivariate model. This may be because after controlling for the effects of being in debt for other reasons, being also in fuel related debt or disconnection did not have a significant and distinct additive impact.

**Figures 7.5 and Table 7.2**

In the final model there were also interesting findings relating to some of the other variables. After adjusting for other factors, a significant, albeit modest, association between housing tenure and CMD remained, with social renters having an increased odds of having CMD

Figure 7.5



(1.58), compared with owner-occupiers. This confirms a relationship that has been found in other research.

After adjusting for other factors in the final model income was not significantly associated with CMD, which also confirms findings from previous studies that have found debt to be a better predictor.<sup>17</sup> Having non-fuel related problem debts, having borrowed money (from 1 or more sources) and living in a deprived area (as measured by IMD) were all independently associated with CMD.

The other predictors to remain in the final model were sex, age and marital status. Women had a modest increase in odds of having CMD, as did middle aged people (aged 35-54) and those who were not married or cohabiting (single, widowed or divorced).

Table 7.2

## 7.5 Discussion

**This chapter provides a first account of the associations between CMD, assessed using a diagnostic instrument, and aspects of fuel related poverty. Although the cross-sectional nature of the data means that direction of causality cannot be determined, this analysis does reveal some striking associations with relevance for policy in this area.**

People with poor mental health were far more likely to experience aspects of fuel related poverty than those with better mental health. They were more likely to have mould, cold housing and financial strain related to domestic fuel consumption.

Fuel related poverty does not occur in isolation, but exists alongside other forms of poverty and deprivation. Therefore to examine the relative contribution of the aspects of fuel related poverty after controlling for other factors, logistic regression models were used.

Even after controlling for a range of financial and socioeconomic factors including income, debt, and tenure: cold housing remained independently predictive of poor mental health. Chapter 6 demonstrated the vital importance of income maximisation strategies, ensuring full benefit uptake and providing support for employment focused education and training programmes. It also showed the need to support the development of financial management skills to further avoid debt. However, the data in Chapter 7 highlight that a dual approach remains essential. Irrespective of debt and low income, living in a cold home is independently associated with poor mental health. This lends support to a policy focus not just on poverty alleviation but also specifically on improving the insulation and heating efficiency of homes, programmes like Warm Front.

However, the findings in this chapter also demonstrate that widescale improvements to home insulation must also prioritise ventilation. Living in a house with mould was also found to independently predict poor mental health.

While a growing body of evidence had already suggested that cold and damp living conditions are independently associated with poor mental health, this project has added to the knowledge base by demonstrating that cutting back on fuel usage is also associated with CMD, even after controlling for income. This lends support to calls to extend the Winter Fuel Payment to other vulnerable households, such as those headed by a lone parent, to encourage increased expenditure on heating where necessary.

Housing tenure remained a significant predictor of CMD in the final model, with those who are social renters having a modest increased odds of having CMD, compared with owner-occupiers (this association was not significant for private renters). It has been suggested that a lack of autonomy, stigma and wider aspects of deprivation contribute to the disadvantage experienced by those living in social housing.<sup>23</sup>

In contrast to previous research,<sup>15</sup> after adjusting for other factors, the type of property people lived in was not associated with increased odds of having CMD. This is a positive finding for policy intervention as the property type of existing stock is fixed. This finding would benefit from further exploration.

In any cross-sectional survey, it is necessary to be cautious about inferring the direction of causality. It is possible that those suffering from CMD may be more disposed to take a pessimistic opinion when asked about their housing situation. Furthermore, it may be possible that those with CMD are more anxious generally and so, for example, are more prone to using less fuel due to worry about cost (although this explanation is less plausible when it comes to reporting fuel related problem debt or presence of mould). There is also the possibility of downwards drift, with those disposed to CMD moving towards worse housing and financial situations. Alternatively perhaps manifestations of fuel related poverty affect the ambience of the housing environment in which people live. This in turn may have an impact on their mental state. Chapter 8 demonstrates a link between aspects of fuel related poverty and poor physical health, which in turn is strongly associated with poor mental health. Further longitudinal research is required to understand the exact mechanisms by which these aspects of fuel related poverty are associated with CMD.

## Conclusions

This report highlights that fuel poverty should also be a priority for policy makers and public health practitioners concerned with mental health. In the current financial and economic climate the possible negative impact of the recession on psychological health has been recognised at an international level.<sup>24</sup> This will be compounded by rises in domestic fuel prices.<sup>25</sup> Not only is it likely that increasing numbers of people will become fuel poor this winter, but also that many of these will suffer associated psychological strain.

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- 19 Lewis G, Pelosi AJ, Araya R, & Dunn G (1992). Measuring psychiatric disorder in the community; a standardised assessment for use by lay interviewers. *Psychological Medicine*, 22, 465-486.
- 20 These are; being unable to heat the home adequately in winter (cold home), having mould in the home (excluding bathrooms, shower rooms and toilets); using less gas, electricity or other fuel in winter than needed due to worry about cost; and being seriously behind in paying for electricity or gas and/or being disconnected due to failure to pay domestic fuel bills.
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# Fuel related poverty, physical health and disability

# 8

## 8.1 Purpose

This chapter compares the prevalence of different aspects of fuel related poverty among people with and without physical health complaints and disability. It outlines some of the socioeconomic characteristics associated with poor physical health. Controlling for these, the indicators of fuel related poverty that independently predict poor physical health are identified.

See Tables 8.1 to 8.6 in Appendix C for the data referred to in this chapter.

## 8.2 Background

Since the early studies of Charles Booth, housing and public health have been viewed as entwined. Then, it was the spread of communicable disease which was facilitated by aspects of the environment.<sup>1</sup> The particular emphasis in recent decades has been on the impact of homes that are cold, damp and mouldy.<sup>2,3</sup> Now that access to uncontaminated water is generally available, recent housing initiatives have sought to tackle inefficient insulation, ineffective heating, and under-ventilated damp conditions.<sup>4,5</sup> These can exacerbate condensation, which encourages mould, fungi and other micro-organisms to grow:

*‘Many moulds in damp houses are allergenic and provide a food supply for house mites which are also potential allergens. At certain stages some fungi become toxic. Mould allergy is a recognised cause of asthma.’<sup>6</sup>*

The current World Health Organisation emphasis on the social determinants of health and health inequalities sits well with placing housing at the centre of strategies to improve physical health.<sup>7</sup>

What this chapter seeks to unravel is that, even with cross-sectional data, there is not only an association between being ‘poor’ and having poor health, but that different aspects of housing impact on health in different and independent ways. For example, through relative poverty (as suggested by the impact of tenure status) and through physical characteristics (as suggested by the impact of presence of mould). In particular, this chapter demonstrates that these predict poor health even when other related socioeconomic factors are controlled for.

## 8.3 Our approach

Health inequalities refer to how rates of conditions vary by different characteristics, with some more amenable to intervention than others. Sir Donald Acheson’s major 1997 review, *Inequalities in Health*,<sup>8</sup> highlighted health inequalities as functioning at three key levels:

- Core characteristics (e.g. age, sex and ethnic group),
- Socioeconomic context (e.g. income and neighbourhood), and
- Associated behaviours (e.g. alcohol consumption and smoking).

We drew on this model in structuring the analysis for this chapter.

The main outcome variable - presence of any physical health condition - was derived from the reporting of a physical health complaint that had been diagnosed by a doctor and been present in the past year. This measure is useful because of socioeconomic associations with likelihood of reporting symptoms in general health screens, however it is still subject to the fact that likelihood and timing of getting a doctor's diagnosis is also associated with socioeconomic status.<sup>9</sup>

The prevalence of any physical health complaint was first examined by the aspects of fuel related poverty, without controlling for any covariates other than age group. Age standardisation was important to these analyses given the strong known association between poor health and increasing age.

The odds of having a physical health condition was then examined by each of the following core and socioeconomic characteristics using univariate logistic regressions; age group, sex, ethnic group, marital status, equivalised household income, non-fuel debt, housing tenure, area level deprivation, economic activity, urban/rural, property type and region. Univariate regressions produce odds ratios, without controlling for the confounding effects of other covariates.

The characteristics that were significantly associated with poor health in each of the univariate regressions were then run in a multivariate logistic regression model, and those that remained significant after the other factors in the model were controlled for were retained in the next model. The four domains of fuel related poverty then added to this final model were:

- Being unable to keep home warm,
- Presence of mould (except in bathroom),
- Used less fuel than needed due to cost worries, and
- Problem debt or disconnection related to fuel.

As a check on whether inequalities in health related behaviours account for any variation found, daily smoking and heavy alcohol consumption were also controlled for.

Deciding on a final model is an iterative process and subject to interpretation. A more detailed account of the statistical approaches taken in this report is provided in Appendix A.

This process was repeated, with presence of respiratory disease as the dependent (outcome) variables.

## 8.4 Physical health

Two-thirds (63.5%) of people had at least one doctor diagnosed physical health condition which has been present in the past year.

**People with a physical health condition were significantly more likely to have reduced their use of domestic fuel in the past year due to worry about cost than those without a physical health complaint.** They were also more likely to be living in a cold home and in a home with mould. This comparison controlled for the different age profiles of people with and without a physical health complaint, but not for other covariates. **Figure 8.1 and Table 8.1**

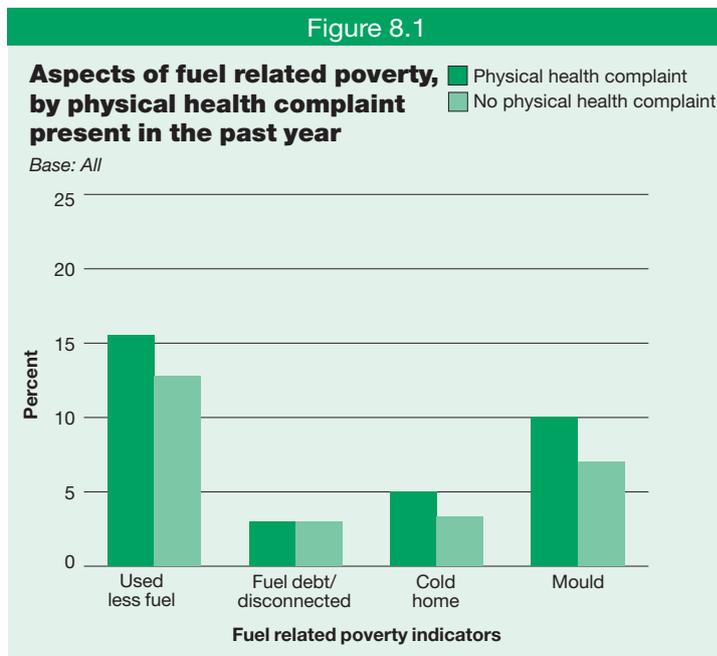
The only aspect of fuel related poverty that remained significantly associated with poor physical health in the multivariate regression model was the presence of mould.

This remained strongly and significantly predictive of poor physical health, even after controlling for smoking and alcohol consumption. The other characteristics to remain significant predictors of poor physical health were:

- Being a social renter,
- Living in an urban (rather than rural) area,
- Being older than 24,
- Female, and
- White ethnic group.

