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Department of Energy & Climate Change

Understanding the behaviours of households in fuel poverty

A review of research evidence

July 2014

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A review of research evidence July 2014

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Executive summary

Introduction

This evidence review focuses on the behaviours and attitudes of the fuel poor, and those at risk of fuel poverty, around energy use. There were a number of drivers for the review. The first is the continuing importance of dealing with fuel poverty given its impact on households, climate change commitments and economic growth. There is also the recent change in the definition of fuel poverty, which combines information on household income and energy costs to work out whether a household is fuel poor. Finally, and perhaps most importantly, although we know quite a lot about the characteristics of the fuel poor, there is a desire to improve the understanding of the attitudes and behaviour of fuel poor households in order to aid the design of future policies.

This review summarises the existing evidence across four broad areas:

1. Knowledge and perceptions of energy efficiency;
2. Current energy behaviours and concerns;
3. Barriers and facilitators to behaviour change; and
4. Organisational and community engagement.

An important objective of the review was to assess gaps in the current evidence base. This helps to identify where new research, including future primary data collection, may be required.

Methods

The review was conducted in two stages:

- Phase 1: A systematic search and initial assessment of the evidence. This phase informed the decision to proceed to the second phase.
- Phase 2: A rapid review of the evidence. This entailed synthesising the evidence around the four broad areas listed above.

The search process was designed to be as comprehensive as possible so that both published and grey literature could be identified. This entailed identifying evidence through four sources: i) policy and industry experts, ii) online forums, iii) evidence databases and iv) 'snowballing' references. Key search terms used to identify the literature included 'fuel poverty', 'energy efficiency', 'utilities', 'heating' and 'retrofit'.

One of the key challenges in conducting the review was how to identify research specifically about the fuel poor, particularly given that the definition of fuel poverty recently changed from categorising a household as fuel poor if they needed to spend 10% of their income to heat their home to the Low Income High Costs (LIHC) definition (DECC, 2013). The LIHC definition deems a household to be in fuel poverty if it meets two criteria:

- Energy costs are higher than is typical for the given household type. In other words, the household has required fuel costs that are above average (the national median level).

- Were the household to spend that amount on fuel costs, they would be left with a residual income, after housing costs, below the official poverty line.

As anticipated, no research used the current definition. However with only a few studies using the 10% definition the focus of the review was widened to include research about groups 'at risk' of fuel poverty, using DECC's latest fuel poverty statistics on the new LIHC definition. This 'at risk' population includes people disproportionately likely to be fuel poor (e.g. the income poor, and the unemployed) and people particularly vulnerable to the impacts of fuel poverty (e.g. infants, older people, disabled people and people with a long-term illness).

The search found almost 200 pieces of evidence. An initial rapid assessment assessed the relevance of the evidence to the four thematic areas, and its methodological robustness. A total of 152 pieces of evidence were deemed both relevant and robust. Resource constraints meant the review had to be restricted to only the most relevant evidence, meaning a total of 57 pieces of evidence were reviewed at phase 2.

Key Findings

The review revealed a general lack of evidence on the behaviours and attitudes of households in fuel poverty. As already mentioned, the timing of the review meant finding evidence using the LIHC measure was unlikely. However, there was still a distinct lack of evidence that specifically identified people as fuel poor using the 10% definition – most evidence either used a proxy to identify the fuel poor (such as low income) or researched an at risk group about fuel poverty issues. As proxies do not explicitly identify people in fuel poverty – for example, not everyone living on a low income is fuel poor if they live in an energy efficient home – making conclusions from such research about the fuel poverty population is difficult. Furthermore, much of the evidence was either qualitative in nature, based on small scale surveys or focused on a specific subgroup of the 'at risk' population, such as low income households or households with older people; again making it difficult to make wider generalisations. This suggests that more research is needed to properly understand the issues this review covers.

Despite these reservations, some useful findings do emerge from the existing evidence. The main findings are summarised briefly below, along with some pointers to the key gaps, and discussed in more depth in the main body of the report.

Knowledge and perceptions of energy efficiency

The first area the review covered was households' knowledge and perceptions of energy efficiency. Helping householders to understand the importance of improving the energy efficiency of their home and adopting energy efficiency behaviours is a key element of attempts to reduce levels of fuel poverty. There has been some, albeit limited, research into these issues with 15 of the 57 pieces of evidence used in the review covering these areas.

Existing evidence

The key messages to emerge from the existing evidence were that householders' awareness and understanding of energy efficiency in the home can be driven by a complex array of factors, but that comfort and cost were key issues. For example, evidence from in-depth interviews with fuel poor householders concluded that energy efficiency was understood in terms of cutting back on energy use to achieve immediate impacts on household finances - rather than having energy efficient properties and cost-effective energy efficiency behaviours.

There is evidence that groups vulnerable to fuel poverty, such as older people, can be unaware of energy efficiency programmes and schemes that they could benefit from. There is also

evidence from older people and social tenants of uncertainty about using such initiatives if there is a risk of short-term cost implications.

Remaining gaps

Despite there being some useful messages to take from the existing literature, gaps in the evidence remain. Further research is required to investigate:

- The lack of evidence around the fuel poor's attitudes to energy efficiency. Existing research studies have tended to focus on the 'poverty' aspect of being fuel poor rather than the energy efficiency of people's homes.
- How those in fuel poverty perceive their situation, particularly the balance between whether it is caused by being unable to achieve good levels of energy efficiency in their home, the costs of energy, and, not having enough income to pay for energy bills.
- Knowledge of existing programmes to help improve energy efficiency in the home, particularly disaggregated by type of programme, scheme or grant available to householders – at both national and local levels.
- The capacity of the fuel poor to pay for improved energy efficiency according to their assets and debts. For example, suppliers will not allow customers to switch when they are in debt. As income is not always a good measure of resources for older people, who tend to have a lower income and higher savings.

Current energy behaviours and concerns

The second area the review covers is current energy behaviours and concerns. This includes collecting evidence on the behaviours of householders in relation to how they heat their homes, for example by controlling the heating in their homes and strategies for keeping warm in a cold home, and what motivates this behaviour. It also looks at the level of engagement with energy usage and bills. This area has a higher number of relevant pieces of literature (38 of the 57 evidence pieces reviewed for this report).

Existing evidence

Households employed a wide range of efficiency (how to make the most efficient use of the heat) and sufficiency (what is the minimum that is required for a 'manageable' level of warmth) strategies to heat their homes within their budgets, and there is evidence to suggest a generational divide in preferences (and needs) for different types and forms of home heating. For example, older people who grew up with solid fuel heating or proximal heaters are more likely to utilise these forms of heating than younger generations. It is common for households at risk of fuel poverty to be very engaged with their energy usage and bills. However, tenants in both the private and social sectors can feel less engaged if their landlord has responsibility for heating systems and investments in energy efficiency measures. It seems that labelled cash transfers where money is nominally assigned to energy costs, for example the Winter Fuel Payment, can influence behaviour, such as spending more money on fuel - an area that needs to be explored further.

Remaining gaps

There is a need for further research in the following areas:

- It is not possible to ascertain from the literature reviewed whether the fuel poor prioritise reducing energy bills or increasing comfort levels, and therefore the extent to which any energy efficiency improvement gains would be taken in bill reduction or increased comfort.
- The number and characteristics of the different types of coping strategies identified in the literature, focusing on households living in and near fuel poverty.
- How fuel poor households operate their home heating systems and to what temperature they heat different parts of their homes and over what periods.
- Whether households feel that they are able to heat their home to the level of comfort they require and if not, what do they think prevents this.
- A clearer understanding of the energy use behaviours across different sub-groups of the fuel poor. In particular there is a lack of existing knowledge on disabled people and unemployed people living in fuel poverty.

Barriers and facilitators to behaviour change

The third area the review covered was the capacity of households at risk of fuel poverty to improve energy efficiency in their homes, and the factors that can trigger change in heating and energy use behaviour. This included identifying barriers such as having to pay for upgrades or new equipment, or taking action to switch supplier or access energy efficiency schemes. This area had the joint highest number of pieces of evidence used in the review (38 of the 57 evidence pieces reviewed).

Existing evidence

There appears to be capacity for at risk or vulnerable households, particularly older people, to improve on the use of their current systems, including better informed use of heating systems, timers and thermostat controls, cladding hot water tanks, insulation of windows and the use of draft excluders. Various factors could trigger such behaviour change, such as advice and clear information from a trusted source and financial incentives. However, barriers to change do exist. The process of switching energy supplier, for example, is seen as too complex and uncertain for many to feel that they can, or have the ability to, change. Evidence suggests some poorer households have anxiety about change, for fear of incurring financial costs and upsetting carefully designed coping strategies. Financial savings from switching suppliers or installing energy efficient measures had to be sufficiently large for some individuals to consider it worth the effort.

Remaining gaps

There are clear gaps in the existing evidence in terms of the coverage of behavioural theory and in the area of changing social norms for the fuel poor population. This suggests new research is required to investigate:

- Whether there are common, or systematic, barriers to energy efficiency among fuel poor households and how these vary between sub groups of the fuel poor.
- What levels of savings (or improvements in comfort) are necessary to illicit change or to invest in energy efficiency measures.
- How to positively influence changes to habitual behaviour to increase energy efficiency.

- The factors that increase the chance of behaviour change becoming permanent.

Organisational and community engagement

The fourth area the review covered was householders' level of engagement with the local community and how this impacts on knowledge and attitudes to energy use. This again was one of the areas with the least amount of evidence; with 17 of the 57 evidence pieces reviewed covering these issues.

Existing evidence

Despite the general lack of evidence in this area, findings from older people and low income households point towards information about energy issues being better received by householders if it is contextualised and socially embedded through trusted networks such as colleagues, friends, relatives and neighbours . Research with vulnerable people, including single parents, the unemployed and those on low incomes, suggests that local organisations (e.g. charities, citizen advice services and outreach services) can be regarded as a useful way to communicate information and engage householders with energy issues. These points seem even more pertinent given householders' negativity towards energy suppliers, as it would mean less potential for households to directly interact with energy companies about energy efficiency issues.

Remaining gaps

Again the amount of literature in this area was not large. Therefore some key research gaps need to be filled, including evidence on:

- How households view the range of engagement strategies used by the different energy companies (rather than by the industry as a whole).
- The current level of household engagement in the local community and how might help overcome barriers to behaviour change.
- The communication channels that fuel poor households use, which types of vulnerable groups use which channels, and how effective these channels are at impacting on attitudes and behaviour change.
- How best to communicate fuel poverty initiatives, including the role of digital communication channels such as the internet, email and social media.
- The reasons why households do not take up the initiatives designed to take them out of fuel poverty, especially those which focus on improving their energy efficiency. This will help provide pointers on the best methods to increase awareness and motivate take-up of help, particularly for those households in the greatest need.

Filling the evidence gaps: Returning to the Hills Review

Finally, given the acknowledgment that important gaps in the evidence base remain, it is worth reiterating some of the key messages from the Hills Review (2012) on how to conduct research into fuel poverty under the LIHC measure. It is challenging for research studies to be able to accurately identify people living in fuel poverty. This is because it is expensive and intrusive to properly assess a household's income and property to establish whether they are living in fuel

poverty. It is also challenging because people's circumstances change and therefore it would be erroneous to be too focused on a single cut-off.

The need for good proxy indicators of fuel poverty therefore becomes apparent. These proxies need to be based on information that can be easily and robustly collected by researchers, whether through quantitative surveys or qualitative interviews with householders. Clearly both elements of the LIHC measure need to be captured in the proxy. In terms of low income, it is not straightforward to capture information about a household's financial situation. The Review points out that the traditional proxy for low income is means-tested benefits receipt, but this only accounts for 62% of LIHC households. So thought needs to be given to how to identify those households at risk of fuel poverty who are not claiming benefits. In terms of capturing high energy costs, the review recommended collecting a small set of physical proxies about the accommodation. These include having oil, solid fuel or portable heating, living in a rural property off the gas grid, having solid walls, and being built before 1945.

Firming up these proxies and providing advice on how to research the fuel poor under the new LIHC measure would provide important information for researchers trying to fill the gaps in the existing evidence.

1. Introduction

1.1 Background

This evidence review focuses on the behaviours and attitudes of the fuel poor, and those at risk of fuel poverty, around energy use. There were a number of motivations for the review:

- The recent change in the definition of fuel poverty;
- The need to identify knowledge gaps; and
- The need to help inform current and future policy design.

The importance of fuel poverty

Fuel poverty is a problem faced by millions of households in the UK and leaves many facing difficult choices about how to budget on a limited income. It leaves many households fearing for their health or the health of their children as they live in a home that is difficult and costly to heat. The government is committed to tackling fuel poverty through The Warm Homes and Energy Conservation Act 2000 (WHECA). This Act sets out the obligation of the Secretary of State to specify a target date in the fuel poverty strategy for achieving the objective of ensuring that, as far as reasonably practicable, no person lives in fuel poverty. The Act informs the action taken by the government on fuel poverty and it obliges the government to publish and implement a strategy for reducing fuel poverty and the setting of targets for the implementation of this strategy.

Understanding the behaviour and attitudes of households at risk of fuel poverty is an important aid to the effective design of policies to reduce fuel poverty. Tackling the causes and effects of fuel poverty can lead to better health outcomes for households. While the evidence implies that there are many factors driving the rate of excess winter deaths, the Hills Review suggests that a conservative figure of 10% of excess winter deaths could be attributed to fuel poverty (2012). Groups particularly vulnerable to poor health outcomes as a result of fuel poverty are the old, young and those with a disability/ long-term illness.

A change in definition of fuel poverty

Understanding which households are fuel poor, or at risk of fuel poverty, forms an integral part of devising appropriate fuel poverty policies. Until recently, a household was deemed to be in fuel poverty if it needed to spend more than 10% of its income to maintain a specific heating regime – as set out by the 2001 Fuel Poverty Strategy (DEFRA/DTI, 2001). However, a review of fuel poverty undertaken by Professor Sir John Hills, commissioned by DECC, questioned the accuracy of this indicator (Hills, 2012). The review found the indicator was based on a number of arbitrary assumptions – for example, the level of average energy consumption 25 years ago, the ratio of energy costs to household income that was deemed ‘unreasonable’, and the temperature standards of the home. Slight adjustments to these assumptions meant that the

number of households in fuel poverty could change significantly. Furthermore, the sensitivity in the measure meant the numbers in fuel poverty was overstated in times when energy prices were high and understated when energy prices were low.

In light of the Hills Review, a new definition of fuel poverty was introduced in July 2013 following a government consultation (DECC, 2013). Using the LIHC indicator, a household is now deemed to be in fuel poverty if it meets two criteria:

- Energy costs are higher than is typical for the given household type. In other words, the household has required fuel costs that are above average (the national median level).
- Were the household to spend that amount on fuel costs, they would be left with a residual income, after housing costs, below the official poverty line.

The new indicator is seen to be helpful in gauging not only the extent of fuel poverty (i.e. how many households are fuel poor) but also its depth, by drawing on the concept of the 'fuel poverty gap' (i.e. the severity of the fuel poverty faced). The 'fuel poverty gap' measures the difference between a household's modelled bill and what their energy expenditure needs to be for them to no longer be fuel poor. Fuel costs are modelled dependent on the lifestyle of people that live in the household, the heating system and fuels used, and the dwelling characteristics.

The change to the way fuel poverty is measured has meant estimates of the number of households in fuel poverty have altered. In 2011 there were 3.2 million (14.6%) households in England in fuel poverty according to the 10% measure and 2.6 million (11.7%) according to the LIHC measure (DECC, 2013). The new measure has also resulted in corresponding changes in the types of households who are found to be fuel poor. For example, many households on higher incomes in larger homes are no longer captured, as well as some low income households who live in energy efficient homes.

1.2 Objectives

The review focuses on evidence around the behaviours and attitudes of households in and at risk of fuel poverty in relation to energy use, efficiency and bills. It does so across four thematic areas:

1. Knowledge and perceptions of energy efficiency;
2. Current energy behaviours and concerns;
3. Barriers and facilitators to behaviour change; and
4. Organisational and community engagement.

The table below provides a further breakdown of the key sub-issues within each thematic area.

Thematic area	Key sub-issues within each area
1. Knowledge and perceptions of energy efficiency	Their awareness and understanding of energy efficiency in relation to: • Their own home. • Existing programmes that can help them improve the energy efficiency of their homes. Their willingness to pay for improved energy efficiency and what affects this.
2. Current energy behaviours and	Their actual behaviours in relation to heating their home. This includes: • How they heat their home.

concerns	• Do they try to control the heating in their homes and, if so, how. • Their level of engagement with their energy usage and bills. Exploring their energy related needs**.** This includes: • Their energy concerns. • Their ability to heat their homes to the required level of comfort and what affects this. • What motivates their current behaviour (is it to improve comfort and/or reduce bills?) and how they prioritise these needs.
3. Barriers and facilitators to behaviour change	Their capacity of the fuel poor to improve energy efficiency in their homes. This includes: • What affects this capacity – including their ability to pay for this. • Which barriers are specific to the fuel poor, including to specific sub-groups. • What has been effective in overcoming these barriers (e.g. whether removing/reducing costs is effective in addressing some or all of the barriers, level of community engagement). Exploring factors that trigger change in heating behaviour (e.g. a change in heating systems) Behavioural barriers to accessing the services and support they require. This includes: • Switching to more appropriate tariffs and/or energy providers. • Accessing support under various schemes (e.g. Green Deal, Affordable Warmth etc). • What has been effective in overcoming these barriers (e.g. evidence of interventions that have been successful, community engagement).
4. Organisational and community engagement	• Their level of engagement with the local community and the impact of this on any barriers faced. • The types of intermediary organisations that the fuel poor are likely to interact with – including which are likely to trust. The communication channels that fuel poor households are most comfortable with. • Their views on their energy supplier.

Another key objective of the review was to assess gaps in the current evidence base. This helps to identify where new research, including future primary data collection, may be required.

1.3 Methodology

Phase 1: A systematic search and initial assessment of the evidence

The first phase involved a systematic search for the evidence, and an initial rapid assessment of the quality of the evidence. The systematic search process was designed to be as comprehensive as possible so that both published and grey literature could be identified. This entailed identifying evidence through four sources: a) approaching policy and industry experts, b) engaging with relevant online forums, c) searching databases of literature and d) 'snowballing' references from found literature. Key search terms used to identify the literature included 'fuel poverty', 'fuel poor', 'energy efficiency', 'utilities', 'gas', 'electricity', 'water', 'heating', 'lighting', 'cooking', 'appliances' 'metering', 'tariffs', 'disconnection', 'poverty', 'poor', 'income', 'retrofit', 'housing', 'insulation', 'suppliers', 'companies', 'single', 'lone', 'benefits', 'welfare', 'vulnerable', 'older people' and 'disabled'.

There followed a rapid assessment of the literature to verify which sources of evidence should be used in the review. This involved first checking the relevance of the evidence to the specifics of the four thematic areas. The methodological robustness of the evidence was then verified. This broadly focused on sample design, data collection and, for surveys and secondary analysis, sample size and analytical approach. Articles found in peer-reviewed journals were automatically included in the review.

Phase 2: A rapid review of the evidence

A rapid review approach was used to synthesis the evidence. This approach involved reviewing only relevant parts of the evidence – executive summary, findings section, and conclusions - and summarising across the four thematic areas. See Annex A for more detail on the methodology.

A note on the coverage of this literature review

The aim of this literature review was to gain a better understanding and consolidate existing knowledge on the attitudes and behaviours of the fuel poor. One of the key challenges in conducting the review was how to identify research specifically about the fuel poor, particularly given the change in definition of fuel poverty. Given the LIHC definition has only recently been introduced, there is limited existing research that used it to explore fuel poverty. Therefore the review also considered research that used the 10% definition.

Furthermore, the review also covered research on those 'at risk' of fuel poverty. This was done for a number of reasons. The behaviour and concerns of those close to fuel poverty are likely to be synonymous with the fuel poor. There are also issues of measurement error in research studies and it is important to remember that fuel poverty is not necessarily a permanent state. Indeed, as the Hills Review states:

"*Being relatively relaxed about the fact that some people on the wrong side of a given threshold may receive assistance makes even more sense when one considers the reality that people's situations change frequently over time, for example as they move in or out of employment, as they have children or as they move home" (Hills, 2012, p71)*

To be able to identify evidence about those at risk of fuel poverty we had to identify particular sub-groups who either had:

i) a higher than average propensity to be fuel poor; for example:

- low income (44% of bottom decile in fuel poverty, 41% of second decile)
- unemployed (34% in fuel poverty)
- lone-parents (27% in fuel poverty)
- people who use prepayment meters (23% in fuel poverty)
- young adults aged 16-24 (22% in fuel poverty)[1] (DECC, 2013)

ii) a higher fuel poverty gap; for example:

- households with someone aged 85 or more (a fuel poverty gap of £700 in 2011) (DECC, 2013)

iii) 'vulnerable households', who are defined in the Fuel Poverty Strategy as:

- infants
- older people
- disabled people
- people with a long-term illness (DECC, 2013)

It is important to remember that not everyone in the 'at risk' population will experience fuel poverty. For example, not everyone living on low income is fuel poor, particularly if they live in an energy efficient home. Likewise it is difficult to make generalisations about the fuel poor from smaller or non-representative studies – although they do provide useful examples of attitudes and behaviours. These points should be remembered when digesting the evidence presented in this report.

A summary of the types of literature reviewed

A total of 57 pieces of evidence were reviewed at phase 2. The three tables below provide a breakdown of the reviewed evidence in terms of source, methodology and subject area. It can be seen that high quality peer-reviewed journals and commissioned reports formed the bulk of the evidence reviewed (51 evidence pieces).

Describing the type of evidence: Source

Source	No. of evidence reviewed
Peer reviewed journal	24
Commissioned report	27
Thesis	1
Conference paper	4
Workshop report	1
Total	57

The majority of the evidence was empirical (44 evidence pieces).

1 There are of course other categories of households that are highly correlated with the above households who would also be deemed to be at risk of fuel poverty. For example, low income is linked to low skills, so lower skilled employees would be a risk group - as would those on means-tested benefits, including those in social housing. Younger adults tend to be at higher risk of fuel poverty partly due to their lower average earnings and the fact that the majority of this age group live in private rented accommodation, which tends to be less energy efficient and thus have higher fuel costs.

Describing the type of evidence: Methodology	
Type	**No. of evidence reviewed**
Qualitative methodology	19
Quantitative surveys	9
Mixed methods	11
Secondary data analysis	7
Review of evidence	5
Discussion paper/policy review	1
Experimental method	3
Physical monitoring	2
Total	57

The majority of the evidence related to 'current energy behaviours and concerns' and 'barriers and facilitators to behaviour change'. That the remaining two areas have been given less coverage in the literature suggests potential gaps in the evidence, and this is discussed in more detail later in the report. Note that a piece of evidence can cover more than one area, hence the numbers in the table total to more than 57.

Describing the type of evidence: Thematic area			
Area	**Sub-areas**	**No. of evidence in each sub-area**	**Total no. of evidence in area**
Knowledge & perceptions of energy efficiency	- Awareness of programmes and schemes to help improve energy efficiency in home	7	15
	- Factors affecting the willingness to improve energy efficiency in home	6	
	- Feelings and views about energy efficiency in their own homes	5	
Current energy behaviours and concerns	- How homes are actually heated	30	38
	- Level of engagement with energy usage and bills	22	
	- Energy concerns and needs of the fuel poor	21	
	- Communication channels that fuel poor are comfortable with	13	
Barriers and facilitators to behaviour change	- Capacity of the fuel poor to improve energy efficiency in home	31	38
	- Barriers to accessing support to changing energy systems to make homes more energy efficient	22	
	- Motivations and triggers to changing energy systems within home	14	
Organisational and community engagement	- Level of engagement with intermediary organisations	9	17
	- Level of engagement with energy	7	

	suppliers	
-	Level of engagement with local community	5

1.4 Report overview

The following chapters present a discussion of the evidence reviewed and the main evidence gaps. Each of the four chapters relates directly to one of the research objectives:

- Knowledge and perceptions of energy efficiency
- Current energy behaviours and concerns
- Barriers and facilitators to behaviour change
- Organisational and community engagement

The methodology is explained in more detail in Annex A. A list of all the literature used in this report, including full abstracts and links to the document, can be found in Annex B.

2. Knowledge and perceptions of energy efficiency: Households at risk of fuel poverty

Summary

The evidence on the knowledge and perceptions of energy efficiency among groups 'at risk' of fuel poverty is sparse, and often collected as part of an evaluation of a scheme to promote energy efficiency. As a result much of the evidence that exists is either qualitative or based on small scale surveys. Perceptions of energy efficiency can be driven by a complex array of factors, including comfort and cost, and often in relation to the associated benefits of having a warm home such as health, well-being and social acceptance. The evidence that exists implies that those at risk of fuel poverty can be unaware of energy efficiency programmes and schemes that they could benefit from to improve the energy efficiency of their homes. Those in or at risk of fuel poverty are on low incomes, and could be in debt and risk averse, which could make them wary or unable to pay for improved energy efficiency despite its perceived advantages.

But key gaps in the evidence base remain. Generally there is not a large library of literature on how the fuel poor understand energy efficiency strategies as a feasible route out of fuel poverty – and their decisions to use them rather than coping strategies such as financial budgeting. Linked to this there is also little evidence on the fuel poor's knowledge of existing programmes to help improve the energy efficiency of their homes, at both national and local levels. Although the evidence suggests that income poor householders can be risk averse to employing new strategies, particularly those with an up front cost, more research is needed to understand their willingness to pay for improved energy efficiency and what affects this.

2.1 Introduction

Energy efficiency means getting more from the energy that we use. Improving the energy efficiency of the home is often the most cost-effective way of making a sustained reduction in household energy costs and removing that household from fuel poverty (DECC, 2012a). There are numerous energy efficiency measures that can be used in the home, such as loft, cavity wall and solid wall insulation, heating system upgrade, draught proofing, low energy light bulbs, and energy efficient behaviour such as powering off electrical equipment when not in use.

This chapter looks at the evidence in three key areas of knowledge and perceptions of energy efficiency of households at risk of fuel poverty:

- Their awareness and understanding of energy efficiency in the home.
- Their awareness and understanding of national and local initiatives to improve energy efficiency in the home.

- Their views on paying for improved energy efficiency.

The chapter concludes with an assessment of gaps in the existing evidence. As discussed in the first chapter, this review considers evidence relating to households in fuel poverty or 'at risk' of fuel poverty – not householders in general. Some studies did make attempts to explicitly research fuel poor households and the text makes clear where the evidence explicitly refers to households experiencing fuel poverty.

2.2 Awareness and understanding of energy efficiency in the home

There has been some, albeit limited, research into the awareness and understanding of energy efficiency in the home among households at risk of fuel poverty. These tend to cover three main themes: general concerns about energy efficiency; perceived advantages of energy efficiency; and factors mediating householders' views. From the literature reviewed householders tend to understand energy efficiency in terms of immediate impacts on their living standards, such as having a warm home and being able to afford energy bills, rather than having energy efficient properties and cost-effective energy use attitudes and behaviours.

General concerns about energy efficiency

Helping householders to understand the importance of improving the energy efficiency of their home and adopting energy efficiency behaviours is a key element of attempts to reduce levels of fuel poverty. Harrington et al (2005) carried out in-depth interviews with 30 fuel poor householders as part of a project to explore what it means to be fuel poor, ways of coping with fuel poverty, and responses to fuel poverty interventions. The research highlighted how householders conceptualised fuel poverty as being about keeping warm at home, and viewed this as a basic need for them and others in their household. For example, poor parents often prioritised keeping their home warm in order to protect the health of young children, forgoing luxuries for themselves to be able to pay energy bills and keep the house warm. The study reported that householders may have limited understanding of the complexities of inefficiencies in heating systems and focused on living with its insufficiency or using short-term, do-it-yourself measures - such as putting tape round windows to stop draughts.

There is some, albeit limited, evidence that households at risk of fuel poverty have wider concerns about energy usage other than keeping their home warm. Interviews in 2009/10 with 50 Austrian households on a low income (with a sub-sample identified as fuel poor – 10% definition) revealed that rationing behaviours extended right down to lighting. This could involve keeping lights on in only one room, watching TV with the lights off, not fitting bulbs to all available light fittings and teaching children to turn-off lights when leaving a room (Brunner et al, 2012). Other studies find that fuel poor and at risk households limited hot water consumption (Brunner et al, 2013) or turned down the temperature of heated water (Day and Hitchings, 2009) and reduced the use of lighting (Day and Hitchings, 2009; Changeworks, 2012).

Perceived advantages of energy efficiency

There are a number of advantages of living in an energy efficient home; being able to save money through lower energy costs, having a warmer house (which is linked to better health and well-being), and the possibility of being able to utilise more rooms instead of heating only selected rooms. Having a home that the occupant likes and feels is socially acceptable can also mean being able to provide a more welcoming home for visitors.

Health and well-being benefits are just some of the ways in which householders view the advantages of having an energy efficient home. Langevin et al (2012) conducted 50 in-depth interviews with householders in low-income housing in the US to explore the energy behaviours

of poorer households. They found that householders who used more efficient heating technologies reported increased comfort and savings on energy bills over the longer term.

Factors mediating householders' views

There are other factors that may act to mediate householders' views on energy efficiency. Langevin et al's (2012) study included a sample of householders living in low income public housing whose energy bills were included in their rental payments. The research found that 'non bill payers' tended not to engage with energy usage and payment as much as those who paid their energy bills independently of their rent. Although bill payers and non-bill payers both had positive attitudes towards using specific Energy Conservation Measures, such as low energy appliances and programmable thermostats, bill payers had much greater concern with the financial benefits of energy saving. Householders who did not directly pay bills were more ambivalent than bill payers towards energy efficient behaviour, because there was less incentive for them to do so. Having to pay for measures can also impact on households' views of energy efficiency, particularly for low income households, and this is discussed in more detail in Section 2.3 below.

2.3 Awareness and understanding of energy efficiency programmes

There is limited research on the awareness and understanding of energy efficiency programmes amongst those in and at risk of fuel poverty. The research that does exist comprises a number of studies that have looked at householders' views on national or local initiatives designed to help householders use energy more efficiently. This could involve installing energy efficient measures in the home, advice on energy usage, or assistance with paying for energy bills. This evidence covers two main themes: whether households in fuel poverty have general awareness of energy efficiency programmes on offer, including whether they understand the programmes and related technology once utilised in their own home, and the facilitators and barriers to raising awareness.

General awareness of programmes

The relatively little research that exists in this area suggests that vulnerable groups, particularly older householders, can be unaware of national and local initiatives to reduce fuel poverty. Harrington et al (2005) conducted in-depth interviews with a small sample of low income householders in the North East of England who spent at least 7.5% of their disposable income on fuel. The interviews covered issues such as type of heating and insulation; the meaning of fuel poverty; the impact of cold on health and lifestyle; and the effects, if any, of energy efficiency improvements. Part of these interviews revealed that the respondents had not heard of various schemes that could provide them with cheaper fuel bills – such as the Government's Warm Front scheme. O'Neill et al (2006) also found that older householders, a small sample of older women in this case, were not aware of energy efficiency grants available to them.

However, being aware of such programmes or grants does not necessarily mean that householders will apply to use them. A survey of 267 older people in County Durham found that half had never formally checked benefit entitlements, and a quarter did not think that they were well-informed about energy efficiency (Attend Rights To Warmth, 2009). Another study of older householders who had not applied for energy-efficiency grants found that many had not done so because they felt unable to distinguish between different local authority grant programmes and to align programmes with their individual criteria (Wright, 2004).

Some studies have referred to the role of others in the local community in aiding the awareness and understanding of energy efficiency programmes. Banks and White (2011) spoke to eleven private-rented householders in fuel poverty who took part in a council scheme to install solid wall insulation. The study found take-up of the measures to be very slow, as some

householders thought the unusually high grants being offered were ‘too good to be true’. This problem was overcome to some extent when householders realised the scheme was funded and endorsed by the council. Several different approaches were used in marketing the scheme, including advertising in local papers and taking referrals through Energy Saving Trust advice centres. The most successful was a doorstep flyer from the council in an area where solid wall insulation was already being installed. Council endorsement was very important as was 'first hand' experience of householders seeing the work carried out in neighbouring properties.

Facilitators and barriers to raising awareness

Lack of knowledge of how to use and engage with energy saving measures is an important barrier to adoption and use (See Chapter 4 for further discussion of barriers). Chahal et al (2012) found that householders in social housing who had undergone some form of energy efficiency upgrade - ranging from energy efficient appliances, improvements in thermal efficiency (loft, cavity, internal and external wall insulation) to the installation of renewable technologies (solar photovoltaics, solar thermal and micro- wind turbines) - had a general lack of awareness as to what the retrofit project was, whether measures had already been installed in their home and a lack of understanding of how to have it installed if not.

A report by the Housing Retrofit Programme of Greater Manchester’s Low Carbon Economic Area Initiative (GM LCEA, 2011) used evidence from a number of research projects and case studies, many involving households at risk of fuel poverty, to identify barriers to knowledge of energy saving measures and behaviours:

- not knowing where to find information;
- lack of desire to seek information;
- perceived information overload;
- confusion about conflicting information or partial evidence;
- perceived lack of locally-relevant information;
- format of information not accessible to non-experts;
- source of information not credible or trustworthy, particularly the mass media; and
- information conflicts with values or experience and is therefore ignored.

As mentioned earlier, the issue of risk aversion and confidence in new technologies is also important here.

2.4 Views on paying for improved energy efficiency

Paying for improved energy efficiency is clearly an important issue for households at risk of fuel poverty, as many will be living on a low income. The evidence in this area points to low income householders having concerns about the financial aspects of installing or using energy efficient measures.

Jenkins et al’s (2011) case study of seven low income households in social housing recognised the frugal attitudes of low income households and that these households can feel constrained in their attempts to maximise energy efficiency. For example, lower income households are less likely to be able to make significant financial investment to increase the energy efficiency of their homes – such as changing a boiler or buying new appliances. It is also recognised that low-income households can feel that the more structural aspect of energy efficiency – such as the characteristics of the property they rent – is out of their control.

Brunner et al (2013) also found that the scope for improving energy efficiency in low-income households is limited by finances and perceptions of being unable to make necessary changes to the home. The study focused on investigating energy practices in poor and at-risk-of-poverty households in the Austrian capital Vienna. It used in-depth interviews with 50 households and found that financially constrained households found it difficult to contemplate the cost-benefit potential of more expensive measures, such as cladding and heating technology. Smaller, almost cost-neutral potentials - for example energy saving light bulbs - were being used by low-income households, and did provide small efficiency gains. However it seemed a further step for them to take to consider using more expensive measures.

This unwillingness to pay for improved energy efficiency was also uncovered by Allmark and Tod (2013), who reported on a small study of older people living in an area with high rates of fuel poverty. The study looked at older people's knowledge, beliefs and values regarding keeping warm at home. They found that some older people living in private rented accommodation did not want to ask the property owner to repair or increase the energy efficiency of the property in case their rent increased as a result. Another study, using semi-structured interviews of ten older women, found that they were hesitant about moving to new suppliers or taking up initiatives, partly linked to past experiences of switching services. The authors concluded that more could be done between Local Authorities and the private sector to ensure that the process of taking up initiatives was more straightforward (O'Neill et al, 2006).

Being 'risk adverse' was also highlighted in Anderson et al (2010)'s study which surveyed nearly 700 low income households and undertook 50 in-depth interviews with a subsample of the surveyed households. The study found that, unlike for other resources such as food and clothing, low income households did not shop around for energy. Households had little confidence that switching energy supplier would bring real rewards and genuine concern that unexpected costs may ensue - costs that low-income households can ill afford. Attitudes to switching reflected their lack of knowledge about what this might entail and choices they had, trusting the information they received from energy companies, and anxieties about changing their current financial set up.

2.5 Gaps in the evidence

This chapter has reviewed the available evidence on fuel poor householders, and those at risk of fuel poverty, and their awareness, views and understanding of energy use and efficiency. The mains aims of the chapter were to collate evidence on how households perceive the energy efficiency of their home and how to improve it; their awareness of existing energy efficient programmes; and their willingness to pay for improved energy efficiency and what affects this. In this section we summarise where key gaps in the evidence remain.

Given that issues around knowledge and perceptions of energy efficiency are quite specific, or have been explored as part of an evaluation of a scheme to promote energy efficiency, most of the current evidence base is either qualitative in nature, formed from small sample surveys or focused on particular subgroups. Hence there appears to be a lack of larger scale quantitative evidence on these issues, mainly because these types of question are not routinely asked on large surveys.