**Table 8.2**

Figure 8.1



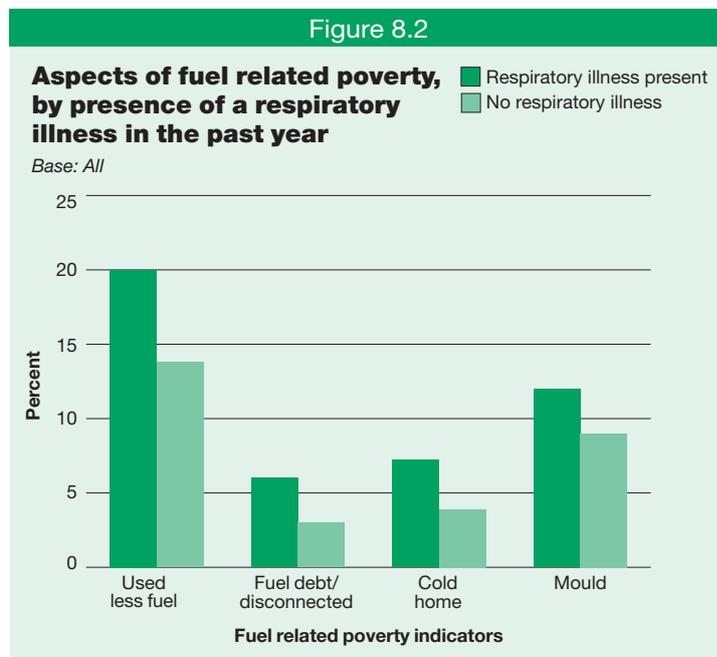
## 8.5 Respiratory illness

The presence of respiratory illness was defined as a doctor diagnosis of bronchitis, emphysema, asthma or a related condition, where the condition was present in the past year. One person in ten reported at least one type of respiratory illness.

**People with a respiratory illness were significantly more likely than those without one to reduce their domestic fuel consumption due to worries about cost, be disconnected/ in fuel related debt, have a cold home or have mould in the home.** This comparison controlled for the different age profiles of people with and without a respiratory illness.

Figure 8.2 and Table 8.3

Figure 8.2



In the multivariate logistic regression (shown in Table 8.4), the fuel related poverty indicators that remained associated with poor physical health after other socio-economic factors were controlled for were:

- Living in a cold home, and
- Being in fuel debt.

The association with fuel debt is particularly interesting given that non-fuel related debt was not found to be a significant predictor of respiratory illness.

The presence of mould in the home was not found to be significant at 95% confidence, however the p value was 0.08 which is suggestive of a weak association.

The following other characteristics also remained significant predictors of respiratory illness:

- Being a social renter (compared with owner occupier),
- Living in an urban area (compared with rural), and
- Being economically inactive (compared with being in employment).

Table 8.4

## 8.6 Cardiovascular disease (CVD)

The presence of CVD was defined as a doctor diagnosis of high blood pressure, heart attack, angina or a related condition, where the condition was present in the past year. Two people in ten reported at least one type of CVD, mostly high blood pressure.

The only marker of fuel related poverty status that significantly predicted presence of CVD was using less fuel due to worry about cost. After standardising for age, 20% of people with CVD reported this compared with 14% of people without CVD (see Table 8.5). The lack of significant association with the other aspects of fuel related poverty tested may be because of the inclusive definition of CVD used, with a diagnosis of 'high blood pressure' potentially including many people with moderate levels of poor health.

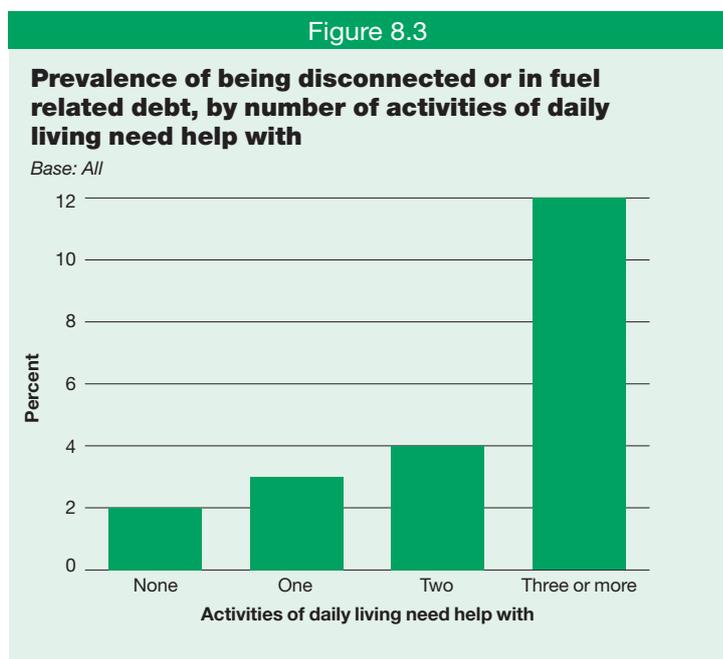
Table 8.5

## 8.7 Activities of daily living (ADLs)

A widely used measure of functional impairment used to capture 'disability' is the Activities of Daily Living (ADL) checklist.<sup>10</sup> Participants were asked which of a list of commonplace and essential activities they had difficulty with. The activities that participants reported needing assistance with were totalled to produce an overall score. Table 8.6 presents the prevalence of each of the aspects of fuel related poverty among those needing help with no, one, two, or three or more activities.

The number of activities that people need help with was strongly associated with the presence of each of the aspects of fuel related poverty, and this was also true when looked at separately among men and among women. The analysis was standardised for age, although other factors were not controlled for.

Figure 8.3 and Table 8.6



## 8.8 Discussion

This chapter confirms that poor physical health is more prevalent among people experiencing aspects of fuel related poverty than among people who do not, and demonstrates that this association also extends, even more strongly, to disability and impairment. Nearly half of disabled people - identified as those who need assistance with activities of daily living - experienced at least one of the aspects of fuel related poverty covered in the study.

This chapter has also demonstrated that of the factors that remained associated with physical health, after a range of socioeconomic variables were controlled for, several related specifically to housing. These included the presence of mould, being unable to keep the home warm, and being in fuel debt. It is interesting to note that being in fuel debt was independently associated with having a respiratory illness, while being in other types of debt was not a predictor.

Unfortunately analysis of cross-sectional data cannot establish those 'determinants', but it can further understanding of the associations between current circumstances and current physical health. The findings reported here, therefore, may underestimate environmental impact, in particular the associations that longitudinal data have identified between childhood housing conditions and adult poor health. Associations in cross-sectional data are also confounded by the fact that people who already suffer from ill health will tend to live in more substandard housing by virtue of their reduced income.<sup>11</sup> A further limitation to the APMS 2007 data is that while the assessment of mental disorder was based on presence of symptoms, the physical health measure relies on doctor diagnosis. Those in higher socioeconomic circumstances may be more likely to secure such a diagnosis, or secure it earlier.<sup>12</sup>

Renting a property from a social landlord and living in an urban environment are also associated with poor health. Housing tenure has been positioned as a marker of relative deprivation, in a society where such an emphasis is placed on aspiring to home ownership. Precisely what aspects of the urban environment explain its association with physical health needs further exploration, as the link was stronger than for markers of population density or of local area deprivation, which were also tested.

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### A.1 Introduction

The data source for this report is the Adult Psychiatric Morbidity Survey (APMS) 2007, which consisted of two phases. Phase one involved interviews carried out by NatCen interviewers with adults aged 16 and over, employing structured assessments using diagnostic criteria and screening instruments for a range of mental disorders, as well as questions about general health, risk factors for poor mental health (including housing conditions and financial strain) and demographics. Phase two interviews were carried out by clinically trained research interviewers and involved assessing a sub-sample of the phase one participants for conditions (such as psychosis and personality disorder) that required the use of clinical judgement in ascertaining a diagnosis. This report draws on data from phase one only.

This appendix outlines our methodological approach to the health, mental health and housing secondary analysis study; providing an overview of the APMS 2007 sampling, weighting and topic coverage, and the data analysis used in this study. A more detailed description of the APMS 2007 methods and results is available elsewhere (freely accessible on the NHS Information Centre website, [www.ic.nhs.uk/pubs/psychiatricmorbidity07](http://www.ic.nhs.uk/pubs/psychiatricmorbidity07)).<sup>1</sup>

### A.2 Sample

The APMS 2007 sample was designed to be representative of the population living in private households in England. The sampling frame for the survey was the small user Postcode Address File (PAF). The PAF compiled by the Post Office and lists all addresses to which 50 or fewer items of mail are delivered a day (to minimise the likelihood of including businesses). APMS adopted a stratified two stage random probability sampling design, involving the sampling of primary sampling units (PSUs) and the sampling of addresses within selected PSUs.

The PSUs were individual or groups of postcode sectors, containing on average 2,550 delivery points. Smaller sectors were grouped to contain at least 500 delivery points.

To increase precision and reduce standard error, the population was divided into a number of strata based on known proportions. The stratifiers were: NHS office region, a measure of socio-economic status, and proportion without a car. In total, 519 postal sectors (PSUs) were selected in England.

28 delivery points were randomly selected within each of the 519 postal sectors, yielding 14,532 addresses to issue to field. At those addresses found to have more than one household, standardised procedures were used to select one household whilst ensuring all households had an equal chance of selection. Within each household interviewers used standardised procedures to select one adult aged 16 or over at random to take part. Of the 14,532 addresses in the original sample, 13,171 addresses were found to be potentially eligible for inclusion in the survey.

### A.3 Topic coverage

The phase one computer-assisted interview consisted of an initial module of questions administered face to face by an interviewer, a self-completion section, and a further interviewer administered module. The interviews took an average of 90 minutes each, although some took much longer. An overview of the topics covered in the interview is provided in Figure A.1.

Figure A.1			
Phase one interview content			
	Age of participant		
	16-59	60-69	70+
<b>CAPI interview: face to face interview [1]</b>			
Marital status and household relationships	•	•	•
Identification of household reference person	•	•	•
General health (SF12) and health conditions	•	•	•
Activities of daily living	•	•	•
Caring responsibilities	•	•	•
Service use and medication	•	•	•
Self-perceived height and weight (for calculation of BMI)	•	•	•
Common mental disorders (CIS-R)	•	•	•
Suicidal behaviour and self-harm	•	•	•
Psychosis screening questionnaire (PSQ)	•	•	•
Attention Deficit Hyperactivity Disorder (ASRS)	•	•	•
Work related stress	•	•	-
Smoking	•	•	•
Drinking 1	•	•	•
<b>CASI interview: self completion</b>			
Drinking 2 (inc. AUDIT, SADQ-C)	•	•	•
Drug use	•	•	•
Personality disorder and social functioning (SCID-II)	•	•	•
Problem gambling	•	•	•
Autistic Spectrum Condition (ASCQ)	•	•	•
Posttraumatic stress disorder (TSQ) & military experience	•	•	•
Domestic violence and abuse	•	•	•
Suicidal behaviour and self-harm (3 questions from face to face)	•	•	•
Eating disorder (SCOFF)	•	•	•
Discrimination	•	•	•
<b>CAPI interview: face to face interview [2]</b>			
Intellectual functioning:			
TICS-M	-	•	•
National Adult Reading Test (NART)	•	•	•
Animal naming test	-	•	•
Stressful life events (LTE)	•	•	•
Social support networks (inc. IMSR)	•	•	•
Parenting	•	•	•
Religion and spirituality	•	•	•
Social capital and participation	•	•	•
Socio-demographics (inc. housing & fuel poverty indicators)	•	•	•
Consents (NHS Central Register flag & phase two consent)	•	•	•

The interviewer administered modules included twenty questions specifically about different aspects of fuel related poverty. APMS 2007 was not able to collect detailed information about the amount of money spent by households on domestic fuel use. Accurate estimates of this are complex to ascertain in social surveys, and the fuel poverty and housing conditions module had to be limited to core questions so as to not impact adversely on the overall interview length and response rate.