Range of literature

Despite there being some useful messages to take from the existing literature, generally there is not a large library of literature on issues of:

- How much people understand about energy efficiency in the home.

- How much people are aware of, and understand, the range of energy efficiency programmes that exist, both at a national and local level; and
- Whether people are explicitly willing to pay for energy efficient measures.

Our initial scoping of the literature revealed that 15 of the 57 pieces of literature that we used in the reviewed directly covered these issues – compared to nearly 40 pieces of literature on issues related to 'current energy behaviours and concerns' and to 'barriers and facilitators to behaviour change'.

General understanding of the problem

There is a lack of information on how at risk groups understand issues of fuel poverty - in particular, whether they regard it as simply not being able to afford fuel bills or whether they relate it to energy efficiency factors, such as not having sufficient insulation in their home. Existing evidence suggests that low income households use income budgeting strategies rather than strategies to make their use of energy more efficient. More research is needed to understand why these decisions are made and how low income householders can be encouraged to undertake more energy efficient behaviours.

Coverage of all groups at risk of fuel poverty

Most of the evidence that does exist seems to focus on two groups of vulnerable households: social tenants and older people. Gaps appear in our knowledge of other groups at risk of fuel poverty; particularly those risk groups under the LIHC measure with less overlap with those at risk under the previous definition (for example, single people and the unemployed).

Knowledge of existing energy efficiency programmes

The evidence on the fuel poor's knowledge of existing programmes to help improve the energy efficiency of their homes is limited, particularly when considering the range of programmes, schemes and grants available to householders – at both national and local levels. The evidence suggests that some groups at risk of fuel poverty do lack awareness, but also that lack of understanding of programmes can restrict those that are aware to adopt such interventions. Understanding responses to different interventions and how to design interventions to maximise take-up seems paramount. This is likely to vary across different groups, for example for people with language barriers (such as migrant communities), and those who have limited social networks and fewer other connections with their local community.

Communication

How to communicate fuel poverty interventions seems particularly important for groups that are targets of multiple policies and programmes to combat poverty, especially in an environment in which wider changes are being made to the benefit system.

3. Current energy behaviours and concerns: Households at risk of fuel poverty

Summary

The literature reveals that households at risk of fuel poverty employ a wide range of efficiency (how to make the most efficient use of the heat) and sufficiency (what is the bear minimum that is required for a 'manageable' level of warmth) strategies to heat their homes and keep warm on a limited budget. There appears to be a high level of awareness and monitoring of energy usage among this group and pre-payment meters (more common among this group) brought a welcome level of control despite the higher costs of this payment method. The evidence suggests a generational divide in preferences (and perhaps needs) for different types and forms of home heating. For example, older people who grew up with solid fuel heating or proximal heaters are more likely to utilise these forms of heating than younger generations. There were also differences found between older people struggling to afford to pay for adequate warmth who were more likely to reduce heating than families with children who were more likely to cut back on other expenditures.

Important gaps in the literature remain and for many of the findings it was not possible to establish how common particular behaviours are or the extent to which they directly apply to fuel poor households or sub-groups of this population.

3.1 Introduction

This chapter looks at four key areas of households' current energy behaviour and concerns:

- How households heat their homes and keep warm.
- The level of engagement with energy usage and bills.
- Households' energy concerns.
- What motivates current behaviour.

The chapter concludes with an assessment of gaps in the existing evidence. As discussed in the first chapter, this review considers evidence relating to households in fuel poverty or 'at risk' of fuel poverty – not householders in general. Some studies did make attempts to explicitly research fuel poor households and the text makes clear where the evidence explicitly refers to households experiencing fuel poverty.

One important contextual factor that in part shapes the behaviour of households at risk of fuel poverty is the type of main fuel used to heat their homes. This is not always a matter of choice. As noted earlier, a higher share of these households live in rental accommodation and are

therefore not in a position to make such changes. Fuel poor households are more likely to power their central heating systems using fuel types that are associated with higher risks of fuel poverty. Gas is the most common fuel used to power central heating, although the share is lower among fuel poor households (LIHC); 80% compared with 86% among households who are not in fuel poverty. A higher share of fuel poor households (LIHC) use electricity to power their central heating (9.5%) than households not living in fuel poverty (7%). Higher shares of fuel poor households use oil (6% compared to 4%) or solid fuel (2% compared to less than 1%) and a higher share have no central heating systems (6% compared to 3%) (DECC, 2013; table 23).

3.2 How households heat their home and keep warm

The cost of heating accounts for over half of households' energy bills (Hills, 2011) and with lack of warmth a key concern for reducing excess winter deaths, heating dominates much of the literature on fuel poverty. This is reflected in the definition of fuel poverty which explicitly uses an adequate level of warmth to define fuel poverty - although modelled fuel costs used to compute official statistics include spending on heating water, lighting, appliance usage and cooking costs. The chapter also looks at whether fuel poverty affects the ways in which households heat their homes and what strategies households at risk of fuel poverty adopt to keep warm.

Strategies for keeping warm

A wide range of strategies were employed by households at risk of fuel poverty searching for low-cost solutions to keeping warm on a tight budget. Andersen, White and Finney (2010) in a study of low income households (below 60% median income before housing costs) suggest that coping strategies for achieving a warm home can be informed by a basic theoretical model where coping is framed by: material and personal circumstances; individual attitudes and values; personal resourcefulness and coping skills. No large scale quantitative analysis was found in the literature reviewed and therefore it was not possible to quantify how common different strategies were or whether or not there was any systematic difference between at risk groups.

In the literature it was reported that coping strategies for keeping warm involved the way heating systems and sources were operated, energy efficiency solutions and devising alternative ways of protecting body heat in a cold home. Heating was rationed by turning thermostats down, turning heating off at night and for some periods during the day, heating only some rooms, and by sometimes using proximal heaters rather than central heating (Allmark and Tod, 2013; Brunner et al, 2012; Day and Hitchings, 2009). The use of thick curtains, draught excluders and taping draughty windows were low cost everyday solutions adopted to maximise the warmth generated by existing heating. Strategies to improve body warmth included sitting close to the heat source, going to bed during the day, going elsewhere (outside the home) to keep warm, wearing multiple layers of clothing and wrapping up in blankets and quilts, as well as consuming hot food and drink (Brunner et al, 2012; Cotter et al, 2012; De Haro and Koslowski, 2013; Faulk, 2009; Harrington et al, 2005; Lomax and Wedderburn, 2009; Banks and White, 2011; Jenkins et al, 2011). Some heated the bedroom for a few hours only, used hot water bottles, shared a bed, went to bed early and some slept in the living room or even stayed with relatives (Cotter et al, 2012; Day and Hitchings, 2009; De Haro and Koslowski, 2013; Anderson et al, 2010). For many a too cold home shrank the effective size of the living space and for some contributed to social isolation (Cotter et al, 2012; Harrington et al, 2005). These coping strategies have been described as efficiency (how to make the most efficient use of the heat) and sufficiency strategies (what is the bear minimum that is required for a 'manageable' level of warmth) (Brunner et al, 2012; Brunner et al, 2013).

Having a warmer home was a key reason why a sample of 40 social housing residents said they liked their accommodation (Basham et al, 2004). The study used in-depth interviews with residents and found that prior to having central heating installed as part of a residential housing project, residents said that house design or heating, being draughty or having damp or condensation were reasons why they disliked their homes. This changed after installation of central heating, when the residents said they liked the comfort and warmth, and more freedom to use the space of the house. Residents in the same study were also likely to associate energy efficiency in the home with health benefits, including well-being, for themselves and others living with them. For example, improvements in energy efficiency, through installation of central heating and draught reduction, meant more usable living space, which in turn led to perceived improvements in well-being. Some residents also associated having a warm home with social acceptability, including making the home welcoming to other people.

It is commonly noted in the qualitative studies that there is considerable variation in the energy use behaviour, expectations about staying warm and coping strategies of households in or at risk of fuel poverty (see for example, Cotter et al, 2012; Harrington et al, 2005). Qualitative interviews with 30 individuals drawn from a random sample of households living in or near fuel poverty (households needing to spend 7.5% of disposable income after housing costs in order to keep homes adequately warm) found that these often complex strategies are mediated by cultural and historical factors (Harrington et al, 2005). For example, this study found that biographical experience and background expectations influenced respondents' tolerance of a cold home, and their willingness to accept strategies such as wearing outdoor clothes indoors.

An in-depth study monitored nine identical low-energy social housing units equipped with solar panels, in part to assess how household energy use behaviour could adapt to varying energy supply patterns. Households were provided with a detailed user guide with information on how to maximise financial return. This was achieved through a combination of low export and low import of energy due to the price differential - in general, the tariff that a homeowner is paid for export of electricity to the grid is a fraction of the import cost. Householders also had web access to monthly performance and electricity usage data and in-home display meters. After one year the study found quite dramatic differences in energy consumption between the houses, with some houses being both high consumers of energy and high exporters of generated energy. Discussions with the tenants on their energy usage and management part way into the project led to reduction in usage in some of the households. However this was not sustained, and within 12 months households appeared to take advantage of the perceived lower energy costs and actually increased their energy consumption (8 of the 9 properties). This study highlights the need for sustained education to accompany the installation of energy saving devices suggesting that structural changes to dwellings and investments designed to improve energy efficiency and consumption will not be enough on their own to tackle fuel poverty. The authors conclude that on-going education and re-enforcement of the energy message is necessary to achieve long-term demand reduction (Bahaj and James, 2007).

Reducing other household expenditure

Low income households - particularly those unable to smooth energy costs, dip into savings or turn to credit - can be faced with the need to make cut-backs on other areas of household expenditure to meet the costs of heating, especially during cold weather periods. The focus of the literature, and in the media, in this area is on the 'heating-versus-eating' trade-off (Beatty et al, 2014) but low income households were also found to cut back on discretionary expenditure such as holidays, socialising, and new clothes (Anderson et al, 2010).

People who are at home during the day are often faced with the double burden of being in receipt of a lower income and the need to heat the home for a greater number of hours. For example, annual domestic energy expenditure for average dwelling size is found to be higher

for households where the household reference person (HRP) is unemployed relative to households where the HRP is employed full-time (Thanos and Dunse, 2012). This finding is significant after controlling for a range of factors including: tenure, dwelling type, type of heating fuel and heating system, presence of loft insulation and payment method. Interestingly the same analysis found that households with a retired HRP are estimated to have lower annual energy expenditure. This has been attributed to higher income constraints (Meier and Rehdanz, 2010) – lower 'permanent income' – and as we will suggest below, due to attitudes and behaviours. Where the HRP is employed part-time energy expenditure is lower than in the case of full-time employment which could be due to income-effects (Thanos and Dunse, 2012). In a representative sample of low income households (income less than 60% median) it was found that the majority occupied their homes most or all of the day (Anderson et al, 2010).

Groups most reliant on home heating for long hours during the day include: older people, young families, the unemployed, long term sick and disabled people who are out of work. The literature suggests that these groups can broadly be described as having different needs, attitudes, and coping strategies. The unemployed don't appear to have been separately identified in the fuel poverty literature to any great extent even though quantitative analysis shows that households where the HRP is unemployed have the highest fuel poverty rate (34% in 2011 using the LIHC definition) (DECC, 2013; Table 3.2), no doubt affected by increased energy consumption and lower income.

Vulnerable groups

Here we focus on older people, long term sick and disabled people and children; as these three groups are identified by DECC as those who could be at the highest risk of the detrimental effects of living in fuel poverty. It is estimated that the majority of fuel poor fall into one of these vulnerable groups (DECC, 2012b). However, it is worth noting that these so-called vulnerable groups are very heterogeneous and only 18% of households identified as vulnerable according to these characteristics were living in fuel poverty (10% definition) in 2010. In recognition of the elevated effect of cold homes on health and well-being the definition of fuel poverty adopted in Scotland (fuel poverty is a partially devolved issue) assumes that households with pensioners, long term sick and disabled people require a higher temperature to reach an adequate standard of warmth in their homes. In the fuel poverty methodology implemented by DECC (for the 10% definition and the LIHC measure) a more generous heating regime is applied to people who are likely to spend more time in the home (e.g. households containing pensioners, families with young children and long term sick or disabled) (DECC, 2013).

Older people

The research evidence suggests that there is a generational divide in the sources of home heating among those at risk of fuel poverty (Wright, 2004). Older people who grew up with solid fuel heating or proximal heaters (single gas heaters, fan heaters, etc.) are more likely to utilise these forms of heating than younger generations. Some survey respondents in their eighties reported that they had become more sensitive to cold as they aged (Wright, 2004). There is also evidence that older generations take pride in their ability to 'make do', 'go without' or 'cope with the cold'. These factors could be shaping the ways in which they choose to heat their homes and are looked at further below.

So despite the fact that stand-alone heaters are less efficient and more expensive (on a larger scale at least) many older people have been found to opt for this form of heating and express that in part their preference is affected by its simplicity and the fact that they find it easier to tell if they are switched on or off (Allmark and Tod, 2013). Some older people find central heating systems complex to operate and this too influenced their choice (Allmark and Tod, 2013; Lusambli, 2011). A small scale study looking into the impact of modern technology and health

among older people found that some older people didn't use their central heating systems because they didn't know how to turn them on or because it was too awkward (for example it involved kneeling on the floor) (Lusambli, 2011). Some were cold despite living in energy efficient homes and this was because they could not use or reach heating equipment or did not understand how it worked (Tod et al, 2012). Some opted to heat their homes, or at least turn the heat up when they had visitors but in other cases the lack of adequate warmth deterred people from having visitors (Day and Hitchings, 2009; Tod et al, 2012; Anderson et al, 2010).

Where these measures are not enough to keep warm, particularly in periods of severe cold weather, households unable to smooth energy costs on a fixed income can find the need to make cuts in other household expenditure. Statistical analysis of expenditure by older households in the UK (at least one member aged 60+) over the period 1974-2007 estimated that severe cold weather shocks led to reductions in food expenditure (Beatty et al, 2014). The effect was found to be largest for the poorest households. This study did not attempt to identify the fuel poverty status of households, instead identifying the poorest households in terms of their position in the expenditure distribution (a proxy for 'permanent income'). The fact that the effect was greatest among the poorest households is suggestive that at least some older fuel poor households cut back on food expenditure during severe cold weather. It is important to note here that although this study does find a fall in household expenditure during periods of severe winter weather this does not necessarily mean that these individuals went hungry or undernourished but could have opted to use supplies rather than leave the house in severe cold. The authors note that they cannot rule this out but identify a reduction in the expenditure of perishable goods which they conclude demonstrates a real consumption effect. This is clearly an area where more research would be helpful. A number of qualitative studies have, however, identified households at risk of fuel poverty prioritising heating over food (see for example O'Neill et al, 2006).

Older people tended to have lived in their property for some time and length of residency has been found to be positively correlated with increasing fuel expenditure (Thanos and Dunse, 2012). This may be due to the efficiency of heating systems and how well insulated the property is, but could also be related to lack of knowledge of specific energy systems.

Young families

Parents with young children on a low income and struggling to manage fuel bills were less able to make self-sacrifices without impacting on the welfare of their children. This meant that they prioritised keeping the home warm for the sake of their children (Harrington et al, 2005), with rationing of heating tending to fit around times of the day that children were out of the house. With less scope to ration fuel expenditure these families are at a greater risk of debt (Harrington et al, 2005; Gibbons and Singler, 2008) and their strategies for coping tend to be focused on seeking to reduce expenditure wherever possible on other household items (Gibbons and Singler, 2008). The literature here focuses on the trade-off between 'heating and eating'; an issue which is not restricted to young families (as noted above). Families cut back on food expenditure in terms of both quantity and quality, seeking the best prices and deals (Barnardo's, 2012).

Despite the efforts made by families to seek to protect their children from cold homes there is clear evidence that young children living in cold homes suffer a range of physical health problems, and older children are more susceptible to mental health problems and social isolation (Barnardo's, 2012). The Marmot Review Team look explicitly at the evidence linking cold homes to health outcomes and identified direct effects of fuel poverty and cold housing on weight gain among infants, higher hospital admission rates among young children, negative effects on development status and the severity and frequency of asthmatic symptoms, negative effects on the mental health of adolescents, increased levels of minor illnesses such as cold

and flu, exacerbation of existing conditions such as arthritis (Marmot Review Team, 2011). They also identify indirect negative effects of cold housing on children's educational attainment, emotional well-being and resilience. And that fuel poverty negatively affects dietary opportunities and choices (Marmot Review Team, 2011).

Once again the literature highlights considerable variation in coping strategies with some households happy to adopt strategies which are fiercely rejected by others (Harrington et al, 2005).

Long term sick and disabled people

Long term sick and disabled people are more likely to be living in fuel poverty (24% in 2010 compared with 15% of households where no one was long term sick or disabled; 10% definition) (DECC, 2012b) yet there was very little evidence specifically on disabled people in relation to fuel poverty or energy efficiency in the literature identified for this review. A quantitative study using data from the English Housing Survey 2010 and 2011 found a greater proportion of households with a disabled person to be fuel poor than households in which there are no disabled people (20-25% compared to 15-16%) (Thomson, Snell and Bevan, 2013).

This study also finds that although there has been much debate around the inclusion of disability related benefits that are in place to compensate disabled people for the extra costs associated with their disability, when one of these benefits (Disability Living Allowance) is excluded from the measure of income, fuel poverty incidence among disabled people increases but not by very much (1% or less but this varies by measure of fuel poverty, type of disability, region, tenure and household composition).

Unfortunately none of the literature reviewed covered differences in energy consumption or home heating and coping strategies between disabled and non-disabled people.

3.3 The level of engagement with energy usage and bills

As the literature reviewed for this chapter demonstrates, households at risk of fuel poverty appear engaged with their energy usage and bills. With greater reliance of pre-payment meters, other payment budget schemes and payment on receipt of bills, low income households seem acutely aware of the cost implications of the energy that they use. This is obviously brought to the fore during the winter months and cold spells.

Payment method

The method of payment used for paying for fuel is associated with different rates of fuel poverty. The highest rates of fuel poverty are found among those who pay for their gas by pre-payment (19%); more than twice the rate among households who pay by direct debit (7%) and higher than among households who pay by standard credit (14%) (2011 – LIHC measure) (DECC, 2013). This matters because the best (i.e. lowest) tariffs are available to those paying by direct debit. However this needs to be seen in the context of direct debit being the most common method of payment among both low income and higher income households (Anderson et al, 2010).

Prepayment meters are much more common among lower income households than higher income households. A recent study found that in 2010 around 6 million households used this method of payment with debt recovery increasingly being the main reason (Mummery and Reilly, 2010). Households containing disabled people are more likely to use prepayment meters for electricity than households without disabled people, but this could be related to the greater incidence of poverty among disabled households. Fuel poverty rates among households with disabled people who use prepayment meters for electricity or gas are higher than similar households without disabled people (Thomson, Snell and Bevan, 2013); but there is no

indication in the literature reviewed whether this was due to depth of fuel poverty, choice, the long-term effects of managing on a low income or for some other reason.

A qualitative study of low income and fuel poor households found wide variation in the level of financial management (Brunner et al, 2012) and this no doubt affects the extent to which households engage with their energy usage and bills.

Interviews with a sample of older people found some reluctant to use a direct debit payment method due to lack of trust in how they work and whether or not they would be charged for their actual usage. They were used to paying in cash and preferred to stick with this method (Lusambli, 2011). The 'invisibility' of direct debits was a concern to some older people and this was exacerbated by lack of trust with energy companies to manage these payments without overcharging. Others valued the social contact that came with lining up at the bank or post office and paying by cash (Tod et al, 2012). Some older people were found not to have a bank account and therefore couldn't benefit from the cheaper tariffs available from selecting payment by direct debit (Allmark and Tod, 2013).

Equal instalment plans are less common in the poorest households and therefore have less protection from 'cold weather shocks' as the full cost of heating needs to be borne at the time of the shock (pre-payment scheme) or shortly afterwards (standard credit) (Beatty et al, 2014).

The amount of control possible with pre-payment meters made them an attractive option for low income households even though the unit cost of energy was higher using this method (Anderson et al, 2010; Mummery and Reilly, 2010). Annual energy expenditure was considerably higher even after taking a range of factors into account (based on estimates for the UK and not exclusively households at risk of fuel poverty) (Thanos and Dunse, 2012). The main reason identified for dissatisfaction with pre-payment meters was the higher expense (Mummery and Reilly, 2010), followed by inconvenience of topping-up and the threat of disconnection.

Some monitored their meters on a daily basis (O'Sullivan, 2011) and were more likely to monitor their energy use than those paying by direct debit (Lomax and Wedderburn, 2009). Low income pre-payment meter households were more likely to top-up their meters with smaller amounts and on a more frequent basis and qualitative evidence revealed that this was due to a wish not to 'tie-up' too much of their budget (Mummery and Reilly, 2010). It gives householders a sense of being in control and negates the possibility of suddenly being faced with an unexpectedly large bill (Mummery and Reilly, 2010).

Qualitative research found that individuals struggling on a low income to adequately cover the costs of fuel and food resorted to putting the minimum amount of money into pre-payment meters and trying to make it last as long as possible through rationing their energy use to try and leave enough money for food (Anderson et al, 2010). Self-rationing through limiting the amount of money spent on topping-up or stretching a defined amount of credit was achieved through a variety of means. Qualitative evidence revealed that this could reach 'extreme levels': cooking 'bargain' (out of date) meals in the microwave, cutting back on washing clothes and bedding, limiting the use of the vacuum cleaner, even turning the fridge off (Mummery and Reilly, 2010). Emergency credit (a limited amount of extra credit on a meter, automatically repaid at the next top-up, which allows households to stay connected even though they have technically run-out of credit) is commonly used among prepayment households as a buffer zone, those short of time to get a top-up, the disorganised and the forgetful (Mummery and Reilly, 2010).

A survey of prepayment meter households found that 16 percent had self-disconnected at least once in the previous year. For some (5 percent) this was regularly (at least three times a month) and those households whose main heating source was electricity were more likely to self-disconnect (26 percent) than for those with gas-fired heating (14 percent) and, not

surprisingly, self-disconnection was more common over the winter (Mummery and Reilly, 2010). Other survey evidence has found a higher rate of self-disconnection among pre-payment gas meters (33% at least once in the previous year) but the majority of stoppages for pre-payment gas meters are of short duration which most commonly linked to a gap between the credit expiring and the household topping up the meter (Doble, 2000). The main reasons for self-disconnection were: not realising the meter was so low; not having enough money to top-up; forgetting to top-up and waiting to be paid (Mummery and Reilly, 2010).

Oil fired and electric night storage heating

Households reliant on oil fired central heating are also required to pay upfront for their heating costs, with large lump sum payments required to fill oil tanks. Prices for heating oil are higher in winter months, and some households were found to hold off refilling their tanks towards the end of the winter to try and take advantage of cheaper summer rates (Wright, 2004).

Where used, night storage heaters were found to be unpopular due to less control as they are required to be set the day before to take advantage of cheaper night time electricity rate (De Haro and Koslowski, 2013). If the temperature goes up unexpectedly then energy is wasted, if it goes down unexpectedly then the house is cold and more expensive form of heating will be required.

Monitoring energy usage

Research evidence from focus groups involving vulnerable people living in Scotland (older consumers, people on low incomes, lone parents, people who are blind or partially sighted, people with learning disabilities, ethnic minorities, rural consumers) found that a lack of understanding of how to interpret the readings hampered households' ability to monitor usage and estimate costs (Faulk, 2009). Some individuals reported difficulties reading energy meters due to their location, particularly where gaining access was impeded by physical impairments. This was especially relevant for those who are blind, partially sighted or with literacy and numeracy problems. Some of the vulnerable individuals included in this study also reported that they found energy bills hard to read and understand (Faulk, 2009).

There is little evidence of the extent to which smart meters influence households' energy usage in the literature reviewed for this report as the mass roll-out of smart meters does not begin until the summer of 2015. An evaluation of a retrofit project among fuel poor (10% definition) pre-pay meter social housing residents in Cambridge, where Smart Meters were installed, found that households did not use these to regulate energy usage because they did not understand the readings (Sunikka-Blanket al, 2012). Wallenborn, Orsini and Vanhaverbeke (2011) carried out a small scale social experiment that installed different meters in 21 Belgium households (including low income households). This qualitative study found that while the meters changed energy perception in most of the households, only households already interested and engaged with energy savings utilised the meter to change energy consumption. The authors argue that smart meters only improve energy consumption if accompanied by a change in the 'culture of energy' use and that installation of meters does not trigger new energy saving behaviours in themselves.

3.4 Households energy concerns

The greatest concern reported by households covered in this review was how to achieve an adequate level of warmth and comfort within the limitation of their household budgets. Parents are concerned about the impact of inadequate heat on the health and well-being of their children and older people are aware of the impact of cold on their own health and how it aggravates long term health problems (Cotter at al, 2012). Households managing at the edge of their income fear cold weather.

Nearly half of the subsample of low income households in the 2009 NatCen omnibus survey (47%) reported that their homes were colder than they wanted in the previous winter (Anderson et al, 2010). This was more prevalent among single adult households below pension age (although the definition of income used in this study is before housing costs), lone parent households and couples with children, households on very low incomes, households who had experienced a fall in income, households who used prepayment meters or budget schemes to pay for their electricity.

There was little evidence in the research reviewed for this report that these households were greatly concerned with energy use in relation to climate change. Instead they were focused on concerns around the impact of under-consumption (or at least lack of warmth) in their own homes rather than over-consumption more generally. With a greater tendency for low income households to live in rental accommodation most of the investments in energy efficiencies were the responsibility of their landlords.

3.5 What motivates current behaviour

Research evidence on older people suggests that they are debt adverse and more likely to cut back on energy usage than younger age groups. This means that they are more likely to heat their homes to sub-optimal temperatures, resort to a range of alternative strategies to keep warm – clothing, proximal heating (space heaters, solid fuel), going to bed during the day/early in the evening, hot water bottles, rationing the time that heating is on (for example when visitors are present) (see references in section 3.2). The majority of the literature finds that families with young children are less likely than older people to ration heating use. One study found the reverse: relative to younger households, older households were less likely to cut back on energy use (Anderson et al, 2010). The Hills Review (2012) recommends that income should be measured after housing costs and the result is that fewer older households with low or zero housing costs are captured by the LIHC measure of fuel poverty.

How outlook is related to behaviour

Coping strategies are often framed by individuals' outlook on life and it is clear that some are in a better position to cope than others. There is no doubt that the extent to which individuals feel like they are coping fluctuates over time. A piece of qualitative research (50 interviewees in low income households) identified five distinctive attitudes: frugality, autonomy, managing in the face of adversity, acceptance and resignation, and only just scraping by (Anderson et al, 2010). Frugality was used by some to present the challenge of living on a low income in a positive light and took pride in their ability to manage in the face of hardship. Autonomy and the ability to stay in control was found to often underpin frugality and was a matter of personal integrity and something to be proud of. Others just managed in the face of adversity, accepting that this was something they had to do but took little strength from their ability to do so. For some this created a level of acceptance and resignation, particularly where they had lived on a low income for a long time. Others teetered on the brink, only just scraping by, often fed up and depressed and struggle to maintain a positive outlook (Anderson et al, 2010).

Attitudes, values and beliefs, often built up over a lifetime and with childhood antecedents, were identified as important factors in influencing decisions and behaviour around energy usage and home heating in a qualitative study of 50 older people aged at least 55 and living in an area with high rates of fuel poverty (10% definition) (Tod et al, 2012). Despite being at risk of negative health impacts from cold weather the study found a low level of awareness on why and how to keep warm. Some even adhered to beliefs that hot rooms or central heating was bad for you. This study emphasised the complex range of influences that motivate people's behaviour in relation to energy usage and home heating decisions. Other studies have highlighted how the culture of some older people directly contributed to them living in cold homes, identifying frugal

living, the practice of turning heating off during the day, sleeping in unheated bedrooms and keeping the window open at night even though these are acknowledged to be unhealthy (Wright, 2004).

Influencing behaviour through labelling cash transfers

An evaluation of the use of the Winter Fuel Payment (WFP) finds that 'labelling' cash transfers has an effect on how the money is spent (Beatty et al, 2014). Standard economic theory predicts that households should treat labelled cash transfers in the same way as any other income (i.e. the label should not influence how the money is spent). Instead this evaluation finds that receipt of WFP affects households' behaviour and increases households' average expenditure on fuel by 41% rather than the expected 3% rise if households treated WFP simply as cash.

3.6 Gaps in the evidence

This chapter has reviewed the evidence on current behaviours and concerns of households at risk of fuel poverty. It has examined the evidence on how these households heat their homes and strategies they employ to keep warm. It has also looked at the evidence on these households level of engagement with their energy usage and bills, their key energy concerns and what motivates their current behaviour. While most of the topics have been covered in the literature, many of the studies have looked at different risk groups and have not specifically focused on the fuel poor. In addition as many of the studies are based on qualitative research it is difficult to gauge how common or otherwise different types of behaviour are likely to be among fuel poor households. There are a number of areas where gaps in the literature have been identified:

Evidence on groups at risk of LIHC fuel poverty

While there is significant literature on two of the three groups who are identified as vulnerable to the effects of fuel poverty – older people and young families – there is very little research on the long term sick and disabled. There are clear vulnerabilities associated with different types of disability that need exploring in more detail. The greater incidence of Excessive Winter Deaths among the very old population requires further research. The unemployed are another group who experience higher than average levels of fuel poverty but on whom evidence is sparse. Important differences are likely to exist between short and long term unemployed.

Coping strategies and using heating systems

Much of the literature reviewed concentrates on the coping strategies used by low income households to keep warm, although there was insufficient quantitative evidence to provide an estimate of the scale of this problem. The evidence also did not disentangle whether strategies were more focused on improving the level of comfort or reducing the cost of bills. There was much less evidence on precisely how households operate their heating systems. It was not possible to conclude from the literature what level of understanding fuel poor households had about the energy efficiency of their homes and whether this varied between different sub-groups of the fuel poor.

Monitoring energy use

Households at risk of fuel poverty who use pre-payment meters like the greater amount of information they have in terms of their energy consumption and expenditure, but this comes at a cost. As smart meters and in-home display units become more widespread in the UK it is currently unknown how this will impact on fuel poor households – for example, will the greater ability to monitor energy consumption help them to avoid pre-payment schemes?

The depth of fuel poverty

The current LIHC measure of fuel poverty also includes the ability to measure the depth of fuel poverty. As this is a new concept, there was no evidence in the literature reviewed that made it possible to assess whether there were any differences in attitudes and behaviour in relation to energy use associated with the depth of fuel poverty.

Assets and debts

There also appear to be gaps in the evidence on the links between fuel poverty, attitudes and behaviours and householder's assets and debts. Much of the literature has focused on income (presumably as it is as a key component of fuel poverty measurement) but assets and debts are clearly important in affecting people's behaviour as well as their ability to make home and energy improvements or switch energy suppliers. For example, suppliers will not allow customers to switch when they are in debt. Home and energy improvements typically require some financial outlay. Savings give households a sense of security about the future and allow them to plan but many of the low income households at risk of fuel poverty are managing week to week or month to month. Although the majority of income poor households with have little or no assets, not all are asset poor (for example some with have housing assets or small amounts of savings). However it is currently unknown how much of the current behaviour of at risk households is affected by the existence of financial assets and debts.

4. Barriers and facilitators to behaviour change: Households at risk of fuel poverty

Summary

There is little direct evidence on the barriers and facilitators to behaviour change in relation to energy efficiency in fuel poor households, however relevant findings among the at risk population groups does provide some useful findings. In terms of at risk households the literature finds that there is capacity to improve energy efficiency within current systems. These included more efficient use of current heating systems through better use of timers, thermostats, cladding hot water tanks, insulation of windows and the use of draft excluders. The literature also suggests that there is some scope for private landlords to improve the energy efficiency of tenants' homes through simple repairs and improvements as well as larger projects for which grants are available.

The literature reveals that various factors trigger behaviour change. These included receiving advice and clear guidance from a trusted source and evidence of a sufficient financial saving. Barriers to change included fear of change, lack of motivation, a focus on other priorities, habitual behaviour, deep-seated coping strategies and insufficient financial saving. Switching energy suppliers was reported as being too complex (including getting information from online comparison websites) and uncertainty about the real savings from switching put some at risk households off from switching.

A number of key gaps in the literature were identified. There was no direct evidence on what works in terms of positively influencing change to habitual behaviour to increase energy efficiency among fuel poor households or the factors that increase the chance of any change becoming permanent. Similarly, there were gaps in the literature on how people living in fuel poverty adopt energy efficiency behaviour from one another or from other sources and which are the most effective in terms of lifting people out of fuel poverty.

4.1 Introduction

This chapter looks at three key areas in relation to barriers and facilitators to behaviour change:

- Capacity to improve energy efficiency in the home.
- Factors that trigger behaviour change.
- Barriers to behaviour change.

The chapter concludes with an assessment of gaps in the existing evidence. As discussed in the first chapter, this review considers evidence relating to households in fuel poverty or 'at risk' of fuel poverty – not householders in general. Some studies did make attempts to explicitly

research fuel poor households and the text makes clear where the evidence explicitly refers to households experiencing fuel poverty.

4.2 Capacity to improve energy efficiency in the home

Households' capacity to improve energy efficiency in the home is affected by their tenure type, their financial position, their ability in relation to financial management and controlling current systems.

Tenure type

The higher relative rates of social and private renting among households at risk of fuel poverty clearly limit these households' capacity to significantly improve energy efficiency in their homes (Guertler, 2012). Social landlords have taken advantage of various grants and schemes to improve the energy efficiency of their homes and therefore homes occupied by social renters tend to have higher average SAP scores, offering some protection from fuel poverty (DECC, 2013). This is one explanation put forward to explain why tenants living in social housing are found to have lower average energy expenditure than owner occupiers (Thanos and Dunse, 2012). The literature refers to an "incentive asymmetry" between tenants and landlords to explain why private renters pay higher average fuel bills (after controlling for a range of factors including income but not specific to fuel poor households). The landlord has no incentive to improve energy efficiency in a rented property where someone else is paying the bills (Thanos and Dunse, 2012). However it is clear from the coping strategies outlined in Chapter 3 that in many cases households act within their constraints to employ a range of initiatives that are designed to boost the energy efficiency of their homes (use of thick curtains and thermal liners for example).

Some tenants express concern about asking the property owner to make repairs or energy efficiency improvements as they feared that this would lead to a rent increase (Allmark and Tod, 2013); the sample included social and private tenants and this finding was not attributed to one particular group. Low income public housing renters in the US expressed lack of control in the decision making around repairs and upgrades to equipment which was the responsibility of housing authorities (Langevin et al, 2012). This meant that, for example, they lived with faulty radiators which couldn't be individually turned off. More generally lack of control over systems (sometimes due to lack of knowledge) and consumption practices affected households' capacity to change (Langevin et al, 2012).

Cost of improvements limits households' capacity to change

The cost of making improvements to the home appears to be the main prohibiting factor in increasing energy efficiency for low income households. A study of fuel poor households (spending at least 7.5% of their disposable income on fuel) found many recognised that this placed them in a vicious cycle whereby their energy costs were so high that they lacked the resources to make energy efficiency investments (Harrington et al, 2005). Instability in income among low income homeowners also made investment decisions difficult (Rohe et al, 2010). The scale of the improvements that needed to be made (windows, heating appliances, etc.) made it prohibitive for many low income households to even consider it as an option (Brunner et al, 2012).

Some studies point to a lack of awareness of energy saving options and this in turn limited the ability of at risk households to make improvements (Brunner et al, 2012). Hanging on to old appliances limited the extent to which households could benefit from modern energy saving technologies; Young (2008) conducted a study of the use of household appliances in Canadian households and found that low income households were more likely to hold onto old washing

machines with lower energy efficiency for longer than higher income households and this directly contributes to higher energy consumption among these households.

Lack of awareness and knowledge can limit change

The fact that many older households in the at risk group report lack of knowledge of how to operate their central heating systems does suggest that there is scope for relatively low cost improvements to be made within the current systems that are already in place (Allmark and Tod, 2013; Lusambli, 2011). Older people can sometimes struggle to understand modern technologies (exacerbated by impairments in some cases) which can limit the extent to which they operate new systems in the most efficient way. This extended beyond heating systems to understanding banking technologies (Direct Debit payment systems, internet banking, etc.) (Lusambli, 2011) which can affect the extent to which they are made aware of and can benefit from the cheapest fuel tariffs. Many older people seem to rely on younger family members to program heating systems but this was not an option available to all (Lusambli, 2011). When new heating systems are installed, the need for a trusted family member or friend to help understand new systems was very important as landlords often failed to do so (Brown et al, 2013). Not knowing how to operate new heating systems contributes to inefficient operation and reduces their effectiveness at improving warmth and/or reducing bills (Lomax and Wedderburn, 2009).