In summary the fuel poverty and housing characteristics modules covered:

- *Housing context* - when property was first built, type of dwelling (i.e. detached house, terraced house), tenure (way in which household occupy the dwelling);
- *Fuel efficiency* – extent of double or triple glazing, types of heating present in the property and used to heat living room in winter;
- *Aspects of fuel related poverty* – describing the nature and experience of fuel related poverty (e.g. being cold in winter, presence of mould, using less fuel than needed to due to cost, fuel bill payment difficulties, social isolation due to cold);
- *Related social factors* – providing social context for and/or associated with the presence of fuel related poverty (e.g. detailed household income, area level measures such as population density and Index of Multiple Deprivation).

The questions included in the survey were developed in consultation with experts and were subject to cognitive testing and piloting, with improvements made where appropriate. A full questionnaire is available in Appendix D of the main APMS 2007 report.<sup>1</sup>

### **A.3.1 Survey response**

57% of the 13,171 potentially eligible households agreed to take part, resulting in 7,461 productive interviews. This included 50 partial interviews and 58 proxy interviews.

### **A.3.2 Overview of achieved sample**

Although the data used in this report have been weighted to take account of non-response and selection probabilities, it is useful to compare the achieved APMS sample prior to weighting with that observed in the Health Survey for England (2007) and the mid-2006 population estimates provided by the Office of National Statistics.<sup>2</sup> Overall, the raw APMS 2007 sample compares well, although younger people are slightly underrepresented, and older women slightly overrepresented.

**Table 1.1**

Once the data are weighted the profile of the sample matches that of the general population. There were slightly more women (51%) than men in the sample. 52% of participants were married, 23% were single, 10% cohabiting, 7% widowed, and 7% divorced or separated. And the majority of participants were of a White ethnic origin (90%), while 4% self-identified as South Asian, 3% as Black and 3% as of a mixed or other ethnic origin.

**Table 1.2**

23% of households consisted of only three or more adults, 22% contained two adults (aged 16-59) and no children, 17% were smaller families with fewer than three children, and 16% were two adult households (with one or both aged 60 or more). 8% was the figure for both younger single adult (aged 16-59) households, and older single adult (aged 60+) households, and 6% were larger families with three or more children. Overall, 23% of households included children (aged 15 or under).

**Table 1.2**

## **A.4 Housing stock**

Alongside the sample of people, it is also necessary to consider the achieved sample of housing stock. The weighting applied (described in Section A.5.1) corrects for the selection bias towards households containing a smaller number of adults, resulting from the fact that only one adult per household was selected to take part giving those in larger households a smaller chance of selection. Using the Office of National Statistics (ONS) harmonised urban rural classifications, based on grouped population density, the majority of participants lived in urban (79%) rather than rural (11%) or town and fringe (10%) areas, in proportions comparable to that observed in the English population.<sup>3</sup>

**Tables 1.3**

The age of a residential property has been found to be a key indicator of its thermal efficiency (how well it generates and retains warmth), with older homes generally being less efficient at retaining warmth and more costly to heat to a comfortable temperature. Participants were asked to estimate when their home was first built, using banded year

ranges. Relatively few participants lived in homes built recently, only 13% were built in the 1990s or later, 14% 1977-1989, 31% 1950-1976, 30% 1900-1949, and 12% were built before 1900. Again, the age profile of the properties that participants lived in is comparable to that identified by the Survey of English Housing and elsewhere.<sup>4,5</sup> **Tables 1.4**

Interviewers were asked to classify the type of dwelling unit that participants lived in. A third of participants lived in semi-detached houses (33%), a quarter lived in detached houses (24%), and a fifth (20%) lived in terraced houses. The remainder had purpose built flats or maisonettes (11%), end of terrace houses (9%), flat or maisonette conversions (2%), or other types of properties (1%). To ascertain tenure, participants were asked about the ways in which their household occupied their home. The majority of households were owner occupied (70%), 17% were rented from a social landlord and 13% were identified as rented privately or otherwise. Both type of dwelling and tenure were found to be in proportions closely comparable to those found in the Survey of English Housing. **Tables 1.5, 1.6**

## **A.5 Data analysis and reporting**

### **A.5.1 Data weighting**

Survey data were weighted to take account of non-response and to ensure the results were representative of the household population aged 16 years and over. Sample weights were applied to:

- Take account of the different probabilities of selecting participants in different sized households;
- Reduce household non-response bias, a household level weight was calculated using interviewer observation and area-level variables; and
- Take account of differential non-response between regions and age-by-sex groups to represent the structure of the national population.

It should be noted that to reduce non-response bias, adjustments were made regarding two aspects of housing characteristics to ensure that the sample profile matched that of the population as a whole. Non-response weighting was applied to adjust for variation in response according to presence of barriers at entry to the property (addressing in part a lower response from those living in flats, particularly where there is an intercom at the door); and percentage of households owner-occupied in the local area (addressing a lower response in areas where a lower proportion of households are owner-occupied).

### **A.5.2 Weighted and unweighted bases**

The data presented in the tables of this report are weighted, but both weighted and unweighted bases are given. The unweighted bases are presented to show the number of participants included. The weighted bases show the relative size of the various sample elements after weighting, reflecting their proportions in the English population, so that data from different columns can be combined in their correct proportions.

### **A.5.3 Data reporting**

As a secondary analysis project based on a cross-sectional survey of the general population, whilst it is possible to explore associations between variables, it is important to emphasize that any such associations cannot be assumed to imply causality. This is key for an analysis of the associations between health and indicators of poverty as influence can be in either direction. All analyses were performed using SPSS v15.0 and Stata v10.

### **A.5.4 Age standardisation**

In some analyses rates have been age-standardised in this report to allow for comparisons between groups after adjusting for the effects of any differences in their age distributions. When sub-groups are compared in respect of a variable on which age has an important

influence, differences in age distributions between sub-groups are likely to affect the observed differences in the proportions of interest.

Age standardisation was carried out using the direct standardisation method, the reference population being the Office for National Statistics' Census-based mid year 2006 population estimates for England.

### **A.5.5 Testing for impact of seasonal variation and region**

APMS 2007 fieldwork was conducted over the course of a year, so seasonal variation could be explored. Because minimum and maximum temperature can vary considerably by month, we hypothesized that reporting of aspects of fuel related poverty, particularly relating to difficulty keeping the home warm in winter, might vary by month even where the question asks about the past year. This could be due to recall and recency effects, for example a participant may be more likely to remember and report being too cold if interviewed in January, as opposed to August. In a related way, average temperature in England varies by region and so we would expect rates of living in a cold home to also vary accordingly.

To check this, we looked at whether participants reported being unable to keep their home warm enough in the winter by month of interview and region of residence. Overall, those interviewed in generally warmer months tended to report lower rates of being cold in their home in the winter, compared with those interviewed in colder months. In addition, a higher proportion of those interviewed in colder regions of England reported being unable to keep their home warm enough, although the pattern was not always straightforward (for instance, London with a relatively mild climate, had one of the highest rates). This association is likely to involve a complex range of factors including types of housing and variation in poverty by region. To account for this, both month and region of interview were controlled for in Chapter 6 of this report.

It should also be noted that the sample was selected so that each quarter of issued addresses was a representative sample, so for example the regional distribution of sample was the same in each calendar quarter.

### **A.5.6 Equivalised household income**

Household income was established by means of show-cards<sup>6</sup> on which narrowly banded incomes were presented. While income alone can be used as an analysis variable, measures of equivalised income that are adjusted to take account of the number and characteristics of people living in the household are more meaningful. To derive this, each household member is given a score depending, for adults, on the number of adults cohabiting or not cohabiting, and for dependent children, their age. The total household income is divided by the sum of the scores to provide the measure of equivalised household income. Participants were then allocated to the equivalised household income quintile to which their household belonged.

### **A.5.7 Logistic regression**

Logistic regression modelling has been used in Chapters 6, 7 and 8 of this report to examine the factors associated with selected outcome variables, after adjusting for other factors. Models were constructed for three outcomes of interest: latent class membership, any common mental disorder in the past week, and any physical health problem in the past year. The models included a variety of explanatory variables relating to both participant characteristics (e.g. age, sex, marital status), housing characteristics (e.g. presence of mould, cold in winter) and other demographics (e.g. level of education and IMD). Although the models used comparable variables as far as possible, they also included variables specific to particular outcomes; for example the physical health model included controlling for whether participants smoked cigarettes, given the known association between this behaviour and poor physical health.

The results of the regression analyses are presented in tables showing odds ratios for the

final models, together with the probability that each association is statistically significant. The explanatory variable is considered to be significantly associated with the outcome variable if  $p < 0.05$ .

The explanatory variables include only categorical variables (where cases are grouped into a number of discrete categories). The models show the relative odds of the outcome of interest (e.g. latent class membership) for each category of the explanatory variable (e.g. being a man or woman). For categorical variables, odds are expressed relative to a reference category, which has a given value of 1. Odds ratios greater than 1 indicate higher odds (increased likelihood), and odds ratios less than 1 indicate lower odds (reduced likelihood). 95% confidence intervals for the odds ratios are shown. Where the range of the confidence interval does not include 1, this category is considered to be significantly different from the reference category.

The models included in this report use, as far as possible, the same or comparable explanatory variables. Variables which were not significantly associated with the outcome but which were included in the models are noted in the text, although they are not shown in the tables for reasons of space and clarity.

Details of the latent class analysis used in Chapter 6 are provided in Appendix B.

## References and notes

- 1 McManus S, Meltzer H, Brugha T, Bebbington P, & Jenkins R (2009). *Adult Psychiatric Morbidity in England, 2007: Results of a household survey*. The Health and Social Care Information Centre, Social Care Statistics. [www.ic.nhs.uk/pubs/psychiatricmorbidity07](http://www.ic.nhs.uk/pubs/psychiatricmorbidity07).
- 2 HSE and ONS mid-year population estimates reported in: Craig, R. & Shelton, N. (2008). *Health Survey for England 2007: Healthy lifestyles: knowledge, attitudes and behaviour. Volume 2. Methodology and documentation*. The Health and Social Care Information Centre, Social Care Statistics.
- 3 Data accessed [http://www.defra.gov.uk/rural/strategy/annex\\_b.htm](http://www.defra.gov.uk/rural/strategy/annex_b.htm), 23.02.09.
- 4 Office for National Statistics (ONS), *Housing Statistics Summary 027: Survey of English Housing Preliminary Results 2006/7*. Communities and Local Government.
- 5 *English House Condition Survey 2006. Annual report*. (2008). Communities and Local Government.
- 6 See Appendix E in McManus S, Meltzer H, Brugha T, Bebbington P & Jenkins R (2009). *Adult Psychiatric Morbidity in England, 2007: Results of a household survey*. The Health and Social Care Information Centre, Social Care Statistics.

## B.1 Introduction

Income, fuel poverty and financial strain are clearly related to each other, but the nature of the associations is complex and can be difficult to unravel. This appendix describes the statistical methods used in the analysis presented in Chapter 6 and the accompanying tables.

## B.2 Statistical methods

### B.2.1 Latent class analysis

Latent class analysis (LCA) is a statistical technique for finding subtypes of related cases (latent classes) from multivariate categorical data. The analysis fits a model to the data that (a) identifies a given number of latent classes, and (b) generates probabilities for each participant of their being in each class (one probability per class). An individual is then assigned to the class for which they have the highest probability. In this way, as with cluster analysis, they are assigned to the group where they are most similar to the other members (in terms of the pattern of psychiatric conditions they met criteria for).

This technique is similar to cluster analysis with the main advantage of LCA over cluster analysis in this instance being that it is designed for categorical data, whereas cluster analysis is designed for continuous data. Furthermore, unlike cluster analysis, LCA generates a parameterised model of class membership. These parameters allow the relationship between the original set of variables (in this case the variables indicating presence or absence of particular markers of deprivation) and the final latent classes to be formally traced. In particular it is possible to trace why a participant is in one class rather than another, and what the members of a class have in common.

### B.2.2 Modelling the data

In this study, LCA was used to create homogeneous groups of participants with similar poverty experiences. Eleven binary variables were used as input to the LCA. They each defined the presence/absence of one of the following poverty indicators:

- Being in the lowest equivalised household income quintile (annual income of less than £10,575),
- Being in receipt of any benefits, excluding maternity or state pensions
- Having any mould in the property,
- Being unemployed,
- Experiencing a major financial crisis in last six months, including being sacked or made redundant, looking for work without success for more than one month, major financial crisis like losing three months of income,
- Reporting problem debt (being seriously behind in paying in the time allowed) with the gas electricity or other fuel supplier,
- Being disconnected for gas, electricity or other fuel,

- Reporting any other (non-fuel related) problem debt,
- Being unable to keep home warm enough in winter,
- Using less gas, electricity or other fuel than needed due to worry about cost, and
- Having borrowed money from a pawnbroker, moneylender, family or friends.

The probability of belonging to each class can be obtained for each participant, with individuals allocated to the class for which this probability is the largest (modal allocation).

A key question in exploratory LCA is how many classes the sample should be divided into. However, there is no definitive method of determining the optimal number of classes. Because models with different numbers of latent classes are not nested, this precludes the use of a difference likelihood-ratio test. Therefore we must rely on measures of fit such as Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC). In comparing different models with the same set of data, models with lower values of these information criteria are preferred. Furthermore, the resulting classes have to be interpreted. For the purposes of this analysis the main importance in deciding the number of classes was placed on interpretability.

### **B.2.3 Missing data in LCA**

Equivalent household income data was missing for 1548 cases. In most cases this reflected that whilst data was present for individual income (i.e. participants' own income), some participants were unable to answer for the household (in most cases they were most likely adult children living with parents or older people living with an extended family, and were unable to answer the total household income question).

Limited numbers of missing data in LCA does not normally pose a significant problem if the data is a random selection of cases. The analysis was repeated including those with missing equivalent household income data and broadly similar results were found, although the associations were somewhat weakened and harder to interpret for cluster 4. It was felt that cluster 4, once missing cases had been excluded, represented an important group that would otherwise be missed. The decision to exclude such cases was taken because it was felt that including those with missing data might dilute income is a defining cluster characteristic, so while the group excluded is probably not a random selection of missing cases it remained the best option to exclude them from this analysis.

### **B.2.4 Identifying the number of classes**

As part of a latent class analysis we need to identify the number of classes. In practice, it is unlikely that there will be a single 'correct' model so it is usual to consider a range of possible models containing different numbers of classes and choose the most appropriate using some criteria.

A general approach to statistical model fitting is to try to balance the fit and the parsimony of a model – generally if two models fit a data set equally well the one with fewer parameters will be chosen. Under this principle, in LCA, if a model with  $k+1$  classes fits the data just as well as one with  $k$  classes the  $k$ -class model will be chosen.

LCA software packages such as Latent GOLD provide the analyst with statistics to help in the choice of the correct number of classes in the data. In particular it provides several goodness-of-fit statistics to help decide on an appropriate model; a formal hypothesis test can also be performed to see if a  $k+1$ -class model is an improvement on a  $k$ -class model.

First, Latent GOLD was used to fit models with varying numbers of classes, in this case those with between two and eight classes. Goodness-of-fit statistics were then examined for each of the models. These statistics allowed us to rule out certain models as having too poor a fit to be considered, and also gave an approximate upper limit for the number of classes that needed to be considered.

The choice between these was then made on the basis of several less formal considerations:

1. The most of important of these was interpretability of the classes. A model with  $k$  interpretable classes was preferred to one with  $(k+1)$  classes where one or more of the classes was not readily interpreted.
2. We assigned participants to clusters (using modal assignment) and examined how the composition of the clusters changed as we moved from one solution (with  $k$  clusters) to the next ( $k+1$  clusters). This allowed us to examine the stability of the models and to understand how new clusters formed and from which clusters in the previous solution.
3. We considered the sizes of the clusters. In this case we expected to have one or two relatively small groups comprising those with multiple conditions. However, a model with several very small groups would be neither stable nor interpretable.
4. We examined membership probabilities, in particular the probability that a participant belongs to cluster to which he/she has been assigned. Ideally each individual would have a fitted probability of 1 of being in their assigned group but in reality this figure is lower.

We found that all clusters in all models with up to four clusters were interpretable but once five clusters was reached, the 'new' cluster could not be readily interpreted and the model contained a high percentage of classes with membership probabilities of less than 0.6, therefore the new cluster which appeared was much less robust than the rest in terms of the average probability of membership. Again this suggested that a four cluster solution was more appropriate for the data.

When we looked at the change in the composition of cluster membership we found that each successive solution added a new cluster from the remnants of one or more of the previous clusters but apart from this the remaining clusters were relatively stable. The four cluster solution produced a new cluster (not present in the three cluster solution), which, although small, clearly represents those individuals that have a higher income but are also in debt, a key group to compare with the lower income class experiencing debt. For these reason, having ruled out the three and five cluster solution, four clusters was preferred.

### **B.2.5 Classifying individuals and describing classes**

Once a working model has been chosen, the analyst will usually try to relate membership of each class with the participants' answers to each question and thus describe the classes.

One method of doing this is to examine the parameter estimates obtained by the model. Latent GOLD estimates the probability associated with each class for its answers to each question. For example, a member of cluster four has a 78% probability of having problem debt, whereas a member of cluster one has only a 1% probability of this. Thus, cluster four will be more associated with being in debt than cluster one.

Another method is to examine the responses rather than the parameters. This method requires participants to be assigned to their modal class and hence does not take into account the uncertainty concerning class membership.

Either of these methods can be used to help describe classes. The first method has the advantage that it does not require that individuals are assigned to clusters. On the other hand, the second method might be preferable as its class labels are based on descriptions of a real sample rather than estimates of parameters (many of which could have quite large standard errors).

We used the first method when comparing the interpretability of solutions with different numbers of classes. However, once we had chosen our final solution we assigned participants to clusters and treated the resulting variable like any other analysis variable when comparing the characteristics of each cluster.

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### Tables for Appendix A

#### Methods

- 1.1 Unweighted age group within sex, by survey and projected population estimates
- 1.2 Overview of the APMS 2007 sample profile: weighted and unweighted comparison
- 1.3 Population density in the 2001 Census and APMS 2007
- 1.4 Age distribution of the housing stock in the Survey of English Housing (SEH) 2006 and APMS 2007
- 1.5 Dwelling type in the SEH 2006 and APMS 2007
- 1.6 Housing tenure in the SEH 2006 and APMS 2007

Table 1.1			
Unweighted age group within sex, by survey and projected population estimates			
<i>All</i>			
Age group	Data source		
	APMS 2007	Health Survey for England 2007 <sup>a</sup>	Mid-2006 population estimates <sup>b</sup>
	%	%	%
<b>Men</b>			
16 - 24	9	12	16
25 - 34	13	14	17
35 - 44	19	19	20
45 - 54	15	16	15
55 - 64	18	16	15
65 - 74	14	14	10
75+	12	10	7
<b>Women</b>			
16 - 24	7	10	14
25 - 34	15	15	16
35 - 44	19	19	19
45 - 54	15	17	14
55 - 64	17	16	15
65 - 74	13	13	11
75+	14	11	10
<i>Bases (unweighted)</i>			
<i>Men</i>	3226	3070	19,508
<i>Women</i>	4235	3812	20,450

<sup>a</sup> Health Survey for England (HSE) 2007. Based on those who took part in an interview.

<sup>b</sup> Mid-2006 population estimates for England excluding those in institutions (Source: ONS). Base shown in thousands.

Table 1.2

**Overview of the APMS 2007 sample profile: weighted and unweighted comparisons**

<i>All</i>		<i>2007</i>	
Sample characteristics	Weighted (unweighted)	%	
<b>Sex</b>			
Men	49 (43)		
Women	51 (57)		
<b>Ethnic origin</b>			
White	90 (93)		
Black	3 (3)		
South Asian (Indian, Pakistani or Bangladeshi)	4 (3)		
Mixed or other	3 (2)		
<b>Marital status</b>			
Married	52 (48)		
Cohabiting	10 (8)		
Single	23 (19)		
Widowed	7 (13)		
Divorced	6 (9)		
Separated	2 (3)		
<b>Household type</b>			
One adult aged 16-59, no children	8 (12)		
Two adults, both 16-59, no children	22 (19)		
Small family	17 (17)		
Large family	6 (5)		
Large adult household	23 (13)		
Two adults, one or both aged 60+, no children	16 (17)		
One adult, aged 60+, no children	8 (16)		
<i>Weighted base</i>	<i>7460</i>		
<i>Unweighted base<sup>a</sup></i>	<i>7461</i>		

<sup>a</sup> Bases are shown for sex, bases for other variables will vary but be of a similar magnitude.

Table 1.3

**Population density in the 2001 Census and APMS 2007**

*All*

Population density <sup>a</sup>	Data source	
	2001 <sup>c</sup>	APMS 2007 <sup>d</sup>
	%	%
Urban	81	79
Town & fringe	9	10
Rural <sup>b</sup>	10	11
<i>Weighted base</i>	-	<i>7460</i>
<i>Unweighted base</i>	-	<i>7461</i>

<sup>a</sup> ONS harmonised population density.

<sup>b</sup> Village, hamlets and isolated dwellings.

<sup>c</sup> Data accessed from: [http://www.defra.gov.uk/rural/strategy/annex\\_b.htm](http://www.defra.gov.uk/rural/strategy/annex_b.htm).

<sup>d</sup> Percents for APMS 2007 are weighted.

Table 1.4

**Age distribution of the housing stock in the Survey of English Housing (SEH) 2006 and APMS 2007**

*All*

Estimated property age	Data source	Estimated property age <sup>a</sup>	Data source
			APMS 2007 <sup>c</sup>
	Survey of English Housing 2006 <sup>b</sup>		
Before 1851 <sup>d</sup>	4	Before 1900	12
1851-1918	16	1900 – 1949	30
1919-1944	19	1950 – 1976	31
1945-1964	22	1977 – 1989	14
1965-1984	25	1990 – 2002	10
1985-1994	7	2003 or later	3
1995 or later	7		
<i>Weighted base</i>			<i>7136</i>
<i>Unweighted base</i>			<i>7171</i>

<sup>a</sup> Respondent estimate of when property was first built.

<sup>b</sup> Data accessed from: <http://www.communities.gov.uk/housing/housingresearch/housingstatistics/>

<sup>c</sup> Percents for APMS 2007 are weighted.

<sup>d</sup> Please note that the different date ranges used by the two surveys.

Table 1.5

<b>Dwelling type in the SEH 2006 and APMS 2007</b>		
<i>All</i>		
Type of dwelling unit <sup>a</sup>	Data source	
	Survey of English Housing, 2006 <sup>b</sup>	APMS 2007 <sup>d</sup>
	%	%
Detached house	23	24
Semi-detached house	32	33
End of terrace house <sup>c</sup>	-	9
Terraced house	28	20
Flat or maisonette – purpose built	12	11
Flat or maisonette – conversion	4	2
Other	0	1
<i>Weighted base</i>	-	7459
<i>Unweighted base</i>	-	7460

<sup>a</sup> As coded by NatCen interviewers on APMS.

<sup>b</sup> Data accessed from: <http://www.communities.gov.uk/housing/housingresearch/housingstatistics/>

<sup>c</sup> Survey of English Housing tables do not classify terraced or end of terraced house separately.

<sup>d</sup> Percents for APMS 2007 are weighted.