Lifestyle factors and occupancy

In studies of social housing tenants the capacity to change is affected by high occupancy in terms of the number of people at home during the day (unemployed and children), a large number of electronic appliances and a desire in some cases to heat homes to a high level (25 degrees celsius), along with lack of knowledge on how to operate energy saving systems and cases where systems didn't function properly (Sunikka-Blank et al, 2012; Basham et al, 2004). Newly installed heating systems did not always meet social tenants' needs who described them as non user-friendly and difficult to operate (Brown et al, 2013).

Evaluation of behaviour change

Evidence of capacity to change can be found in evaluations of behaviour change following the introduction of new technologies. While capacity for behavioural change may be present realising that potential proves to be difficult and is influenced by a vast range of factors, such as: perceptions of energy use; household structure, existing systems; financial situation; interest in or capacity to use and integrate new technologies into lifestyles and routines (Wallenborn et al, 2011; National Energy Action and Consumer Futures, 2013).

4.3 Factors that trigger behaviour change

In the literature it is reported that a range of factors can trigger a behavioural change in relation to energy efficiency or in terms of getting a better price deal for energy used within the home. This part of the review looks at the evidence of triggers for individuals and organisations making decisions that affect households. As in the rest of this review, the literature focuses on groups at risk of fuel poverty.

Behaviour change can be reactive or proactive

Sometimes changes in behaviour in relation to energy efficiency improvements were reactive and in response to a doorstep salesperson, representatives in shopping centres, phone calls and usually involved outlining details of a cost saving (Faulk, 2009; FDS International, 2011). In some cases it was as simple as an information leaflet that facilitated changed attitudes and perceptions (Gascoigne et al, 2009). For older people this could result from information about the health risks of cold weather and living in homes that are too cold (Gascoigne et al, 2009).

While the majority of behaviour change elicited from these booklets were subtle (putting a coat on even when going outside briefly, for example to hang out washing, or putting on a dressing gown and slippers first thing in the morning) they could potentially have significant benefits to health. In some cases they were able to change behaviour based on personal preferences (such as putting some heat on in the bedroom during cold nights) and made people address draught issues in cold weather (draught excluders around doors, cat flaps, letter box covers).

Demonstrations of possible results achievable from energy efficiency improvements, and take-up among family and neighbours were found to trigger changes in behaviour (Energy UK, 2012). Failure of boilers and appliances resulting in installation of modern technologies could bring about behavioural change (Young, 2008).

Evidence suggests that with appropriate financial intermediaries it is possible for renewable energy incentives to help alleviate fuel poverty (Saunders et al, 2012). Two case studies of renewable energy projects in low income areas found that factors that help to facilitate these schemes were the availability of low interest finance, having a community-controlled approach, good communication which was vital for trust, making sure that the scheme was tailored to specific needs (Saunders et al, 2012).

A survey of a sample of social housing tenants across England (251 households) designed to understand issues around the adoption and effectiveness of refurbishments and improvements to property which were designed to increase energy efficiency, found that only a very small minority of respondents accepted energy efficiency measures based on concerns for the environment/climate change (Chahal et al, 2012). More important factors for this group were the desire to reduce bills, increase home comfort and improve health outcomes (Chahal et al, 2012).

Behaviour change may not be permanent

However there is a danger that behavioural change can be temporary as highlighted in the case of advice given to a group of high energy users which led to a reduction in two out of three households living in low-energy social housing units but this effect had disappeared a year later (Bahaj and James, 2007).

4.4 Barriers to behaviour change

The literature reviewed in the area of behaviour change has focused, like that covered in the rest of this report, on households at risk of fuel poverty. In this section we look specifically at change in relation to switching energy supplier and take up of various grants.

Barriers to switching energy supplier

Households reported a number of reasons why they were either reluctant to switch suppliers or had chosen not to bother switching. These included: inertia (too much hassle), uncertainty about how it would work and whether they would end up having to pay two suppliers during the switch over which they simply could not afford, bad previous experience with switching, lack of trust with energy suppliers. They may also be sceptical of low cost offers, lack of transparency in terms of long term cost savings, fear of ‘double-billing’ during switch-over period, brand loyalty, range and complexity of tariffs, some just hadn’t considered switching or simply couldn’t be bothered to make the effort (Faulk, 2009; FDS International, 2011; Anderson et al, 2010; Lomax and Wedderburn, 2009).

Online comparison websites provide a useful source of information for people who are considering switching energy supplier to reduce their energy costs. However, in some cases switching was hampered by the fact that not everyone found the online comparison websites easy to use due to the complexity of options available and the amount of information required to

compare prices and some simply didn't have internet access (FDS International, 2011). However, despite the reluctance expressed by some to switch energy supplier it was not uncommon for low income and older household to switch suppliers (Wright, 2004; Anderson et al, 2010). In a representative sample of low income households interviewed in 2009, 18% had switched supplier or tariff in the previous winter and a further 25% had switched before the previous winter. These appear to be similar to national averages even though incentives and reasons for not switching may be different between groups.

Barriers to taking up energy efficiency initiatives

Lack of information on the full costs and benefits of energy efficiency schemes was highlighted as a problem by some householders (Banks and White, 2011). Others were put off by the level of upheaval and disruption they anticipated (research on social housing tenants who dropped out of a free retrofit project (Affinity Sutton, 2011); and on households taking part in a Smart Meter trial (Wallenborn et al, 2011)).

The size of savings matter as does receiving information from a trusted source

Qualitative evidence suggests that the size of any savings had to reach a minimum threshold for consumers to consider that switching energy supplier was worthwhile. Due to hassle and risk factors people associate with switching suppliers, even low income households express the need for significant savings before they would consider switching (£100 or more in 2009) (FDS International, 2011). Another study reported that large grants were very important to persuade people to take part in any energy efficiency scheme but free schemes could be viewed as "too good to be true" (fuel poor home owners – 10% income definition) (Banks and White, 2011) . In the US it has been shown that lower income families require higher financial stimulus to purchase energy efficient or renewable energy products than the rest of the population (Zhao et al, 2012). An evaluation of a retrofit project in the social housing sector found that take-up of the free energy improvement works offered to tenants was low and that drop-out rates were high. The evaluators understanding was that this was due to the fact that a cautious approach was taken and households were not promised big savings on their energy bills but were told that they would achieve warmer more comfortable homes and have the potential to save money on their bills (Affinity Sutton, 2011).

Lack of information from a trusted source on how to efficiently operate currently installed heating system was reported in a number of studies which looked at older people and identified this as a barrier to behaviour change (Basham et al, 2004) but also among younger households. Where there are many organisations involved in helping people with energy issues older people can find this confusing and discouraging and this can lead them not to seek help where it is needed (Tod et al, 2012).

Some found energy companies difficult to contact (use of semi-automated telephone systems etc.) and lack of trust and scepticism affected people's judgement of any advice they offered (Faulk, 2009 (based on focus groups with vulnerable groups); George et al, 2011 (variety of vulnerable groups).

Coping strategies and habitual behaviour can be a barrier

For some households behavioural factors such as the coping strategies outlined in Chapter 3 meant that they had established coping mechanisms that worked for them and there was a certain sense of security and dignity associated with sticking with what they knew (Harrington et al, 2005). Habit also seems to be an important behavioural trait that is hard to break even for simple actions such as switching off lights when leaving a room (Vries, Arts and Midden, 2011).

4.5 Gaps in the evidence

The evidence reviewed in this chapter examines barriers and facilitators to behaviour change in relation to energy efficiency among households at risk of fuel poverty. Evidence on the capacity of households to improve energy efficiency is reviewed, what factors trigger change and what are the key barriers to behaviour change. Despite there being a good coverage of evidence in the existing literature, some gaps remain. Our initial scoping of the literature revealed that 38 of the 57 pieces of literature that we used in the review directly covered barriers and facilitators to behaviour change. However, within this area there were noticeably fewer studies that had focused on motivations and triggers to changing energy systems within the home.

Barriers to behaviour change

The literature reviewed didn't identify whether there are common, or systematic, barriers to energy efficiency among the fuel poor group (or sub-groups) other than a general assumption that low incomes prohibited their ability to make the necessary investments and the higher incidence of living in rental accommodation meant that decisions regarding large scale investments were taken by landlords. Some of the evidence reviewed did identify the importance of significant savings associated with any investment or even to switch energy supplier but it was not possible to precisely identify what levels of savings was necessary for a range of different energy efficiency investments or whether removing or reducing costs would overcome barriers to taking up energy efficiency measures. Some of the evidence highlighted the issue that fuel expenditure does not necessarily fall following energy efficiency improvements and can even rise. A clearer understanding of the behaviours of fuel poor households in relation to returns to investments from energy efficiency measures taken in the form of increased comfort and reductions in bills could help inform the barriers and facilitators to behaviour change.

Behavioural theory and changing social norms

In terms of the literature reviewed here there are gaps in terms of the coverage of behavioural theory and in the area of changing social norms. This is most likely because the behavioural theory in this area has not focused on individuals in fuel poverty but more generally on energy efficiency and adoption of green behaviours (Cabinet Office Behavioural Insights Team, 2011). However, it seems like there are important lessons that can be learned from that broader literature that could be applied to fuel poor households and it would be helpful to know if the same triggers for changing social norms applied to households at risk of fuel poverty (comparative energy consumption information, reducing hassle factors, collective purchasing) or if other factors were more important, such as certainty of reductions in expenditure or increased thermal comfort associated with making changes.

Changing habits

A better understanding of how to positively influence changes to habitual behaviour to increase energy efficiency is an area that could fruitfully benefit from more research. There is likely to be existing research on changing habits in the psychology literature, but probably not that which focus on specific behaviour of the fuel poor.

5. Organisational and community engagement

Summary

There is only a small evidence base on the organisational and community engagement of the 'at risk' population, pointing to the need for more research in this area. However some useful findings do emerge from the existing stock of evidence. Research with older people and homeowners found that information about energy issues can be better received if contextualised and socially embedded through trusted networks such as colleagues, friends, relatives and neighbours. Community organisations, such as outreach services for vulnerable groups, can help to engage householders with energy issues - especially if this information is high quality and from a trusted source. This appears important as unsurprisingly vulnerable householders, for example older people, show levels of discontent, cynicism and mistrust towards energy companies.

There are a number of keys gaps in the existing evidence. More evidence is required to confirm suggestions that the local community is an important mechanism for communicating energy efficiency information to the fuel poor - and which communication channels work best for the different at risk and vulnerable households. There is also the need to understand how organisational and community engagement develops into energy efficient behaviour change, particularly for those households in the greatest need.

5.1 Introduction

This chapter looks at three key areas of householders' organisational and community engagement around issues of energy efficiency:

- Level of engagement with the local community and how engagement helps overcome barriers to behaviour change
- Types of intermediary organisations households interact with
- Views on energy suppliers

As discussed in the first chapter, this review considers evidence relating to households in fuel poverty or 'at risk' of fuel poverty – not householders in general. Some studies did make attempts to explicitly research fuel poor households and the text makes clear where the evidence explicitly refers to households experiencing fuel poverty.

5.2 Level of engagement and overcoming barriers to behaviour change

This section looks at households' engagement with the local community – friends and neighbours, as well as community groups and local institutions – and how this can help

overcome barriers to behaviour change. The evidence base in this area is not large and tends to focus on three themes: how householders use family members for advice; and the role of community groups, and how suppliers attempt to reach out to householders through community links.

Using family members for advice

Lusambili et al (2011) undertook interviews with 30 older people to explore the relationship between social connectedness, modern technology and the ability to keep warm during winter. They found that the majority of older people rely on family members for advice on how to programme their heating system and pay bills (although the effectiveness of this very much depended on whether their family used the internet to search for solutions). These findings may suggest that information about energy efficiency should not simply be passed on from the expert to the user, as the information needs to be contextualised and socially embedded through trusted networks such as colleagues, friends, relatives and neighbours.

The role of community groups

A number of studies emphasise the importance of generating community awareness about the importance and usefulness of energy conservation, and that energy agencies can aid learning through local neighbourhood initiatives to adopt energy efficient technology. Lusambili et al's (2011) research with older people also found community groups, for example day care centres, as a place where such information was discussed and shared. Hence older people with no connection to local community groups were at a big disadvantage in terms of accessing information. Older people, in particular, required help and advice on heating and energy efficiency from someone they trust. This puts those who are socially isolated at a distinct disadvantage.

Suppliers are aware of the difficulties in reaching vulnerable households, and to motivate them to take up energy efficient programmes and measures. As part of the energy industry's learning and outreach programme, Energy UK organised a workshop on reaching and motivating vulnerable or at risk of poverty consumers (Energy UK, 2012). It was felt that collaboration with local groups or trusted brands is required to generate support for projects and take-up of energy efficiency initiatives. Other conclusions were that messages around energy efficiency should be tailored to communities with reference to local knowledge of particular needs and worries of householders – and that existing points of contact, for instance GPs and social workers, should be utilised to help engage and motivate neighbourhoods.

Ramsay and Pett (2003) point out that national energy efficiency programmes cannot be tailored to every individual and hence hard-to-reach groups – including those on lower incomes but not low enough to qualify for government programmes providing free energy efficiency measures - can miss out on information or help they need to be more energy efficient. They too argue that bringing in community partnerships and the expertise of other disciplines in identifying and relating to excluded audiences is essential for moving the market for energy efficiency forward. They give an example of frontline health professionals going into the homes of patients, identifying energy inefficient homes that could be linked to poor health, and then referring patients on to organisations able to help with energy efficiency measures.

5.3 Types of intermediary organisations households interact with

Research has looked at a number of ways in which households engage with organisations about fuel poverty. This includes direct contact with government, local authorities, third sector organisations and energy companies. This section discusses how households interact with or come into contact with these organisations and which communication channels households at risk of fuel poverty are most comfortable with.

Methods of communication

Research on how energy companies communicate with vulnerable householders was carried out by Energy UK (2012), who explored issues of engagement at a workshop with key stakeholders. Energy suppliers were not able to overcome barriers of trust and the stigma some vulnerable households (notably older people) associated with handouts. Charities and citizens advice organizations have been more successful in accessing these consumers. Some made intensive efforts to reach specific groups - the emphasis here was on persistence and tailored efforts, and that messages should not be over-complicated or lengthy as householders tend to abandon complex projects.

Some householders report finding energy companies difficult to contact with the need to select from a range of options when making contact by telephone as well as the need to enter various personal details such as account numbers. Older people, partially sighted and blind people, people whose first language was not English and those with learning difficulties, were more likely to find these systems difficult and expressed a preference for speaking directly to a real person (George et al, 2011).

Having intermediary organisations to provide advice, rather than expecting these households to proactively search for information, may be particularly relevant for vulnerable groups. A small survey on attitudes and behaviours towards keeping warm among older people found that they were unlikely to seek out advice on energy efficiency. They were also unlikely to take advice provided by Local Authorities and energy suppliers (Attend Rights to Warmth, 2009). Older people were much more responsive to receiving information from health practitioners and charities. Communication that took a health angle rather than an environmental one was also more likely to be impactful due to being able to relate directly to householders' individual concerns.

Buck et al (2007) evaluated pilots aimed at providing financial outreach services for groups facing high levels of deprivation or financial exclusion (which would include people at risk of fuel poverty such as single parents, the unemployed and those on low income). These outreach services took place at locations such as family and children centres, credit unions, housing offices, community centres and prisons. Those who trusted the outreach location and its staff, and who felt they were receiving high quality advice, reported positive experiences of the services provided. Many of the outreach locations had already built up a reputation for providing good quality, professional advice. However, good mainstream local advice provision does not necessarily mean it is used. Being unaware of mainstream advice provision, being unwilling to use it, and/or having difficulty travelling even relatively short distances due to financial or mobility reasons makes the provision of easily accessible outreach advice important.

Views on interaction

The type of contact that households experience can vary from written information (such as leaflets), to personal guidance on using energy efficient technologies. Palmer (2008) undertook a small survey to investigate whether Scottish Government energy efficiency grant leaflets are successful in portraying information to older householders. The research found that a significant minority of respondents did not understand what the grant was about and whether they qualified for it. Furthermore, nearly half of respondents did not understand that grant installations could reduce fuel bills. A lack of clear information being provided by energy efficiency funding organisations was also found by Rohe et al (2010) who reported on the experience of 11 local non-profit organisations funded to develop programmes to housing rehabilitation services.

Changeworks (2012) used focus groups and telephone interviews with the tenants of eight social landlords in Scotland to explore their views of information received. Tenants were

provided with energy efficiency information by their landlords in a number of ways, including guidance leaflets, advisors showing tenants how to use new technology when it was installed, follow up visits from landlords, telephone advice and information sessions. Tenants said that materials provided by the social landlords were effective in communicating information as they were non-technical, user-friendly and straightforward. Ongoing technical advice was also offered to tenants, which was found to be beneficial as tenants did not take all the information in the first time. Tenants preferred being shown how to use the systems rather than having to rely on manufacturer's instructions. The only downside was when different staff were used as they sometimes provided conflicting advice - which is a risk when multiple contractors are used.

Looking at engagement between householders and authorities from the other side, Wade et al (2012) used a web-based survey of 52 local authorities to explore the actions local authorities are taking to engage with customers about tackling fuel poverty. Activities that local authorities felt were the most effective at engaging households included partnership working, effective use of local knowledge and careful targeting, working with short, local supply chains (to ensure quick delivery) and working with community intermediaries.

5.4 Views on energy suppliers

Understanding householders' views on energy suppliers helps to gauge their relationship with the energy market and with levels of service, as well as with the cost of energy. There exists a body of research that focuses on the views of vulnerable groups and those in fuel poverty. Much of this, given the current and recent debates around energy supply and prices, revolves around feelings of cynicism and mistrust.

Recent times have seen rises in the price of energy and this has led to high levels of discontent with suppliers. Research with vulnerable customers to explore their engagement with the energy market found little positive loyalty to suppliers (FDS International, 2011). Feelings of cynicism towards energy companies were driven by what households saw as excessive prices and a lack of understanding of how bills are calculated or why prices were changing. Barnardo's (2012) found that the public think the energy market is too confusing and that vulnerable families and young people are least likely to access the best energy deals due to not having access to the internet or bank accounts.

Another reason for households having negative views on energy companies is the lack of clarity in the information they receive from them. A common feeling among vulnerable householders was that the range and complexity of different tariffs on offer was to purposefully confuse the customer and make their choice more difficult (FDS International, 2011). For example, research on older people fuel poverty in Scotland found that poor information and inappropriate methods of contact were main reasons householders did not take up grant schemes (Palmer, 2008).

Negativity towards energy suppliers can have consequences for how households interact with energy companies. George et al (2011) reviewed the evidence on the needs of vulnerable energy consumers and interviewed a selection of organisations which advise people in vulnerable circumstances. They found that vulnerable customers frequently face multiple barriers in accessing information, advice and support. An important theme that emerged from the study was lack of trust in suppliers as sources of help and advice.

5.5 Gaps in the evidence

This chapter has reviewed the available evidence on the fuel poor, and householders at risk of fuel poverty, and their views on their energy company, the intermediate organisation they interact with and more general engagement in the local community. Despite there being some useful messages to take from the existing literature, gaps in the evidence remain. Generally there is not a large library of literature on the fuel poor's views of their energy company and their

engagement with companies and the community around energy efficiency issues. Our initial scoping of the literature revealed that only 17 of the 57 pieces of literature that we used in the review directly covered these issues – compared to nearly 40 pieces of literature on issues related to 'current energy behaviours and concerns' and to 'barriers and facilitators to behaviour change'. In particular, relatively few pieces of evidence addressed the engagement of those in fuel poverty with their local community and how this engagement may impact on barriers to energy use and efficiency.

Views of specific energy companies

Most of the evidence reviewed in this chapter focused on the fuel poor's views on energy suppliers. This is a popular topic given the current debate about energy prices, hence it is unsurprising that research has sought to explore and draw attention to these issues. However, the research tends to refer to energy suppliers as an industry rather than for specific companies. This information may only exist in companies' own customer satisfaction surveys, which are unlikely to be made public. However, companies could be encouraged to isolate findings from groups at risk of fuel poverty to help design and target bespoke communications.

Local engagement of fuel poor

There is some evidence on how households engage with the local community. Most of this research is based on assessing programmes or schemes which have promoted such interaction. So much of this research is about the views of people who are engaging with energy efficiency interventions rather than the wider pool of households in fuel poverty. Hence there is scope for more research on how fuel poor householders engage with the local community more generally, and how this can help overcome barriers to behaviour change.

Communication channels

There is not a great deal of research on the communication channels that fuel poor households use, which types of vulnerable groups use which channels, and how effective these channels are. The evidence that does exist is to some extent unsurprising – for example that vulnerable households, particularly older people, are less comfortable using the internet and other digital media. Householders tend to favour a more personal approach, so do not respond well to written media, unless incredibly straightforward, non-technical and user friendly (but still an issue of whether they actually read it). More research is required to understand the mechanisms through which communications are well received by the fuel poor, and the processes by which digesting such information impacts on attitudes and behaviour change.

Take up of initiatives to reduce fuel poverty

There is a real need to understand the reasons why households do not take up the initiatives designed to help them out of fuel poverty, especially that which focus on improving their energy efficiency. Research that sheds more light on how householders engage with energy companies and intermediary organisations will help provide pointers on the best methods to increase awareness and motivate take-up of help, particularly for those households in the greatest need.

Development work

Again the balance of research is tipped more towards qualitative and smaller surveys than larger UK-wide representative quantitative research. Hence it makes it difficult to generalise findings to the wider population of fuel poor households. However, it is also difficult to explore issues of trust and loyalty using quantitative research. These questions are not routinely included on large surveys and some development work is likely to be required to ensure questions tap into the issues in the right way.

6. Conclusion

This review focused on identifying and summarising evidence on the behaviours and attitudes of households in fuel poverty. One of the key challenges in conducting the review was how to identify research specifically about the fuel poor, particularly given the recent change from the 10% definition of fuel poverty to the LIHC definition (DECC, 2013). As anticipated, no research used the current definition and hence the review was widened to include research about groups 'at risk' of fuel poverty.

Although some useful messages emerged from the existing literature, the review revealed a general lack of evidence on the behaviours and attitudes of households in fuel poverty. An important objective of the review was to assess gaps in the current evidence base. This revealed a number of key areas where more research is required, notably:

- More large-scale quantitative research, as much of the existing research has used qualitative methods or is based on small scale surveys.
- Understanding whether reducing energy bills or increasing comfort levels is the bigger priority for the fuel poor and therefore the extent to which energy efficiency improvement gains would be taken in bill reduction or increased comfort.
- How fuel poor households operate their home heating and other energy systems.
- How to positively influence changes to habitual behaviour to increase energy efficiency.
- The current level of household engagement in the local community and how might help overcome barriers to behaviour change.
- How effective communication channels are at impacting on attitudes and behaviour change.
- The reasons why households do not take up the initiatives designed to help them out of fuel poverty, especially that which focus on improving their energy efficiency.

Finally, there is the need to develop methodological tools that can be used in research studies to specifically identify the fuel poor. The Hills Review (2012) acknowledges how challenging, intrusive and expensive it is to properly assess a household's income and property to establish whether a household is living in fuel poverty. Proxy indicators of fuel poverty need to be identified and tested to provide the means for researchers to try to fill the gaps in the existing evidence base.

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Annex A Methodology

The review was conducted in two phases:

- Phase 1: A systematic search and initial assessment of the evidence.
- Phase 2: A rapid review of the evidence. This entailed synthesising the evidence around the four thematic areas.

Phase 1 - Systematic search and initial assessment

This phase involved a systematic search for the evidence, and, an initial rapid assessment of the quality of the evidence.

A systematic search for the evidence

The search process was guided by three key parameters which determined whether a publication was included in the review. An overview of these parameters is provided in the table below.

The parameters of the evidence search		
Parameters	**Inclusion**	**Exclusion**
Language	Only English language publications	Publications in other languages.
Timeframe	Publications since the year 2000, to tie in with the introduction of the Warm Homes and Energy Conservation Act 2000.	Publications before 2000
Country	Given the potentially limited evidence base, evidence from other countries was admitted – including Europe, North America, Australia and New Zealand.	Publications relating to developing countries.

The search process was designed to be as comprehensive as possible so that both published and grey literature could be identified. This entailed identifying evidence through four sources: a) approaching policy and industry experts, b) engaging with relevant online forums, c) searching databases of literature and d) 'snowballing' references from found literature. These are explained in more detail below:

a) approaching policy and industry experts

Policy and industry experts in the area of energy use and fuel poverty were approached across a range of organisations.

- *Academia* – Oxford University, University of Leeds, Loughborough University, Salford University, the University of Ulster, London School of Economics;
- *Organisations with charitable status* – National Energy Action, The Energy Saving Trust, Eaga Charitable Trust and the Centre for Sustainable Energy;
- *Energy companies* – EDF and EON;

- *Social housing organisations* – The Peabody Trust
- *Statutory bodies* – Consumer Futures; and
- *Architects* – PRP architects.

b) engaging with relevant online forums

To further capitalise on the knowledge of experts in this area, we also posted a call for relevant evidence on *seven online forums* within the JISC network - a service designed specifically for the further and higher education and research communities. Seven forums were targeted as they specifically dealt with issues surround poverty, energy, vulnerable groups and social policy:

- Child poverty forum
- Energy and society forum
- Energy and vulnerability forum
- Fuel poverty – a forum for postgraduates
- The social policy forum
- The vulnerability network forum
- Energy geographies mailing list

c) searching databases of literature

The majority of evidence was attained through searching six key *evidence databases*. These were selected on the basis of offering good coverage of peer-reviewed literature, grey literature and a specialist focus on fuel poverty. Search strategies were adapted to optimise the functionality of each database and combinations of search terms were used. The databases and search terms used are summarised in the table below.

The databases and search terms used	
Databases searched	**Search terms used across all databases**
• ASSIA • Fuel Poverty Network • IBSS • Social Policy Digest • Social Policy and Practice • Web of Knowledge	• "fuel (poverty or poor)" + [energy + efficiency] • [energy or utilities or gas or electricity or water] or [heating or lighting or cooking or appliances] or [metering or tariffs or disconnection] • [suppliers or companies] OR [income or poverty or poor or disadvantaged] OR [(single or lone) or (benefits or welfare) or vulnerable or (older or aged or elderly) or (disab*)] OR [housing or insulation or retrofit!].

d) 'snowballing' references from found literature

Finally, the *snowballing* exercise entailed gathering further references from the reports, individual authors and organisations recommended by the experts approached.

A rapid assessment of the literature

The search found almost 200 pieces of evidence. The initial rapid assessment process entailed assessing the relevance of the evidence to the specifics of the four thematic areas, and its methodological robustness. At this phase, only abstracts/executive summaries were read to achieve a quick and broad understanding of the body of evidence.

The assessment involved the use of a framework matrix to record the criteria of 'relevance' in terms of how well the evidence fitted the four themes. A total of 156 pieces of evidence were found to be relevant.

The methodological strengths of the evidence were then verified. This assessment broadly focused on sample design, data collection and, for surveys and quantitative analysis analytical approach and presentation of findings. Articles found in peer-reviewed journals were automatically viewed as robust. Only 4 pieces of literature were dropped because the methodology was not robust, taking the running total to 152 (the template used is on the next page).

Phase 2 – A rapid review of the literature

Project resources meant that not all 152 pieces of literature could be reviewed. Discussions with DECC led to the most relevant pieces of literature being used. This meant Phase 2 involved a review of 57 pieces of literature.

A rapid review approach was used to synthesis the evidence. This approach involved reviewing relevant parts of the evidence – executive summary, findings section, conclusions - and summarising these using four analytical matrices that directly reflected the four thematic areas outlined earlier (see below for an overview of what each matrix covered). Each matrix was composed of rows representing the evidence reviewed and columns representing key sub-issues within each area. This 'framework method' facilitated a systematic approach to interpreting the evidence:

- It linked summaries explicitly to the four thematic areas;
- It enabled the evidence for a single research objective (e.g. current energy behaviours) to be easily viewed and interpreted; and
- It enabled reviewers to return to the original sources if the summaries were not clear or more information was needed.

Rapid assessment framework template– phase 1

1. Search details						2. Relevance of the study							3. Quality of the reviewed literature		4. Overall
1.0 Reference	1.1 Fieldwork date	1.2 Type	1.3. Source	1.4 Study location	1.5 Abstract	2.1 Awareness	2.2 Current behaviours	2.3 Behaviour change	2.4 Engagement	2.6 Groups	2.7 Score	2.8 Comment	3.1 Research design	3.2 Method score	Overall score
1.0 Full reference 1.1 Fieldwork date – When fieldwork actually began 1.2 Type – The format of the evidence (e.g. report, journal article) 1.3 Source – where evidence sourced from (e.g. databases, experts) 1.4 Study location – where data collection took place 1.5 Abstract/link to files.						2.1 to 2.4 - Indication of which objective areas (s) the literature related to 2.6 Specifics groups - Whether particular groups of interested were involved in the study (e.g. low income, elderly etc…) 2.7 Overall relevance scores - Maximum 2 and minimum 0 2.8 Relevance comments – Associated comments about relevance							3.1 Research design – the methodology used 3.2 Overall methodology score - Maximum 2 and minimum 0		Overall scores – max of 4 and minimum of 0

Methodology score template (qualitative) – Phase 1

Area	Sub -area	What ideally should be achieved	Scoring	Overall score
Sampling	*Sample frame*	**Ideally, a sample frame should be used**. Study should make explicit: - Where sample drawn from (administrative records, published lists, survey samples, generated sampling frames, through organisations, snowballing) - Rationale for using a particular frame	0.25	1
	Sample size	**Sample size & rationale** for this should be made explicit - Qualitative samples tend to be small - Rationale relating to achieving diversity in sampling criteria	0.25	
	Sampling approach	**Ideally purposive sampling** - Primary and secondary criteria made explicit (including rationale) - Quotas for each made explicit	0.25	
		Use of convenience/snowball sample for some hard to reach groups (process should be made explicit)		
	Achieved sample	**Achieved sample** in relation to size and criteria should be made explicit. Score even if sample not achieved but authors are clear about this.	0.25	
Data collection	*Methods used*	**Explicit statement of methods used and rationale**. This includes: - Type of qualitative method used (observations, interviews, groups) - Evidence of the tool used to collect data. Ideally, the use of observational tools, topic guides to guide interviews and group discussions - including overall coverage - Explicit statement of other data collection techniques (projective and interactive techniques - e.g. sort card, vignettes)	0.75	1

	Delivery of methods	**Clear statement of how method was delivered:** - Duration of data collection encounters (interviews should ideally be an hour and groups no less than 1.5) - Mode of delivery and rationale (e.g. face-t-face, telephone, online etc…) - Rationale for the composition of groups (size and the types of people in each group) - Data should ideally be recorded (audio or video)	0.25	

Methodology score template (quantitative) – Phase 1

Area	Sub -area	What ideally should be achieved	Scoring	Overall score
Data	**Sample design**	Probabilistic (ideally random sample or stratified random sample) Design (cross-sectional, longitudinal, experimental) Size (sufficient to analyse fuel poor) Geography (region, UK, international)	0.25	0.75
	Suitability	Timing (recent, since recession or key policy changes), Measurement of key issues (how well measures or approximates fuel poverty)	0.50	
Analysis methods	**Data interrogation**	Theory driven, clear research questions (e.g. to test theory around fuel poverty)	0.25	0.75
	Statistical techniques	Descriptive (only looking for patterns in data) Multivariate (confirming relationships between variables, e.g. comparing fuel poor and not fuel poor) Significance testing Appropriate techniques used	0.50	
Interpretation	**Assessment of findings**	Interpreted findings correctly	0.25	0.50
	Presentation of findings	Clear and concise to support conclusions	0.25	

Framework matrices overview – phase 2

The framework approach involves summarising ('charting') the evidence using a series of analytical matrices ('charts') to represent each of the key questions asked of the evidence. Each chart will have its own matrix in an excel spreadsheet tab, with rows and columns.

- **The columns**. The column headings on each chart relate to key sub-topics within each question (in the framework below, these are denoted by the numbered cells – e.g. in chart 1, 1.8 Awareness of energy efficiency programmes), as well as some basic characteristics of that reference (e.g. methodological approach). These basic characteristics will already have been completed for the reviewers – although they may want to check the accuracy of some these.
- **The rows**. The rows refer to the individual references. For brevity, each reference will have its own unique serial number in each chart. The spreadsheet will contain a summary tab where the full reference and its associated serial number can be found, for reference.
- **The cells**. The cells where a row and column intersect are where the evidence from each reference is then summarised.

Reviewers will work to a 'charting framework', which specifies the matrices, columns, and rows to be used and what should be entered in each cell. This document outlines the framework. Each chart represents the agreed four broad areas under which the original research questions were grouped. The suggested sub-topics for each chart then refer back to the original questions.

	Chart 1 – Knowledge and perceptions of energy efficiency This chart ONLY deals with views, attitudes and awareness around energy efficiency in particular (see chart 2 & 4 for behaviours)	
Already completed fields - that may need checking	*1.1 Reference serial number*	The **serial number signposts which reference** the row relates to. You can see the full list of all references and their associated serial numbers in the first tab of the spreadsheet (labelled "All articles"). The reference serial number will have already been completed for you. IF YOU FEEL THE REFERENCE IS NOT RELEVANT TO THIS CHART OR IS ALSO RELEVANT TO ANOTHER AREA, PLEASE IDENTIFY.
	1.2 Type of reference	This **specifies the type of reference**. References are categorised as follows: - Commissioned report - Conference paper - Journal article - Report - Thesis - Workshop report The type of reference will have already been completed for you. However, please amend this if it is not accurate or where there are blanks
	1.3 Methodology	**Summary of the methodological approach**. The approaches are categorised as follows: - Discussion paper/policy review - Experimental method - Mixed methods - Modelling - Physical monitoring - Qualitative - Review of the evidence - Secondary data analysis - Survey The methodological approach will have already be completed for you. However, please amend this if it is not accurate or where there are blanks
	1.4 Methodology score	This is a score which indicates the **methodological robustness** of the study. The score will already have been completed for you.
	1.5 Vulnerable group	This indicates whether the **evidence relates to specific vulnerable groups.** This will have already been completed for you. However, please feel free to add any vulnerable groups that have not been already been picked up.
Fields that need to be completed	*1.6 Energy efficiency of own homes - views*	Any evidence around: - What fuel poor **understand and/or how they feel about the energy efficiency** of their home - Their feelings and understanding about the **potential to improve the energy efficiency** in their homes

	1.7 Willingness to pay for improved energy efficiency	Evidence around the factors that affect the **willingness to pay for improved energy efficiency** in their own homes
	1.8 Awareness of energy efficiency programmes	Any evidence around how **aware fuel poor are of existing government programmes** to help improve the energy efficiency of their home (e.g. Green Deal Finance, Warm Front etc…)
	1.9 Other	Anything else not covered on views, attitudes and awareness around energy efficiency

	Chart 2 - Current energy behaviours & needs This chart ONLY deals with current behaviours around energy use - including heating and hot water (see chart 1 for views and chart 3 for behaviour change)	
Already completed fields - that may need checking	*2.1 Reference serial number*	The **serial number signposts which reference** the row relates to. You can see the full list of all references and their associated serial numbers in the first tab of the spreadsheet (labelled "All articles"). The reference serial number will have already been completed for you. IF YOU FEEL THE REFERENCE IS NOT RELEVANT TO THIS CHART OR IS ALSO RELEVANT TO ANOTHER AREA, PLEASE IDENTIFY.
	2.2 Type of reference	This **specifies the type of reference**. References are categorised as follows: - Commissioned report - Conference paper - Journal article - Report - Thesis - Workshop report The type of reference will have already been completed for you. However, please amend this if it is not accurate or where there are blanks
	2.3 Methodology	**Summary of the methodological approach**. The approaches are categorised as follows: - Discussion paper/policy review - Experimental method - Mixed methods - Modelling - Physical monitoring - Qualitative - Review of the evidence - Secondary data analysis - Survey The methodological approach will have already be completed for you. However, please amend this if it is not accurate or where there are blanks
	2.4 Methodology score	This is a score which indicates the **methodological robustness** of the study. The score will already have been completed for you.
	2.5 Vulnerable group	This indicates whether the **evidence relates to specific vulnerable groups.** This will have already been completed for you. However, please feel free to add any vulnerable groups that have not been already been picked up.
Fields that need to be completed	*2.6 How homes are heated*	Any evidence around **how the fuel poor actually heat their homes**. Please use the following headings: - General discussion of heating homes (how they heat their homes) - How control heating use in homes (includes whether they try to control heat/heat expenditure at home, if not, why not and the ways in which they control heating. E.g. heating for shorter periods, heating part of the property, heating below comfort

		levels)
	2.7 Energy usage& bills	Evidence of the extent to which the fuel poor **engage with their energy usage and bills** (e.g. are they aware how much they use, monitoring their usage etc…)
	2.8 Energy needs & concerns	Any evidence around the specific **energy concerns and needs of the fuel poor**. Please use the following headings: - Concerns (includes energy related concerns specific to fuel poor - including sub-groups of fuel poor - & whether they feel able to heat their home to the level of comfort they require. If not, what prevents them from doing this?) - Needs (includes what motivates their current energy behaviour and how they prioritise needs. E.g. is to improve comfort and/or reduce bills)
	2.9 Communication	Evidence around what **communication channels fuel poor are most comfortable** with (including how **digitally included/excluded** they are) This is could relate to communication with a whole range of organisations - central government, local authorities, energy companies, banks etc... and NOT necessarily to do with energy use
	2.10 Other	Anything else not covered on current energy use behaviours and needs