Table 1.6

<b>Housing tenure in the SEH 2006 and APMS 2007</b>		
<i>All</i>		
Housing tenure <sup>a</sup>	Data source	
	Survey of English Housing 2005	APMS 2007 <sup>c</sup>
	%	%
Owner-occupier	70	70
Social renter	18	17
Private or other renter	12	13
<i>Weighted base</i>	-	7327
<i>Unweighted base</i>	-	7337

<sup>a</sup> Grouped according to how the household occupies their home.

<sup>b</sup> Data accessed from: <http://www.communities.gov.uk/housing/housingresearch/housingstatistics/>

<sup>c</sup> Percents for APMS 2007 are weighted.

## Tables for Chapter 4

### Fuel related poverty and property characteristics in England

- 4.1 Extent of double or triple glazing, by population density
- 4.2 Extent of double or triple glazing, by (estimated) year property was built
- 4.3 Extent of double or triple glazing, by type of dwelling
- 4.4 Extent of double or triple glazing, by housing tenure
- 4.5 Central heating system and central heating in living room, by population density
- 4.6 Central heating system and central heating in living room, by (estimated) year home was built
- 4.7 Central heating system and central heating in living room, by type of dwelling
- 4.8 Central heating system and central heating in living room, by housing tenure
- 4.9 Window glazing and any central heating, by population density
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- 4.13 Self-reported thermal comfort, mould and financial strain, by population density
- 4.14 Self-reported thermal comfort, mould and financial strain, by (estimated) year home was built
- 4.15 Self-reported thermal comfort, mould and financial strain, by type of dwelling
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- 4.17 Self-reported thermal comfort, mould and financial strain, by extent of double or triple window glazing
- 4.18 Self-reported thermal comfort, mould and financial strain, by whether have central heating system
- 4.19 Social impact of cold home, by housing tenure
- 4.20 Room in home, by cold in winter and by mould

Table 4.1

#### Extent of double or triple glazing, by population density

<i>All</i> <span style="float: right;">2007</span>				
Extent of double or triple window glazing	Population density			Total
	Urban	Town & fringe	Rural <sup>a</sup>	
	%	%	%	%
All windows	76	81	71	76
Most windows	7	7	9	7
About half of the windows	3	2	4	3
A few of the windows	3	3	4	3
None of the windows	11	7	13	11
<i>Weighted bases</i>	<i>5788</i>	<i>767</i>	<i>781</i>	<i>7337</i>
<i>Unweighted bases</i>	<i>5703</i>	<i>817</i>	<i>819</i>	<i>7339</i>

<sup>a</sup> Village, hamlets and isolated dwellings.

Table 4.2

**Extent of double or triple glazing, by (estimated) year property was built**

<i>All</i>		<i>2007</i>				
Extent of double or triple window glazing	Year range					
	Before 1900	1900-1949	1950-1976	1977-1989	1990-2002	2003 or later
	%	%	%	%	%	%
All windows	44	70	85	83	91	98
Most windows	11	11	5	5	2	-
About half of the windows	7	4	2	1	1	-
A few of the windows	10	3	1	1	1	-
None of the windows	29	12	6	9	6	2
<i>Weighted bases</i>	857	2138	2246	964	738	185
<i>Unweighted bases</i>	825	2067	2372	990	739	169

Table 4.3

**Extent of double or triple glazing, by type of dwelling**

<i>All adults</i>		<i>2007</i>					
Extent of double or triple window glazing	Dwelling type						
	Detached house	Semi-detached house	End of terrace house	Terraced house	Flat or maisonette – purpose built	Flat or maisonette – conversion	Other
	%	%	%	%	%	%	%
All windows	82	80	76	69	75	31	69
Most windows	7	8	8	7	4	13	4
About half of the windows	3	3	3	3	1	4	4
A few of the windows	3	2	2	4	1	11	2
None of the windows	5	7	12	16	19	41	21
<i>Weighted bases</i>	1764	2403	629	1515	777	182	67
<i>Unweighted bases</i>	1762	2393	629	1500	839	138	77

Table 4.4

**Extent of double or triple glazing, by housing tenure**

<i>All</i>		<i>2007</i>		
Extent of double or triple window glazing	Housing tenure			
	Owner occupiers	Social renters	Private renters	
	%	%	%	
All windows	80	74	60	
Most windows	8	3	10	
About half of the windows	3	2	3	
A few of the windows	3	2	4	
None of the windows	7	20	23	
<i>Weighted bases</i>	5142	1205	970	
<i>Unweighted bases</i>	5167	1354	804	

Table 4.5

### Central heating system and central heating in living room, by population density

<i>All</i>		<i>2007</i>			
Central heating system	Population density			Total	
	Urban	Town & fringe	Rural <sup>d</sup>		
	%	%	%		
No central heating <sup>a</sup>	8	8	14	9	
Central heating not main heating in living room <sup>b</sup>	11	10	19	12	
<i>Weighted bases<sup>c</sup></i>	<i>5791</i>	<i>768</i>	<i>783</i>	<i>7341</i>	
<i>Unweighted bases</i>	<i>5708</i>	<i>819</i>	<i>821</i>	<i>7348</i>	

<sup>a</sup> Have no central heating system in home.

<sup>b</sup> Do not use central heating as main type of heating in living room in the winter.

<sup>c</sup> Bases are shown for no central heating, base for central heating not main heating in living room is of similar magnitude.

<sup>d</sup> Village, hamlets and isolated dwellings.

Table 4.6

### Central heating system and central heating in living room, by (estimated) year property was built

<i>All</i>		<i>2007</i>				
Central heating system	Year range					
	Before 1900	1900-1949	1950-1976	1977-1989	1990-2002	2003 or later
	%	%	%	%	%	%
No central heating <sup>a</sup>	12	6	7	11	12	11
Central heating not main heating in living room <sup>b</sup>	17	10	10	13	13	12
<i>Weighted bases<sup>c</sup></i>	<i>857</i>	<i>2138</i>	<i>2247</i>	<i>966</i>	<i>739</i>	<i>185</i>
<i>Unweighted bases</i>	<i>826</i>	<i>2067</i>	<i>2373</i>	<i>994</i>	<i>740</i>	<i>169</i>

<sup>a</sup> Have no central heating system in home.

<sup>b</sup> Do not use central heating as main type of heating in living room in the winter.

<sup>c</sup> Bases are shown for no central heating, base for central heating not main heating in living room is of similar magnitude.

Table 4.7

### Central heating system and central heating in living room, by type of dwelling

<i>All</i>		<i>2007</i>					
Central heating system	Dwelling type						
	Detached house	Semi-detached house	End of terrace house	Terraced house	Flat or maisonette – purpose built	Flat or maisonette – conversion	Other
	%	%	%	%	%	%	%
No central heating <sup>a</sup>	4	6	8	10	23	19	19
Central heating not main heating in living room <sup>b</sup>	7	9	12	13	25	22	21
<i>Weighted bases<sup>c</sup></i>	<i>1765</i>	<i>2404</i>	<i>629</i>	<i>1515</i>	<i>778</i>	<i>182</i>	<i>68</i>
<i>Unweighted bases</i>	<i>1764</i>	<i>2396</i>	<i>629</i>	<i>1501</i>	<i>841</i>	<i>138</i>	<i>78</i>

<sup>a</sup> Have no central heating system in home.

<sup>b</sup> Do not use central heating as main type of heating in living room in the winter.

<sup>c</sup> Bases are shown for no central heating, base for central heating not main heating in living room is of similar magnitude.

Table 4.8

Central heating system	Housing tenure		
	Owner occupiers	Social renters	Private renters
	%	%	%
No central heating <sup>a</sup>	7	10	17
Central heating not main heating in living room <sup>b</sup>	10	14	19
<i>Weighted bases<sup>c</sup></i>	<i>5141</i>	<i>1208</i>	<i>971</i>
<i>Unweighted bases</i>	<i>5168</i>	<i>1357</i>	<i>806</i>

<sup>a</sup> Have no central heating system in home.

<sup>b</sup> Do not use central heating as main type of heating in living room in the winter.

<sup>c</sup> Bases are shown for no central heating, base for central heating not main heating in living room is of similar magnitude.

Table 4.9

Have any double or triple glazed windows and/or central heating system	Population density			Total
	Urban	Town & fringe	Rural <sup>b</sup>	
	%	%	%	
Have double/triple glazed windows and central heating	82	86	77	82
Have double/triple glazed windows only	6	7	9	7
Have central heating only	10	6	9	9
<b>No double/triple glazed windows or central heating</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>2</b>
Lacks one or both <sup>a</sup>	18	14	23	18
<i>Weighted bases</i>	<i>5788</i>	<i>767</i>	<i>781</i>	<i>7337</i>
<i>Unweighted bases</i>	<i>5703</i>	<i>817</i>	<i>819</i>	<i>7339</i>

<sup>a</sup> Has either double/triple glazed windows or central heating only, or lacks both.

<sup>b</sup> Village, hamlets and isolated dwellings.

Table 4.10

Have any double or triple glazed windows and/or central heating system	Year range					
	Before 1900	1900-1949	1950-1976	1977-1989	1990-2002	2003 or later
	%	%	%	%	%	%
Have double/triple glazed windows and central heating	64	83	87	82	85	89
Have double/triple glazed windows only	7	5	6	9	9	9
Have central heating only	24	11	5	7	3	-
<b>No double/triple glazed windows or central heating</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>
Lacks one or both <sup>a</sup>	35	17	12	18	14	11
<i>Weighted bases</i>	<i>857</i>	<i>2138</i>	<i>2246</i>	<i>964</i>	<i>738</i>	<i>185</i>
<i>Unweighted bases</i>	<i>825</i>	<i>2067</i>	<i>2372</i>	<i>990</i>	<i>739</i>	<i>169</i>

<sup>a</sup> Has either double/triple glazed windows or central heating only, or lacks both.

Table 4.11

**Window glazing and any central heating, by type of dwelling**

<i>All</i>								<i>2007</i>
Have any double or triple glazed windows and/or central heating system	Dwelling type						Other	
	Detached house	Semi-detached house	End of terrace house	Terraced house	Flat or maisonette – purpose built	Flat or maisonette – conversion		
	%	%	%	%	%	%	%	
Have double/triple glazed windows and central heating	92	88	82	76	62	48	62	
Have double/triple glazed windows only	2	5	7	8	19	11	17	
Have central heating only	4	6	10	14	15	33	19	
<b>No double/triple glazed windows or central heating</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>8</b>	<b>2</b>	
Lacks one or both <sup>a</sup>	7	12	19	24	39	52	38	
<i>Weighted bases</i>	<i>1764</i>	<i>2403</i>	<i>629</i>	<i>1515</i>	<i>777</i>	<i>182</i>	<i>67</i>	
<i>Unweighted bases</i>	<i>1762</i>	<i>2393</i>	<i>629</i>	<i>1500</i>	<i>839</i>	<i>138</i>	<i>77</i>	

<sup>a</sup> Has either double/triple glazed windows or central heating only, or lacks both.

Table 4.12

**Window glazing and any central heating, by housing tenure**

<i>All</i>				<i>2007</i>
Have any double or triple glazed windows and/or central heating system	Housing tenure			
	Owner occupiers	Social renters	Private renters	
	%	%	%	
Have double/triple glazed windows and central heating	87	73	65	
Have double/triple glazed windows only	6	8	12	
Have central heating only	6	17	18	
<b>No double/triple glazed windows or central heating</b>	<b>1</b>	<b>2</b>	<b>6</b>	
Lacks one or both <sup>a</sup>	13	27	36	
<i>Weighted bases</i>	<i>5142</i>	<i>1205</i>	<i>970</i>	
<i>Unweighted bases</i>	<i>5167</i>	<i>1354</i>	<i>804</i>	

<sup>a</sup> Has either double/triple glazed windows or central heating only, or lacks both.

Table 4.13

**Self-reported thermal comfort, mould and financial strain, by population density**

<i>All</i>					<i>2007</i>
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Population density				
	Urban	Town & fringe	Rural <sup>h</sup>	Total	
	%	%	%	%	
Used less fuel <sup>a</sup>	16	10	10	14	
Disconnected/in fuel debt	3	2	1	3	
Cold in winter	4	2	4	4	
Any mould in home <sup>d</sup>	13 <sup>^</sup>	12 <sup>^</sup>	16 <sup>^</sup>	13	
Mould excluding bathroom, etc <sup>e</sup>	9 <sup>^</sup>	8 <sup>^</sup>	10 <sup>^</sup>	9	
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>24</b>	<b>18</b>	<b>20</b>	<b>23</b>	
<i>Weighted bases<sup>g</sup></i>	<i>5743</i>	<i>765</i>	<i>778</i>	<i>7286</i>	
<i>Unweighted bases</i>	<i>5669</i>	<i>817</i>	<i>816</i>	<i>7302</i>	

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

<sup>h</sup> Village, hamlets and isolated dwellings.

<sup>^</sup> Differences are not statistically significant.

Table 4.14

### Self-reported thermal comfort, mould and financial strain, by (estimated) year property was built

<i>All</i>		<i>2007</i>				
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Estimated age of property					
	Before 1900	1900-1949	1950-1976	1977-1989	1990-2002	2003 or later
	%	%	%	%	%	%
Used less fuel	14	16	14	13	12	10
Disconnected/in fuel debt	2 <sup>^</sup>	4 <sup>^</sup>	3 <sup>^</sup>	2 <sup>^</sup>	3 <sup>^</sup>	3
Cold in winter	8	4	3	4	4	2
Any mould in home <sup>d</sup>	19	15	11	14	9	4
Mould excluding bathroom, etc <sup>e</sup>	14	10	7	9	3	9
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>28</b>	<b>26</b>	<b>21</b>	<b>21</b>	<b>17</b>	<b>14</b>
<i>Weighted bases<sup>g</sup></i>	<i>852</i>	<i>2120</i>	<i>2233</i>	<i>961</i>	<i>735</i>	<i>183</i>
<i>Unweighted bases</i>	<i>821</i>	<i>2052</i>	<i>2364</i>	<i>987</i>	<i>736</i>	<i>168</i>

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

<sup>^</sup> Differences are not statistically significant.

Table 4.15

### Self-reported thermal comfort, mould and financial strain, by type of dwelling

<i>All</i>		<i>2007</i>					
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Dwelling type						
	Detached house	Semi-detached house	End of terrace house	Terraced house	Flat or maisonette – purpose built	Flat or maisonette – conversion	Other
	%	%	%	%	%	%	%
Used less fuel	9	12	17	18	22	16	5
Disconnected/in fuel debt	1	2	5	5	7	3	5
Cold in winter	2	3	8	4	6	12	4
Any mould in home <sup>d</sup>	11	12	17	16	16	22	11
Mould excluding bathroom, etc <sup>e</sup>	7	8	12	11	12	17	9
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>16</b>	<b>20</b>	<b>29</b>	<b>27</b>	<b>33</b>	<b>37</b>	<b>19</b>
<i>Weighted bases<sup>g</sup></i>	<i>1758</i>	<i>2397</i>	<i>626</i>	<i>1493</i>	<i>770</i>	<i>176</i>	<i>65</i>
<i>Unweighted bases</i>	<i>1758</i>	<i>2387</i>	<i>626</i>	<i>1487</i>	<i>831</i>	<i>136</i>	<i>76</i>

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

Table 4.16

### Self-reported thermal comfort, mould and financial strain, by housing tenure

<i>All</i>		<i>2007</i>		
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Housing tenure			
	Owner occupiers	Social renters	Private renters	
	%	%	%	
Used less fuel	1	7	5	
Disconnected/in fuel debt	1	7	7	
Cold in winter	2	10	7	
Any mould in home <sup>d</sup>	11	19	21	
Mould excluding bathroom, etc <sup>e</sup>	7	13	15	
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>17</b>	<b>39</b>	<b>33</b>	
<i>Weighted bases<sup>g</sup></i>	<i>5124</i>	<i>1203</i>	<i>939</i>	
<i>Unweighted bases</i>	<i>5151</i>	<i>1352</i>	<i>784</i>	

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

Table 4.17

### Self-reported thermal comfort, mould and financial strain, by extent of double or triple window glazing

<i>All</i>		<i>2007</i>				
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Extent of double or triple window glazing					
	All windows	Most windows	About half of the windows	Few of the windows	None	
	%	%	%	%	%	
Used less fuel	14 <sup>^</sup>	17 <sup>^</sup>	13 <sup>^</sup>	17 <sup>^</sup>	19	
Disconnected/in fuel debt	3	4	3	2	5	
Cold in winter	3	4	6	7	11	
Any mould in home <sup>d</sup>	3	4	6	7	11	
Mould excluding bathroom, etc <sup>e</sup>	8	11	15	16	15	
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>21</b>	<b>27</b>	<b>28</b>	<b>32</b>	<b>33</b>	
<i>Weighted bases<sup>g</sup></i>	<i>5552</i>	<i>514</i>	<i>193</i>	<i>208</i>	<i>811</i>	
<i>Unweighted bases</i>	<i>5632</i>	<i>490</i>	<i>190</i>	<i>206</i>	<i>774</i>	

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

<sup>^</sup> Differences are not statistically significant.

Table 4.18

<b>Self-reported thermal comfort, mould and financial strain, by whether have central heating system</b>		
<i>All</i>	<i>2007</i>	
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d,e</sup>	Central heating	
	No central heating %	Have central heating %
Used less fuel	18	14
Disconnected/in fuel debt	4 <sup>^</sup>	3 <sup>^</sup>
Cold in winter	13	3
Any mould in home <sup>d</sup>	13	3
Mould excluding bathroom, etc <sup>e</sup>	14	9
<b>Any aspect of fuel related poverty<sup>f</sup></b>	<b>33</b>	<b>22</b>
<i>Weighted bases<sup>g</sup></i>	<i>620</i>	<i>6662</i>
<i>Unweighted bases</i>	<i>713</i>	<i>6586</i>

<sup>a</sup> Used less fuel than needed due to cost to in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in home in the past 12 months.

<sup>e</sup> Presence of mould in home in past 12 months, excluding bathrooms, shower rooms and toilets.

<sup>f</sup> Based on used less fuel, disconnected/ in fuel debt, cold in winter and mould excluding bathroom etc.

<sup>g</sup> Bases are shown for cold in winter, bases for other variables will vary but be of similar magnitude.

<sup>^</sup> Differences are not statistically significant.

Table 4.19

<b>Social impact of cold home, by housing tenure</b>				
<i>All with cold homes in winter</i>				<i>2007</i>
Whether reluctant to invite family/friends to home because too cold	Housing tenure			Total %
	Owner occupiers %	Social renters %	Private renters %	
Yes	19	29	27	25
No	81	71	73	75
<i>Weighted bases</i>	<i>116</i>	<i>117</i>	<i>70</i>	<i>303</i>
<i>Unweighted bases</i>	<i>119</i>	<i>133</i>	<i>66</i>	<i>318</i>

Table 4.20

<b>Room in home, by cold in winter and by mould</b>		
<i>All with cold homes in winter or have mould</i>		
<i>2007</i>		
Problem room	Cold home <sup>a</sup> %	Mould <sup>b</sup> %
All rooms	33	4
Living room	39	20
Adult's bedrooms	29	32
Children's bedroom	14	14
Kitchen	25	17
Bathroom, toilets or shower rooms	16	16
<i>Weighted bases</i>	<i>289</i>	<i>921</i>
<i>Unweighted bases</i>	<i>306</i>	<i>866</i>

<sup>a</sup> Unable to keep home warm enough in winter in the past 12 months.

<sup>b</sup> Had any mould in house in the past 12 months.

## Tables for Chapter 5

### Fuel related poverty and household composition

- 5.1 Aspects of fuel related poverty, by household type
- 5.2 Aspects of fuel related poverty, by lone or dual parent status
- 5.3 Aspects of fuel related poverty, by sex of respondent
- 5.4 Aspects of fuel related poverty, by sex of household reference person

Table 5.1

#### Aspects of fuel related poverty, by household type

All APMS 2007

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Household type							Total
	1 adult 16-59, no children	2 adults 16-59, no children	Small family	Large family	Large adult family	2 adults one or both 60+, no children	1 adult 60+, no children	
	%	%	%	%	%	%	%	%
Used less fuel than needed	24	12	17	17	14	10	14	14
Disconnected/in fuel debt	8	2	5	4	2	0	1	3
Feel cold at home in winter	7	4	6	6	3	2	3	4
Mould in home	9	10	12	18	8	5	3	9
<i>Weighted bases<sup>e</sup></i>	<i>554</i>	<i>1594</i>	<i>1247</i>	<i>469</i>	<i>1697</i>	<i>1173</i>	<i>587</i>	<i>7321</i>
<i>Unweighted bases</i>	<i>879</i>	<i>1417</i>	<i>1241</i>	<i>365</i>	<i>952</i>	<i>1283</i>	<i>1198</i>	<i>7335</i>

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in in home in the past 12 months (excluding bathrooms, shower rooms and toilets).

<sup>e</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

Table 5.2

**Aspects of fuel related poverty, by lone or dual parent status***All* *APMS 2007*

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Children present in household		
	1 adult & child/ children	At least 2 adults & child/ children	No children aged under 16
	%	%	%
Used less fuel than needed <sup>a</sup>	23	15	14
Disconnected/in fuel debt <sup>b</sup>	9	3	3
Feel cold at home in winter <sup>c</sup>	10	4	4
Mould in home <sup>d</sup>	13	13	7
<i>Weighted bases<sup>e</sup></i>	<i>490</i>	<i>1554</i>	<i>5278</i>
<i>Unweighted bases</i>	<i>512</i>	<i>1281</i>	<i>5542</i>

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in in home in the past 12 months (excluding bathrooms, shower rooms and toilets).

<sup>e</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

Table 5.3

**Aspects of fuel related poverty, by sex of respondent***All* *APMS 2007*

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Sex of respondent	
	Men	Women
	%	%
Used less fuel than needed <sup>a</sup>	13*	16*
Disconnected/in fuel debt <sup>b</sup>	3	3
Feel cold at home in winter <sup>c</sup>	4*	5*
Mould in home <sup>d</sup>	8	10
<i>Weighted bases<sup>e</sup></i>	<i>3555</i>	<i>3766</i>
<i>Unweighted bases</i>	<i>3165</i>	<i>4168</i>

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in in home in the past 12 months (excluding bathrooms, shower rooms and toilets).

<sup>e</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

\* Differences are statistically significant.

Table 5.4

**Aspects of fuel related poverty, by sex of household reference person***Respondents who are the household reference person* *2007*

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Sex of household reference person	
	Men	Women
	%	%
Used less fuel than needed <sup>a</sup>	14*	20*
Disconnected/in fuel debt <sup>b</sup>	3	4
Feel cold at home in winter <sup>c</sup>	4*	6*
Mould in home <sup>d</sup>	8	9
<i>Weighted bases<sup>e</sup></i>	<i>2615</i>	<i>1737</i>
<i>Unweighted bases</i>	<i>2577</i>	<i>2406</i>

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in in home in the past 12 months (excluding bathrooms, shower rooms and toilets).

<sup>e</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

\* Differences are statistically significant.