	Chart 3 – Barriers and facilitators to behaviour change This chart ONLY deals energy use behaviour change - including heating and hot water (see chart 1 for views and chart 2 for current behaviours)	
Already completed fields - that may need checking	*3.1 Reference serial number*	The **serial number signposts which reference** the row relates to. You can see the full list of all references and their associated serial numbers in the first tab of the spreadsheet (labelled "All articles"). The reference serial number will have already been completed for you. IF YOU FEEL THE REFERENCE IS NOT RELEVANT TO THIS CHART OR IS ALSO RELEVANT TO ANOTHER AREA, PLEASE IDENTIFY
	3.2 Type of reference	This **specifies the type of reference**. References are categorised as follows: - Commissioned report - Conference paper - Journal article - Report - Thesis - Workshop report The type of reference will have already been completed for you. However, please amend this if it is not accurate or where there are blanks
	3.3 Methodology	**Summary of the methodological approach**. The approaches are categorised as follows: - Discussion paper/policy review - Experimental method - Mixed methods - Modelling - Physical monitoring - Qualitative - Review of the evidence - Secondary data analysis - Survey The methodological approach will have already be completed for you. However, please amend this if it is not accurate or where there are blanks
	3.4 Methodology score	This is a score which indicates the **methodological robustness** of the study. The score will already have been completed for you.
	3.5 Vulnerable group	This indicates whether the **evidence relates to specific vulnerable groups.** This will have already been completed for you. However, please feel free to add any vulnerable groups that have not been already been picked up.

Fields that need to be completed	*3.6 Capacity to improve energy efficiency*	Any evidence on the factors affecting the **capacity of the fuel poor to improve energy efficiency** in their own homes. Please use the following headings: - Facilitators (what factors enable fuel poor to improve energy efficiency in their own homes) - Barriers (Which barriers to this that are specific to the fuel poor - e.g. ability to pay for energy efficiency measures - USE 3.8 FOR SPECIFIC BARRIERS ACCESSING SUPPORT & SERVICES) - Overcoming barriers (What has been effective in overcoming these barriers - e.g. removing or reducing costs)
	3.7 Motivations to change energy systems	Evidence of factors that **triggers changes in energy systems** (e.g. a change in heating systems may be triggered by home renovations etc…)
	3.8 Barriers to accessing support	**Barriers (behavioural and otherwise) to accessing the support** (financial and otherwise) they require to make their homes more energy efficient, switching energy providers, switching energy tariffs, accessing support under various government schemes/programmes. Please discuss these using the following headings: - Switching energy providers - Switching tariffs/payment types - Accessing support through schemes (e.g. energy efficiency support through Green Deal, support with bills etc...) Within each, discuss what has been effective in overcoming barriers - including evidence of interventions that have been successful. USE CHART 4 TO ASSESS IMPACT OF COMMUNITY ENGAGEMENT IN OVERCOMING THESE BARRIERS
	3.9 Other	Anything else not covered on current energy use behaviours and needs

	Chart 4- Organisational and community engagement This chart deals how the fuel poor engage with organisations and their community - not necessarily in relation to energy use	
Already completed fields - that may need checking	*4.1 Reference serial number*	The **serial number signposts which reference** the row relates to. You can see the full list of all references and their associated serial numbers in the first tab of the spreadsheet (labelled "All articles"). The reference serial number will have already been completed for you. IF YOU FEEL THE REFERENCE IS NOT RELEVANT TO THIS CHART OR IS ALSO RELEVANT TO ANOTHER AREA, PLEASE IDENTIFY.
	4.2 Type of reference	This **specifies the type of reference**. References are categorised as follows: - Commissioned report - Conference paper - Journal article - Report - Thesis - Workshop report The type of reference will have already been completed for you. However, please amend this if it is not accurate or where there are blanks
	4.3 Methodology	**Summary of the methodological approach**. The approaches are categorised as follows: - Discussion paper/policy review - Experimental method - Mixed methods - Modelling - Physical monitoring - Qualitative - Review of the evidence - Secondary data analysis - Survey The methodological approach will have already be completed for you. However, please amend this if it is not accurate or where there are blanks
	4.4 Methodology score	This is a score which indicates the **methodological robustness** of the study. The score will already have been completed for you.
	4.5 Vulnerable group	This indicates whether the **evidence relates to specific vulnerable groups.** This will have already been completed for you. However, please feel free to add any vulnerable groups that have not been already been picked up.
Fields that need to be completed	*4.6 Local community*	Any evidence on the fuel **poor's level engagement with their local community** - including impact of this on the barriers they face relating to energy use and efficiency.

	4.7 Intermediary organisations	Evidence on the **types of intermediary organisations** that fuel poor are likely to engage with, not necessarily in relation to energy efficiency directly. These could include: -Government - Local authorities - Third sector organisations - Other
	4.8 Energy supplier	The fuel poor's level of engagement and **views on energy suppliers**.
	4.9 Other	Anything else not covered above

Annex B Summary of studies used in the review

Authors	Title	Date	Type	Source	Geographical area of study
Affinity Sutton.	**Futurefit Report: A Groundbreaking Project That Gives a Unique Insight into How the Green Deal Could Work in Social Housing. Part One.**	2011	Report	http://www.energysavingtrust.org.uk/Publications2/Housing-professionals/Refurbishment/FutureFit-report-part-one	UK
The FutureFit project delves into previously untested territory. Instead of the more usual one-off exemplar or desktop study, this national project, involving more than 100 homes, provides Affinity Sutton with an in-depth understanding of the practicalities of wide scale retrofit across our 56,000 homes. It should provide lessons for social landlords everywhere of the challenges that retrofit presents. This report follows the entire journey of the retrofit process, illustrating key findings and detailed results for each stage. It starts by identifying the properties to retrofit, works out the packages to install, moves through to installing the packages, and moves on to understanding the resident experience and what happens when works are finished. Finally, it explains how the FutureFit project has discovered ways to spread the benefits of retrofit more widely.					
Authors	**Title**	**Date**	**Type**	**Source**	**Geographical area of study**
Allmark, P., and A. M. Tod.	**Can a Nudge Keep You Warm? Using Nudges to Reduce Excess Winter Deaths: Insight from the Keeping Warm in Later Life Project (KWILLT).**	2013 (Epub ahead of print)	Journal article	Journal of Public Health	Rotherham
Nudges are interventions that aim to change people's behaviour through changing the environment in which they choose rather than appealing to their reasoning. Nudges have been proposed as of possible use in relation to health-related behaviour. However, nudges have been criticized as ethically dubious because they bypass peoples reasoning and (anyway) are of little help in relation to affecting ill-health that results from social determinants, such as poverty. Reducing the rate of excess winter deaths (EWDs) is a public health priority; however, EWD seems clearly to be socially determined such that nudges arguably have little role. This article defends two claims: (i) nudges could have a place in tackling even the heavily socially determined problem of EWD. We draw on evidence from an empirical study, the Keeping Warm in Later Life Project (KWILLT), to argue that in some cases the risk of cold is within the person's control to some extent such that environmental modifications to influence behaviour such as nudges are possible. (ii) Some uses of behavioural insights in the form of nudges are acceptable, including some in the area of EWD. We suggest a question-based framework by which to judge the ethical acceptability of nudges.					

Authors	Title	Date	Type	Source	Geographical area of study
Anderson, W., V. White, and A. Finney.	**"You Just Have to Get By": Coping with Low Incomes and Cold Homes**	2010	Report	http://www.cse.org.uk/pdf/you_just_have_to_get_by.pdf	Great Britain
This paper investigates the coping strategies employed by low-income and/or fuel poor households; the links between income, fuel poverty and other forms of social deprivation; and the current role of a competitive energy market in delivering affordable warmth. Finds that low-income households with highly constrained budgets typically cut back their spending on both food and fuel and that nearly half of those surveyed said their homes had been colder than they wanted during the previous winter. Notes that a significant proportion had experienced problems with damp or condensation. Reveals that switching supplier or tariff was a minority activity amongst low-income households and that those interviewed expressed scepticism about the opportunities offered by the energy market.					

Authors	Title	Date	Type	Source	Geographical area of study
Bahaj, A. S. and P.A.B. James.	**Urban energy generation: The added value of photovoltaics in social housing,**	2007	Journal article	Renewable and Sustainable Energy Reviews, 11:9, (2007), 2121-2136	South of England
Social housing offers an alternative for low-to-medium income families and keyworkers (teachers, nurses, and police). In the United Kingdom, this fairly priced, rental accommodation is normally owned by housing associations. This paper explores urban energy generation (micro-generation) focussing on photovoltaics (PV) and how its generated electricity can be used to provide added value in terms of demand reduction and contribute to a reduction in fuel poverty. It presents the results associated from in-depth monitoring of nine low-energy social housing units equipped with PV systems commissioned in 2004 in the South of England. We report on energy load profiles and relate these to occupier behaviour and any changes in consumption that occur. The results highlight the impact of micro-generation showing a close correlation between occupant behaviour and energy consumption. Increased energy awareness can lead to changes in the way energy is used, reducing overall consumption but 'education' must be sustained to ensure long-term energy reductions. The financial benefit of operating high demand electrical appliances at the peak of the solar day as opposed to in the evening when overall demand on the central grid is higher is highlighted. The paper also draws conclusions allied to the challenges that PV micro-generation technology presents in the social housing context.					

Authors	Title	Date	Type	Source	Geographical area of study
Banks, N., and V. White.	**Evaluation of Solid-Wall Insulation in Fuel Poor Households in the Private Sector: Interim Report to Eaga Charitable Trust.**	2011	Report	http://www.cse.org.uk/pdf/solid-wall_insulation_in_fuel_poor_households_in_the_private_sector.pdf	England
The recently completed Watcombe Housing Project used a randomised design to assess the influence, if any, of improving housing conditions on the health of residents. The present study was thus designed to draw upon these initial qualitative findings and, using semi-structured interviews, explore the social structures, processes and interactions associated with living in cold houses. A more quantitative approach using structured interviews on a larger sample was also employed, integrating with our qualitative survey, assessing generalisability of findings from the Watcombe Project. The intention of integrating quantitative and qualitative methods in this way was to promote understanding of the wider social issues of living in cold households by assessing: • Use of the house, and the well-being, and relationships of the household and beyond. • Energy use, methods of payment and costs. • Respondents' perception of their dwelling and area.					

Authors	Title	Date	Type	Source	Geographical area of study
Barnardo's.	**Priced Out: The Plight of Low Income Families and Young People Living in Fuel Poverty. .**	2012	Report	http://www.barnardos.org.uk/pricedoutreport.pdf	UK
Analysis of a survey undertaken with Barnardo's services has identified a range of family groups that have experienced fuel poverty in the last year. Chapter one of this report examines the growing gap between how much families spend on fuel and the amount needed to keep their homes warm, fuel debt and the problems of tariffs and pre-pay meters. Chapter two examines energy efficiency measures and financial support for families on low incomes. Chapter three assesses the impact that fuel poverty has on the lives of children, young people and their families. Finally, chapter four sets out a full list of recommendations for tackling fuel poverty.					

Authors	Title	Date	Type	Source	Geographical area of study
Basham, M., S. Shaw, and A. Barton.	**Central Heating: Uncovering the Impact on Social Relationships and Household Management**	2004	Report	http://www.energybc.ca/cache/globalconsumereconomy/www.carillionenergy.com/downloads/pdf/central_heating.pdf	England
The recently completed Watcombe Housing Project used a randomised design to assess the influence, if any, of improving housing conditions on the health of residents. The present study was thus designed to draw upon these initial qualitative findings and, using semi-structured interviews, explore the social structures, processes and interactions associated with living in cold houses. A more quantitative approach using structured interviews on a larger sample was also employed, integrating with our qualitative survey, assessing generalisability of findings from the Watcombe Project. The intention of integrating quantitative and qualitative methods in this way was to promote understanding of the wider social issues of living in cold households by assessing: • Use of the house, and the well-being, and relationships of the household and beyond. • Energy use, methods of payment and costs. • Respondents' perception of their dwelling and area.					

Authors	Title	Date	Type	Source	Geographical area of study
Beatty, T., L. Blow, and T. Crossley.	**Is there a "Heat or Eat" Trade-Off in the UK?**	2014	Journal article	Journal of the Royal Statistical Society: Series A (Statistics in Society). doi: 10.1111/rssa.12013	Great Britain
Considers whether households cut back on food spending to finance the additional cost of keeping warm during cold shocks, using detailed household level expenditure data from older households and historical local weather information. Sets out an economic analysis of how consumers might be expected to respond to cold weather shocks. Finds evidence that the poorest of older households are unable to smooth spending over the worst temperature shocks. Suggests that statistically significant reductions in food spending are observed in response to unusual temperatures (two or more standard deviations colder than expected) and reductions in food expenditure are considerably larger in poorer households.					

Authors	Title	Date	Type	Source	Geographical area of study
Brown, P., and W. Swan.	**Technology, Users and Everyday Lives: The Installation and Use of Heating Systems and Energy Efficient Technologies in UK Households.**	2012	Conference paper	http://www.eceee.org/library/conference_proceedings/MILEN/MILEN-2012/Presentations/brown-swan/paper	UK
This paper reports on emerging findings from a study that looks to develop a better understanding as to how retrofit technology can be more effective at addressing energy efficiency in the domestic housing sector. The study pays particular attention to the experiences of low income and vulnerable people in the social housing sector. The study, funded by the UKs Engineering and Physical Research Council (EPSRC), has entailed a social scientist (Brown) working more closely with technologists and both within his institution and outside. The intention behind this has been to allow a better understanding to emerge as to the challenges faced across the socio-technical divide. Part of this work has been to engage in discussions leading to a greater sense of mutual understanding as to the potential contributions differing perspectives can bring to the area of low carbon design and retrofit. The other part of this work has resulted in a research study that has focused on improving what we know about people and their everyday lives and how retrofit technology is developed, supplied and installed in households. The research component has three main aims: 1. To better understand the issues faced by technology providers, developers and housing providers when supplying energy reducing technologies to vulnerable households 2. To better understand the barriers and concerns to participating in energy reducing programmes by vulnerable households 3. To develop a co-developmental link between technology providers, developers and housing providers and vulnerable households in order to better address fuel poverty in the UK. A number of methods are being deployed in the study including: the production of a systematic literature review, analysis of existing survey datasets, focus groups and interviews with tenants and landlords, user-design workshops and interviews with manufacturers and installers of retrofit technology. This paper reports on issues emerging from a preliminary analysis of the data from the qualitative research with tenants. The data here draws on six focus groups involving a total of 34 participating tenants, 15 in-depth one-to-one interviews with tenants and a user-design workshop containing six people. The analysis is selective in order to illustrate some of the themes and issues arising from the experience of non-technicians (householders) when coming into contact with retrofit measures and technology.					

Authors	Title	Date	Type	Source	Geographical area of study
Brown, P., W. Swan, and R. Fitton.	**Energy Efficient Technologies in the UK – Installing, Adopting, Learning and Everyday Lives.**	2013	Conference paper	http://proceedings.eceee.org/visabstrakt.php?event=3&doc=8-030-13	UK
The United Kingdom housing stock, like the majority of Europe, is facing significant challenges with regards to carbon reduction, energy consumption and energy affordability. Energy consumption and the cost of fuel continue to increase and the housing stock becomes older. At the governmental level there has been, and continues to be, a strong drive to tackle these issues through the retrofit of existing dwellings. Although the installation of energy efficient technologies in the homes of owner occupiers is still the exception rather than the norm, the social housing sector are pioneers in this area and have been installing increasingly efficient technologies and interfaces in homes for a number of years. These households within the social housing sector are effectively serving as test sites from where we can understand how new technologies and interfaces are being adopted, installed, understood and used in-situ. This paper draws upon findings arising from a multi-method study which aimed to understand the processes involved in the adoption of energy efficient technologies within the social housing sector. Of central importance to this research have been the barriers and concerns to installing energy efficient technologies in the homes of social housing tenants. The research also focused upon attempting to better understand the issues faced by technology providers, developers and housing providers when supplying energy reducing technologies to households. Emerging findings are highlighting that there are currently a number of areas where there is a mismatch between householders, social landlords and those responsible for designing and installing energy efficient technologies for deployment within the UK housing stock. A number of methods are being deployed in the study including: the production of a systematic literature review, analysis of existing survey datasets, focus groups and interviews with tenants and landlords, user-design workshops and interviews with manufacturers and installers of retrofit technology. This paper reports on issues emerging from a preliminary analysis of the data from the qualitative research with tenants. The data here draws on six focus groups involving a total of 34 participating tenants, 15 in-depth one-to-one interviews with tenants and a user-design workshop containing six people.				