## Tables for Chapter 6

### Types of poverty – a latent class analysis

- 6.1 Eleven poverty indicators, by cluster membership
- 6.2 Odds ratios (OR) and 95% confidence intervals (CI) for cluster membership by socio-demographic variables

Table 6.1					
Eleven poverty indicators, by cluster membership					
<i>All (with valid household income)</i>					2007
Poverty indicators	Cluster				All
	Managing on a higher income	Managing on a low income	Struggling on a low income	Struggling on a higher income	
	%	%	%	%	%
Used less fuel <sup>a</sup>	6	34	51	49	13
Fuel disconnected <sup>b</sup>	0	1	1	2	0
In fuel debt <sup>c</sup>	0	0	28	30	3
Cold home <sup>d</sup>	1	19	30	12	5
Mould <sup>e</sup>	11	20	33	31	14
Income less than £10,575 <sup>f</sup>	9	72	96	0	20
In receipt of any benefits <sup>g</sup>	17	92	87	47	30
Unemployed <sup>h</sup>	0	9	16	2	2
Seriously behind with other debts <sup>i</sup>	1	1	78	78	8
Borrowed <sup>j</sup>	3	7	66	61	9
Suffered a major financial crisis in last 6 months <sup>k</sup>	1	1	9	4	1
<i>Unweighted bases<sup>l</sup></i>	4679	605	293	250	5827

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Problem debt with gas, electricity or other fuel supplier in past 12 months.

<sup>d</sup> Felt cold at home in winter.

<sup>e</sup> Presence of mould in any room in home in the past 12 months.

<sup>f</sup> Based on equivalised household income.

<sup>g</sup> Excludes maternity or state pensions.

<sup>h</sup> Economic activity of respondent classed as unemployed.

<sup>i</sup> Reported other (non-fuel related) problem debt.

<sup>j</sup> Having borrowed money from a pawnbroker, moneylender, family or friends.

<sup>k</sup> Includes being sacked or made redundant, looking for work without success for more than 1 month, major financial crisis like losing 3 months of income.

<sup>l</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

Table 6.2

## Odds ratios (OR) and 95% confidence intervals (CI) for cluster membership by socio-demographic variables

Socio-demographic variables	N	Managing on a higher income		Managing on a low income		Struggling on a low income		Struggling on a higher income	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Sex</b>									
Men	2535	1		1		1		1	
Women	3292	0.69*	0.58 - 0.82	1.48*	1.19 - 1.85	1.06	0.75 - 1.48	1.29	0.91 - 1.83
<b>Age group</b>									
16-24	313	1		1		1		1	
25-34	868	0.83	0.55 - 1.26	1.70*	0.99 - 2.92	0.72	0.45 - 1.16	1.02	0.57 - 1.80
35-44	1251	0.89	0.59 - 1.36	2.00*	1.12 - 3.58	0.67	0.41 - 1.10	0.81	0.45 - 1.43
45-54	955	0.82	0.49 - 1.36	3.20*	1.67 - 6.13	0.58	0.33 - 1.01	0.46*	0.24 - 0.89
55-64	989	1.09	0.65 - 1.81	3.26*	1.70 - 6.27	0.44*	0.21 - 0.92	0.23*	0.10 - 0.51
65-74	810	2.26*	1.31 - 3.89	2.29*	1.16 - 4.54	0.04*	0.01 - 0.15	0.16*	0.06 - 0.39
75+	641	2.10*	1.12 - 3.93	2.78*	1.30 - 5.98	0.02*	0.00 - 0.11	0.12*	0.04 - 0.35
<b>Ethnicity</b>									
White	5420	1		1		1		1	
Black	140	0.76	0.45 - 1.29	0.69	0.35 - 1.36	2.12	0.93 - 4.82	1.21	0.59 - 2.50
South Asian	144	0.45*	0.29 - 0.72	2.44*	1.41 - 4.21	1.04	0.41 - 2.59	1.76	0.90 - 3.45
Mixed or other	117	1.07	0.59 - 1.96	1.42	0.69 - 2.93	0.74	0.34 - 1.61	0.68	0.26 - 1.79
<b>Marital status</b>									
Married	2827	1		1		1		1	
Cohabiting	530	0.76	0.56 - 1.04	1.19	0.83 - 1.71	1.43	0.85 - 2.42	1.18	0.69 - 1.99
Single	1012	0.57*	0.41 - 0.79	1.94*	1.33 - 2.85	1.76	0.98 - 3.16	1.45	0.85 - 2.48
Widowed	694	0.99	0.68 - 1.43	1.03	0.69 - 1.53	1.63	0.60 - 4.46	1.19	0.55 - 2.58
Divorced	577	0.46*	0.33 - 0.65	1.51*	1.00 - 2.28	3.69*	1.92 - 7.11	1.98	1.11 - 3.56
Separated	187	0.43*	0.27 - 0.67	1.87*	1.06 - 3.29	2.38*	1.05 - 5.43	2.03	0.98 - 4.18

Continued...

Table 6.2

Table 6.2 continued

Socio-demographic variables	N	Managing on a higher income			Managing on a low income			Struggling on a low income			Struggling on a high income		
		OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper
<b>Children present in household</b>													
One adult and child/children in household	412												
At least two adults and child/children in household	1145	1.60*	1.06	2.41	1.27	0.78	2.06	0.87	0.47	1.61	1.03	0.53	2.01
No children aged under 16	4270	3.35*	2.36	4.75	0.47*	0.30	0.73	0.29*	0.20	0.44	1.41	0.79	2.53
<b>Urban/rural</b>													
Urban	4533	1			1			1			1		
Town and fringe	664	1.10	0.80	1.50	1.07	1.97	3.29	0.77	0.40	1.47	0.87	0.48	1.57
Rural	630	1.61*	1.13	2.29	0.78	1.33	2.58	0.50	0.21	1.21	0.66	0.36	1.24
<b>Highest educational qualification</b>													
Degree	1175	1			1			1			1		
Teaching, HND, nursing	426	0.58*	0.36	0.94	1.31	0.75	2.28	1.58	0.63	3.98	2.03	1.02	4.02
A Level	765	0.56*	0.39	0.81	2.16*	1.36	3.43	1.24	0.60	2.54	1.38	0.76	2.50
GCSE or equivalent	1469	0.42*	0.31	0.57	2.67*	1.76	4.04	1.70	0.89	3.23	1.69	1.02	2.80
Foreign/other	216	0.37*	0.22	0.64	3.21*	1.75	5.90	1.42	0.50	3.99	1.12	0.40	3.11
No qualifications	1687	0.27*	0.19	0.37	3.45*	2.21	5.38	3.16*	1.60	6.23	1.60	0.89	2.87
<b>Housing tenure</b>													
Owner-occupier	4111	1			1			1			1		
Social renters	1102	0.19*	0.15	0.24	2.55*	1.97	3.29	12.07*	7.50	19.41	2.28*	1.27	3.16
Private renters	614	0.34*	0.26	0.45	1.85*	1.33	2.58	7.13*	4.35	11.69	2.01*	0.99	3.66
<b>IMD</b>													
0.59->8.35 (least deprived)	1119	1			1			1			1		
8.35->13.72	1286	0.59*	0.42	0.83	1.49*	1.00	2.22	1.59	0.68	3.73	1.90	0.99	3.66
13.72->21.16	1134	0.48*	0.33	0.69	2.07*	1.38	3.10	1.42	0.64	3.15	2.17	1.17	4.03
21.16->34.21	1102	0.44*	0.32	0.63	2.24*	1.49	3.36	2.21	0.97	5.05	1.83	0.98	3.44
34.21->86.36 (most deprived)	1186	0.31*	0.21	0.44	3.13*	2.02	4.86	2.38	1.03	5.52	2.21	1.13	4.34

<sup>a</sup> Village, hamlets and isolated dwellings.

<sup>b</sup> IMD is a measure of multiple deprivation at the small area level. See Appendix A for details.

## Tables for Chapter 7

### Fuel related poverty and common mental disorder

- 7.1 Aspects of fuel related poverty (age standardised), by whether respondent has a common mental disorder (CMD) and sex
- 7.2 Adjusted logistic regression odds ratios (ORs) and 95% confidence intervals (CIs) for having CMD

Table 7.1			
Aspects of fuel related poverty (age standardised), by whether respondent has a common mental disorder (CMD) and sex <sup>a</sup>			
All	2007		
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Meets criteria for common mental disorder		*Indicates significant difference
	Has common mental disorder %	No common mental disorder %	
<b>Men</b>			
Used less fuel	31%	11%	*
Disconnected/in fuel debt	6%	3%	*
Cold home	11%	3%	*
Mould	15%	7%	*
<b>Women</b>			
Used less fuel	25%	13%	*
Disconnected/in fuel debt	7%	2%	*
Cold home	9%	4%	*
Mould	15%	8%	*
<b>All adults</b>			
Used less fuel	27%	12%	*
Disconnected/in fuel debt	6%	2%	*
Cold home	10%	3%	*
Mould	15%	8%	*
<i>Weighted bases<sup>e</sup></i>			
<i>Men</i>	436	3118	
<i>Women</i>	735	3031	
<i>All adults</i>	1171	6149	
<i>Unweighted bases</i>			
<i>Men</i>	408	2757	
<i>Women</i>	837	3331	
<i>All adults</i>	1245	6088	

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room in the past 12 months (excluding bathrooms, shower rooms and toilets).

<sup>e</sup> Bases shown are for 'used less fuel than needed'. Base sizes for other variables are of similar magnitude.

<sup>^</sup> There were no significant interactions by sex and fuel related poverty.

Table 7.2				
Adjusted <sup>a</sup> logistic regression odds ratios (OR) <sup>b</sup> and 95% confidence intervals (CI) for having CMD				
All	2007			
	N	OR	95% CI	
			Lower	Upper
<b>Fuel related poverty markers<sup>c</sup></b>				
Have not used less fuel	6245	1		
Used less fuel	1088	1.77*	1.46	2.16
Home not cold	6983	1		
Cold home	319	1.85*	1.33	2.58
No mould	6697	1		
Mould	626	1.52*	1.19	1.94
<b>Housing tenure</b>				
Owner-occupier	5174	1		
Social renters	1357	1.58*	1.29	1.94
Private renters	806	0.93	0.71	1.22
<b>IMD<sup>c</sup></b>				
0.59->8.35 (least deprived)	1427	1		
8.35->13.72	1649	1.17	0.91	1.51
13.72->21.16	1479	1.53*	1.20	1.94
21.16->34.21	1396	1.20	0.89	1.60
34.21->86.36 (most deprived)	1510	1.33*	1.01	1.74
<b>Problem debt (non-fuel only)</b>				
No problem debt	6780	1		
Has problem debt	551	1.87*	1.43	2.44
<b>Borrowed money</b>				
No	6738	1		
1 source	471	1.67*	1.27	2.21
2 or more sources	126	1.69*	1.02	2.82
<b>Sex</b>				
Male	3226	1		
Female	4235	1.71*	1.45	2.02
<b>Age group</b>				
16-24	573	1		
25-34	1040	1.38	0.98	1.94
35-44	1419	1.40*	1.00	1.97
45-54	1138	1.86*	1.31	2.62
55-64	1282	1.31	0.91	1.89
65-74	1034	0.86	0.58	1.28
75+	975	0.64	0.41	1.01
<b>Marital status</b>				
Married	3554	1		
Cohabiting	615	1.08	0.82	1.42
Single	1438	1.24*	1.01	1.52
Widowed	958	1.45*	1.12	1.88
Divorced	672	1.43*	1.12	1.83
Separated	224	1.38	0.97	1.95

<sup>a</sup> Adjusted for income, housing and other sociodemographic variables.

<sup>b</sup> Only variables significant in the final model are presented here.

<sup>c</sup> IMD is a measure of multiple deprivation at the small area level. See Appendix A for details.

<sup>o</sup> There was no significant association for fuel related debt and CMD, so this is not presented.

\* Denotes significant difference from reference category.

## Tables for Chapter 8

### Fuel related poverty and household composition

- 8.1 Aspects of fuel related poverty (age standardised), by whether respondent had a physical health condition in past year and sex
- 8.2 Adjusted logistic regression odds ratios (OR) and 95% confidence intervals (CI) for had a physical health condition in past year
- 8.3 Aspects of fuel related poverty (age standardised), by whether respondent had a respiratory illness in past year and sex
- 8.4 Adjusted logistic regression odds ratios (OR) and 95% confidence intervals (CI) for had a respiratory illness in past year
- 8.5 Aspects of fuel related poverty (age standardised), by whether respondent had CVD in past year and sex
- 8.6 Aspects of fuel related poverty, by whether respondent had a functional impairment and sex

Table 8.1

#### Aspects of fuel related poverty (age standardised), by whether respondent had a physical health condition in past year and sex

All 2007

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Any physical health condition <sup>e</sup>		*Indicates significant difference
	None	One or more	
	%	%	
<b>Men</b>			
Used less fuel	12	14	NS
Disconnected/ in fuel debt	3	3	NS
Cold home	3	4	NS
Mould	7	9	*
<b>Women</b>			
Used less fuel	13	17	*
Disconnected/ in fuel debt	3	3	NS
Cold home	3.	5.	*
Mould	8.	11	*
<b>All adults</b>			
Used less fuel	13	16	*
Disconnected/ in fuel debt	3	3	NS
Cold home	3	5	*
Mould	7	10	*
<i>Bases (weighted)</i>			
<i>Men</i>	1447	2119	
<i>Women</i>	1235	2540	
<i>All adults</i>	2681	4659	
<i>Bases (unweighted)<sup>f</sup></i>			
<i>Men</i>	1142	2028	
<i>Women</i>	1225	2950	
<i>All adults</i>	2367	4978	

<sup>a</sup> Used less fuel than needed in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room (except the bathroom) in the past 12 months.

<sup>e</sup> Physical health condition diagnosed by a doctor and present in the past 12 months.

<sup>f</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

Table 8.2

Adjusted logistic regression odds ratios (OR) <sup>a</sup> and 95% confidence intervals (CI) for had a physical health condition in past year				
	N	OR	95% CI	
			Lower	Upper
<i>All</i> <span style="float: right;"><i>2007</i></span>				
<b>Mould</b>				
No mould	6617	1		
Mould	663	1.38*	1.14	1.67
<b>Housing tenure</b>				
Owner-occupier	5118	1		
Social renters	1199	1.28*	1.10	1.49
Private renters	964	1.08	0.89	1.31
<b>Urban/rural</b>				
Urban	5748	1		
Town/fringe	761	1.22	0.99	1.50
Rural	771	0.74*	0.62	0.89
<b>Sex</b>				
Male	3534	1		
Female	3746	1.38*	1.23	1.55
<b>Age group</b>				
16-24	1016	1		
25-34	1202	1.32*	1.08	1.62
35-44	1412	1.73*	1.42	2.12
45-54	1180	2.95*	2.37	3.67
55-64	1088	4.99*	3.94	6.32
65-74	753	5.93*	4.57	7.68
75+	630	8.09*	6.11	10.72
<b>Ethnic group</b>				
White	6568	1		
Black	221	0.60*	0.44	0.84
South Asian	279	0.72	0.52	1.00
Other	214	0.69*	0.48	0.99

<sup>a</sup> Only variables significant in the final model are presented here

\* Denotes significant difference from reference category

Table 8.3

Aspects of fuel related poverty (age standardised), by whether respondent had a respiratory illness in past year and sex				
	All	2007		*Indicates significant difference
		Yes	No	
<b>Fuel usage,<sup>a</sup> fuel debt,<sup>b</sup> cold home<sup>c</sup> and mould<sup>d</sup></b>				
		Yes	No	
		%		
<b>Men</b>				
Used less fuel		19	13	*
Disconnected/ in fuel debt		6	3	*
Cold home		8	3	*
Mould		12	8	NS
<b>Women</b>				
Used less fuel		21	15	*
Disconnected/ in fuel debt		5	3	*
Cold home		6	6	NS
Mould		12	9	NS
<b>All adults</b>				
Used less fuel		20	14	*
Disconnected/ in fuel debt		6	3	*
Cold home		7	4	*
Mould		12	9	*
<b>Bases (weighted)</b>				
<i>Men</i>		325	3244	
<i>Women</i>		422	3355	
<i>All adults</i>		746	6599	
<b>Bases (unweighted)<sup>f</sup></b>				
<i>Men</i>		303	2870	
<i>Women</i>		494	3683	
<i>All adults</i>		797	6553	

<sup>a</sup> Used less fuel than needed in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room (except the bathroom) in the past 12 months.

<sup>e</sup> Bronchitis, emphysema and/or asthma diagnosed by a doctor and present in the past 12 months.

<sup>f</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

Table 8.4

**Adjusted logistic regression odds ratios (OR)<sup>a</sup> and 95% confidence intervals (CI) for had a respiratory illness in past year**

<i>All</i>		<i>2007</i>		
	N	OR	95% CI	
			Lower	Upper
<b>Thermal comfort</b>				
Home not cold	300	1		
Cold home	6922	0.66*	0.46	0.96
<b>Fuel debt</b>				
Not in fuel debt	7046	1		
In fuel debt	176	1.75*	1.14	2.69
<b>Mould (not significant at 95%)</b>				
No mould	6565	1		
Mould	657	1.29	0.97	1.72
<b>Housing tenure</b>				
Owner-occupier	5095	1		
Social renters	1191	1.35*	1.09	1.66
Private renters	936	1.05	0.79	1.40
<b>Urban/rural</b>				
Urban	5697	1		
Town/fringe	757	1.19	0.88	1.61
Rural	768	0.72*	0.53	0.97
<b>DVIL03a</b>				
In employment	4398	1		
Unemployed	203	0.98	0.55	1.73
Economically inactive	2620	1.48*	1.18	1.85

<sup>a</sup> Only variables found to be significant and included in the final model are presented here, except for mould where p=0.077. Although mould is not therefore significant at 95%, this result does suggest an association is likely. Adjustment was also made for age group, although this was not significant when other factors were controlled for.

\* Denotes significant difference from reference category.

Table 8.5

**Aspects of fuel related poverty (age standardised), by whether respondent had cardiovascular disease (CVD) in past year and sex**

<i>All</i>		<i>2007</i>		
Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Presence of CVD <sup>e</sup>		*Indicates significant difference	
	Yes	No		
	Yes	No		
	%	%		
<b>Men</b>				
Used less fuel	21	13	NS	
Disconnected/ in fuel debt	7	3	*	
Cold home	6	3	NS	
Mould	7	9	NS	
<b>Women</b>				
Used less fuel	20	15	NS	
Disconnected/ in fuel debt	3	3	NS	
Cold home	8	5	*	
Mould	10	10	NS	
<b>All adults</b>				
Used less fuel	20	14	*	
Disconnected/ in fuel debt	5	3	NS	
Cold home	7	4	NS <sup>g</sup>	
Mould	9	9	NS	
<b>Bases (weighted)</b>				
<i>Men</i>	624	2944		
<i>Women</i>	699	3077		
<i>All adults</i>	1324	6021		
<b>Bases (unweighted)<sup>f</sup></b>				
<i>Men</i>	694	2479		
<i>Women</i>	911	3266		
<i>All adults</i>	1605	5745		

<sup>a</sup> Used less fuel than needed in the past 12 months due to cost.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room (except the bathroom) in the past 12 months.

<sup>e</sup> Cardiovascular disease (CVD) diagnosed by a doctor and present in the past 12 months.

<sup>f</sup> Bases are shown for those with a response to any indicator. Individual indicator bases will be of similar magnitude.

<sup>g</sup> There is a significant interaction with sex.

Table 8.6

**Aspects of fuel related poverty (age standardised), by whether respondent had a functional impairment and sex**

All

2007

Fuel usage, <sup>a</sup> fuel debt, <sup>b</sup> cold home <sup>c</sup> and mould <sup>d</sup>	Number of activities of daily living have difficulty with <sup>e</sup>				*Indicates significant difference
	0	1	2	3 or more	
	%	%	%	%	
<b>Men</b>					
Used less fuel	9	22	23	27	*
Disconnected/ in fuel debt	2	4	4	10	*
Cold home	2	7	4	14	*
Mould	7	13	14	13	*
<b>Women</b>					
Used less fuel	13	19	24	30	*
Disconnected/ in fuel debt	2	3	5	14	*
Cold home	3	6	8	10	*
Mould	8	11	15	15	*
<b>All adults</b>					
Used less fuel	11	20	23	29	*
Disconnected/ in fuel debt	2	3	4	12	*
Cold home	3	7	6	12	*
Mould	8	12	14	14	*
<i>Bases (weighted)</i>					
<i>Men</i>	2454	532	226	356	
<i>Women</i>	2491	555	247	484	
<i>All adults</i>	4945	1087	473	840	
<i>Bases (unweighted)<sup>f</sup></i>					
<i>Men</i>	2052	496	220	405	
<i>Women</i>	2537	664	320	656	
<i>All adults</i>	4589	1160	540	1061	

<sup>a</sup> Used less fuel than needed due to cost worries in the past 12 months.

<sup>b</sup> Disconnected fuel supply or seriously behind in paying fuel bills in the past 12 months.

<sup>c</sup> Felt cold at home in winter.

<sup>d</sup> Presence of mould in any room (except the bathroom) in the past 12 months.

<sup>e</sup> As measured by the number of Activities of Daily Living (ADL) that the respondent reports difficulty doing without help.

<sup>f</sup> Bases shown are for 'any aspect'. Base sizes for other variables are of similar magnitude.

This report presents secondary analyses of the Adult Psychiatric Morbidity Survey (APMS) 2007, focusing on health, mental health and housing conditions in England. These analyses are part of a study funded by the eaga Charitable Trust and undertaken the National Centre for Social Research (NatCen), with advice and support from the UCL Energy Institute, Institute of Psychiatry (IoP) and the Health Sciences Department, University of Leicester. The NHS Information Centre for health and social care commissioned the original survey, with funds from the Department of Health.

APMS 2007 included a structured clinical assessment of mental health that allowed for the reliable diagnosis of common mental disorders such as anxiety and depression. The questionnaire also covered aspects of housing conditions and financial strain related to domestic fuel use, including presence of mould, cutting back on fuel usage, lack of central heating and double-glazing, being cold at home, and fuel-related problem debt or utility disconnection.

This report presents the prevalence of different aspects of poor housing in the English population and identifies which types of household are at greatest risk. It also explores how poor housing conditions and fuel related debt relate to other indicators of poverty, and goes on to examine associations with mental and physical health and disability.

### **National Centre for Social Research**

[www.natcen.ac.uk](http://www.natcen.ac.uk)

The National Centre for Social Research (NatCen) is an independent institute specialising in social survey and qualitative research for the development of public policy. Research is in areas such as health, housing, employment, crime, education and political and social attitudes. Projects include ad hoc, continuous and longitudinal surveys, using face to face, telephone and postal methods; many use advanced applications of computer assisted interviewing.



### **eaga Charitable Trust**

[www.eagacharitabletrust.org](http://www.eagacharitabletrust.org)

eaga Charitable Trust (eaga-CT) is a grant-giving trust that was founded by eaga plc in 1993. It currently supports projects and research in two main areas: the relief of fuel poverty and the promotion of energy efficiency; and vulnerable consumers - multiple needs and preferences.