Authors	Title	Date	Type	Source	Geographical area of study
Brunner, K. M., M. Spitzer, and A. Christanell.	**Experiencing Fuel Poverty; Coping Strategies of Low-Income Households in Vienna/Austria.**	2012	Journal article	Energy policy 49 (2012), 53-59.	Austria
Until the present day, research on fuel poverty focussing on the point of view of those concerned is few and far between. The present paper aims at filling this gap, analysing experiences with and behavioural responses to fuel poverty. It examines the day-to-day energy situation of households, which are poor/at-risk-of-poverty and/or suffering from fuel poverty in a case study conducted in the Austrian capital Vienna. Qualitative interviews provide the data for investigating the relevant factors in causing fuel poverty (among those, bad housing conditions, outdated appliances, financial problems), and provide a basis for discussion about the respective behavioural strategies of the people concerned. The results show that the ways of handling this problematic situation vary greatly and that people follow different strategies when it comes to inventing solutions for coping with the restrictions and finding ways of satisfying at least a part of their basic energy needs. Nonetheless, it also clearly surfaces that the scope of action is limited in many cases, which in turn only supports the claim that changes in the overall conditions are essential.					

Authors	Title	Date	Type	Source	Geographical area of study
Brunner, K. M., S. Mandl, and A. Christanell.	**From Local to National: Tackling Fuel Poverty in Austria.**	2013	Conference paper	http://oin.at/_publikationen/PublikationenNEU/Fachartikel/Brunner.pdf	Austria
The authors have started a new project in late 2011 (funded by the Austrian Climate and Energy Fund) which aims to develop, implement and evaluate tailor-made advice services for the improvement of energy efficiency and the mitigation of fuel poverty in 400 to 500 Austrian households. Three different sub-projects covering fuel poor households from urban, suburban as well as rural regions serve as examples of implementation. The programmes and measures will be evaluated regarding their effectiveness and their improvement of advice services. Benefits (e.g. mitigation of burdens related to fuel poverty, reduction of CO2-emissions) and costs will be calculated. On the basis of the evaluation of all three sub-projects, strategies will be developed in close cooperation with stakeholders in order to implement effective efficiency programmes and measures against fuel poverty nationwide. The paper presents first results from the local sub-project.					

Authors	Title	Date	Type	Source	Geographical area of study
Buck, A., T. Tam, and C. Fisher.	**Putting Money Advice Where the Need Is: Evaluating the Potential for Advice Provision in Different Outreach Locations.**	2007	Report	http://webarchive.nationalarchives.gov.uk/20100210214359/http://lsrc.org.uk/publications/Outreach.pdf	UK
Between March and June 2006, BMRB Social Research carried out a survey of 563 people using different types of outreach locations included in the pilots. The aim was to assess the suitability of a number of different outreach location types – family and children centres, credit unions, housing offices, community centres and prisons – for the delivery of money advice to 'hard-to-reach' and disadvantaged groups. The survey took place at an early stage: the pilots were either just up and running or due to start soon in all the locations.					

Authors	Title	Date	Type	Source	Geographical area of study
Carroll, D., and J. Berger.	**Transforming Energy Behavior of Households: Evidence from Low-Income Energy Education Programs.**	2008	Conference paper	http://www.aceee.org/files/proceedings/2008/data/papers/7_391.pdf	United States
Over the last twenty years, there has been considerable investment by low-income usage reduction programs in energy education procedures, tools, and technology. Some programs have been successful in reducing energy usage and/or increasing reports of energy-saving behaviors. Other programs have fallen short of their goals. In this paper, we review program evaluation research from some of the most innovative approaches and consider which program models offer opportunities for future initiatives with both low-income households and for broader market initiatives. Our review of the literature finds that, for low-income households, direct interaction between an experienced educator and the client is a model that results in behavior change and energy savings. We also find that multicontact approaches are effective. To date, programs that have made use of technology to disaggregate client energy use and identify the best energy saving opportunities have not been successful in motivating clients to change their energy-using behaviors.					

Authors	Title	Date	Type	Source	Geographical area of study
Chahal, S., W. Swan, and P. Brown.	**Tenant Perceptions and Experiences of Retrofit**	2012	Report	http://www.salford.ac.uk/__data/assets/pdf_file/0003/142428/072-Chahal.pdf	England
The UK Residential Sector accounts for approximately 27% of all the of the energy use in the UK (DECC 2011). The slow replacement rate of the stock, less than 1% per annum, means that changes to the way we build new homes will only make a minimal impact on the energy use within the domestic sector, meaning minimal impact on policy issues such as climate change and fuel poverty. To drive real changes we must address the existing stock. However, when we are considering the residential stock we are not talking about a purely engineering problem. Despite many technical improvements to the UK building stock, CO2 levels continue to rise (Lomas 2010). Resident attitudes, perceptions and experiences of energy efficiency upgrades, both prior and after the installation of measures, are a central element of understanding the success of a retrofit project. In 2010, Fusion21 in conjunction with TPAS (Tenant Participation Advisory Service), Procurement for Housing (PfH), the University of Salford and the Knowledge Transfer Partnership (KTP) undertook a survey of 251 households in social landlord tenure to identify some of the attitudes and knowledge of social housing residents with regards to the adoption and use of sustainable retrofit within their homes.					

Authors	Title	Date	Type	Source	Geographical area of study
Changeworks.	**21st Century Heating in Rural Homes: Social Landlords and Tenants' Experience of Renewable Heat.**	2012	Report	http://www.consumerfocus.org.uk/scotland/files/2012/03/21st-century-heating-in-rural-homes.pdf	Scotland
Consumer Focus Scotland commissioned Changeworks consultants to explore: ● the technologies and approaches used by social landlords to provide affordable warmth for off-gas consumers; ● the views of social landlords on the effectiveness of those technologies, including issues they encountered and addressed during pilot projects, their experience of supporting tenants using the new systems and support they would wish to see provided in support of further work; ● the views of tenants on both the systems themselves, including levels of comfort and running costs, and on the support they received from landlords to help them use the new technologies.					

Authors	Title	Date	Type	Source	Geographical area of study
Clear Plan UK, and Logan Project Management.	**The Scottish Renewable Heating Pilot.**	2008	Report	http://www.scotland.gov.uk/Resource/Doc/245506/0069193.pdf	Scotland
Evaluates a pilot study into the viability of including renewables in future fuel poverty programmes, focusing on the results from heat pump technologies. Notes that nearly; nine in ten householders were satisfied with their new renewables central heating system and other benefits were identified such as self-reported health status and energy; efficiency behaviours. Provides a cost benefit analysis, covering installation costs and option appraisal, and makes recommendations.					

Authors	Title	Date	Type	Source	Geographical area of study
Cotter, N., E. Monahan, H. McAvoy, and P. Goodman.	**Coping with the Cold -- Exploring Relationships between Cold Housing, Health and Social Wellbeing in a Sample of Older People in Ireland.**	2012	Journal article	Quality in Ageing and Older Adults 13: 1 (2012), 38-47	Ireland
Older people are vulnerable to fuel poverty on the island of Ireland. This paper seeks to explore the lived experiences of older people in cold weather with a view to informing fuel poverty policy and service responses. Design/methodology/approach -- A postal and online survey utilising an opportunistic sample of older people living in Ireland and linked with a range of services/community and voluntary groups was undertaken in January-April 2011. Data on the experiences of 722 older people in the cold weather of winter 2010/2011 were analysed in the context of socio-economic, health, and housing circumstances. Findings -- During the period of extreme cold weather half of the sample reported that they went without other household necessities due to the cost of home-heating. In general, 62 per cent of those surveyed worried about the cost of home-heating. Homes considered "too cold" were more likely to lack central heating and experience damp/draughts. Staying indoors, keeping the heating on, and eating hot food/drinks were common responses to cold weather but a diverse range of behaviours was observed. Associations were observed between living in a cold home and higher levels of chronic illness, falls and loneliness, and fewer social activities. Research limitations/implications -- The sample cannot be considered nationally representative; single occupancy and social housing units were overrepresented. Originality/value: This research found significant associations between living in a cold home/difficulty paying for heating, and aspects of ill-health and social exclusion. While no causal association can be assumed, this phenomenon has implications for policies supporting healthy ageing.					

Authors	Title	Date	Type	Source	Geographical area of study
Day, R., and R. Hitchings	**Older People and Their Winter Warmth Behaviours: Understanding the Contextual Dynamics.**	2009	Report	http://www.geog.ucl.ac.uk/about-the-department/people/academic-staff/russell-hitchings/dr.-russell-hitchings/files/Older%20People%20in%20Winter%20Report.pdf	UK
This report presents the findings of a qualitative research project that sought to generate new insights about how contemporary older people in the UK respond to the advent of winter cold and why they choose to manage their winter warmth in the ways they do. Rather than starting with specific policy framings, it took a deliberately open approach, talking with older people about how exactly they kept warm during winter and the various contextual factors influencing these choices. The participants in our study were 21 households in the Birmingham area. We recruited households in 2 categories: one being more affluent, and the other being on relatively low incomes. The aim was to draw out the extent to which winter warmth practices were common across the generational cohort irrespective of wealth and to reveal the times when income levels continued to make significant impacts. Each household was visited at home twice for a long semi-structured interview, once at the start of the winter in late 2008 and once towards the end of winter in early 2009. Participants were also asked to complete a photo diary for a few days during a cold period, documenting their warmth-related practices.					

Authors	Title	Date	Type	Source	Geographical area of study
De Haro, M. T., and A. Koslowski.	**Fuel Poverty and High-Rise Living: Using Community-Based Interviewers to Investigate Tenants' Inability to Keep Warm in Their Homes.**	2013	Journal article	Journal of poverty and social justice 21: 2 (2013), 109-22.	Edinburgh
The number of households living in fuel poverty across the UK is on the increase. This paper explores the experiences of those living in fuel poverty, and seeks to understand the reasons for lack of warmth in homes. Using a case study approach, 101 face-to-face interviews with residents of a high-rise block of flats in Edinburgh were conducted by trained community-based interviewers, many of whom had experience of fuel poverty themselves. As such, this research contributes to our understanding of fuel poverty by giving a voice to those directly affected					

Authors	Title	Date	Type	Source	Geographical area of study
De Vries, P, Aarts, H., Midden C.	**Changing simple energy-related consumer behavior: How good intentions may be thwarted by acting and non-acting habits**	2011	Journal article	*Environment and Behavior, 43,* 612-633.	Netherlands
Achieving ambitious CO2 emission reductions require changing mundane consumer behaviors in addition to increasing modern technology's energy saving potential. Frequently, energy-related behaviors, however, may occur highly and thus tend to become habitual. On basis of the notion that habits represent automatic reactions to situations, and hence, are hard to control, we examined whether the capability to perform or abstain from performing actions depends on the type of habit established. We tested whether an acting habit (switching off the light upon leaving a room) supports execution of the intention to act (switching it off), but hinders the intention to abstain from acting (not switching it off). Conversely, a habit of not switching off the light (a non-acting habit) is expected to obstruct execution of the intention to switch the light off, but facilitates the intention to not switch it off. Results support these ideas, and underscore the importance of differentiating between habits resulting from frequently acting and frequently not acting.					

Authors	Title	Date	Type	Source	Geographical area of study
Doble, M.	**A Regulatory Policy for Self-Disconnection: An Examination of the Reasons for and Implications of Pre-Payment Meter Stoppages.**	2000	Journal article	Policy Studies 21: 3 (2000), 229-43.	England
There has been considerable concern about the degree of hardship undergone by pre-payment meter (PPM) users who experience gas stoppages due to self-disconnection. In the context of competition in energy supply markets fuel poverty has risen up the political agenda to the extent that the energy regulator Ofgem has been asked by the government to ensure equity in the provision of gas and electricity to disadvantaged customers. It has been proposed that energy suppliers should have a code of practice dealing with services to pre-payment meter customers and that further research should take place into self-disconnection. This study seeks to establish the scale of the pre-payment meter stoppages, the reasons they take place, the implications of this for users, and to identify those who experience hardship. A survey of 200 gas PPM users was undertaken in Coventry using face to face interviews, in peoples' homes. Most households were on low incomes, 36 per cent having incomes of £5000 or less. In addition, 24 per cent were single parent households and in 60 per cent someone was receiving at least one benefit out of income support, job seekers allowance, family credit, invalidity benefit or disability living allowance. It was found that 33 per cent (66 users) have self-disconnected their gas PPMs at some time in the last year. Examining all supply interruptions, the majority (64 per cent) last less than seven hours and the main reason given for the last disconnection was the user being unaware the credit was low. For stoppages of seven hours or more the three main reasons were that the user was waiting for benefits/wages to be paid, the outlet was closed or the gas ran out overnight. Through the course of discussion it was possible to identify a small group of users who felt that they had a problem with the Quantum meter, were experiencing hardship and wished to pay another way. It was possible to draw some practical conclusions for consideration in formulating policy about how such users could be protected from hardship. Nevertheless, amongst the sample as a whole, self-disconnection does not present a significant problem for the vast majority of gas PPM users and most stoppages could not be described as problematic in terms of their length or consequences					

Authors	Title	Date	Type	Source	Geographical area of study
Attend Rights to Warmth.	**Changing Attitudes Towards the Cold: Research into the Attitudes and Behaviours of Older People Towards the Cold.**	2009	Report	http://www.eagacharitabletrust.org/index.php/projects/item/rights-to-warmth-attitude-survey	England
This report sets out the findings of a survey of the attitudes and behaviour towards keeping warm among 267 older people in County Durham. The survey was funded with a grant from the Eaga Partnership Charitable Trust. It was carried out in April 2008, after significant increases in energy prices early in the year, but before the larger increases announced in July and August.					

Authors	Title	Date	Type	Source	Geographical area of study
Energy UK.	**Reaching and Engaging Consumers Who Are Vulnerable or at Risk of Poverty.**	2012	Workshop Report	http://www.energy-uk.org.uk/publication/finish/5/761.html	UK
As part of the energy industry's learning and outreach programme, Energy UK organised a workshop on "Reaching and motivating vulnerable or at risk of poverty consumers" on 6 July 2012, at ELEXON in London. Key stakeholders with experience in approaching individuals and communities and inspiring involvement or motivation attended. The workshop's objectives were: · To learn from organisations who work with vulnerable people and communities about how they encourage engagement and action; · To share difficulties suppliers have with encouraging engagement from vulnerable people with energy efficiency measures, and identify possible solutions. Three key themes and a number of specific lessons were identified which can be useful for any organisation when considering the targeting of specific people and communities.					

Authors	Title	Date	Type	Source	Geographical area of study
Faulk, A.	**Switching Off: Attitudes to Switching Energy Suppliers among Disadvantaged Consumers.**	2009	Report	http://www.consumerfocus.org.uk/scotland/files/2010/10/CFS-Switching-Energy.pdf	Scotland
In May 2008 the Scottish Consumer Council, one of our predecessor organisations, published a major report on the performance of the energy, telecommunications and personal financial services markets in Scotland, Making Markets Work for Consumers in Scotland – Everyone Benefits. In order to gain a more detailed understanding of the situation in the energy market, we commissioned eight focus groups in order to gather in-depth qualitative information. Our aims were to: • Explore attitudes to switching energy suppliers among disadvantaged consumers. • Explore barriers to switching energy suppliers for disadvantaged consumers.					

Authors	Title	Date	Type	Source	Geographical area of study
FDS International & OFGEM	**2011 Vulnerable Customer Research.**	2011	Report	https://www.ofgem.gov.uk/ofgem-publications/39714/ofgemvulnerablecustomersresearchfinal.pdf	UK
We conducted ten focus groups and eight depth interviews with different categories of vulnerable customers. These sessions ran from 13th January – 2nd February 2011. The first half of each session covered individuals' engagement with the energy market including:- suppliers used/payment method motivation for and experiences of changing tariff or supplier barriers to switching knowledge and understanding of company communications and tariffs. In the second half of each session respondents were introduced to possible new options for tariff structures.					

Authors	Title	Date	Type	Source	Geographical area of study
Gascoigne, C., K. Morgana, H. Gross, and J. Goodwin.	**Reducing the Health Risks of Severe Winter Weather among Older People in the United Kingdom: An Evidence-Based Intervention.**	2009	Journal article	Ageing & Society 30: 2 (2009), 275-97.	UK
Excess winter morbidity and mortality among older people remain significant public health issues in those European countries which experience relatively mild winter temperatures, particularly the United Kingdom (UK), Ireland, Portugal and Spain. In the UK, episodes of severe winter weather, when ambient temperatures fall below 5° C, are associated with peaks in general practitioner consultations, hospital admissions, and cardiovascular deaths among those aged over 65. While research indicates that such health risks could be substantially reduced by the adoption of appropriate behavioural strategies, accessible and credible advice on how older people can reduce risk during 'cold snaps' is lacking. This paper describes a programme of research that aimed: (a) to translate the relevant scientific literature into practical advice for older people in order to reduce health risk during episodes of severe winter weather; and (b) to integrate this advice with a severe winter weather 'Early Warning System' developed by the UK Met Office. An advice booklet was generated through a sequential process of systematic review, consensus development, and focus group discussions with older people. In a subsequent field trial, a combination of the Met Office 'Early Warning System' and the advice booklet produced behavioural change among older people consistent with risk reduction. The results also show that long-held convictions about 'healthy environments' and anxieties about fuel costs are barriers to risk reduction.					

Authors	Title	Date	Type	Source	Geographical area of study
George, M., C. Graham, and L. Lennard**.**	**Too Many Hurdles: Information and Advice Barriers in the Energy Market.**	2011	Report	http://www2.le.ac.uk/departments/law/research/ccess/documents/Too-Many-Hurdles-2011.pdf	UK
This study focused on the needs of vulnerable consumers and found that they frequently face multiple barriers in accessing information, advice and support in this essential service. It explores the factors that contribute to these barriers, including those arising from both personal circumstances and organisational behaviour. The study aims to help improve policies and practices in the energy sector so that they reflect the reality of people's needs. Identifying such barriers helps to point the way to practical solutions, in particular how organisations can ensure that their policies and practices are tailored to meet people's needs. The study was based on a literature review of research and other material from the energy sector and elsewhere. The key findings from the review were explored in interviews with a selection of organisations which advise people in vulnerable circumstances. The purpose was to gain a qualitative picture of the range of people's needs and difficulties faced. The recommendations are based on the findings of the literature review and the interviews. Commissioned by Eaga.					

Authors	Title	Date	Type	Source	Geographical area of study
Gibbons, D., and R. Singler.	**Cold Comfort: A Review of Coping Strategies Employed by Households in Fuel Poverty.**	2008	Report	http://www.infohub.moneyadvicetrust.org/content_files/files/cesi_cold_comfort_report.pdf	UK
Provides evidence of the coping strategies used by households in fuel poverty such as fuel use reduction and energy efficiency measures. Looks at physical, stress, and mental; health problems and the impact of fuel poverty on relationships. Indicates that household responses to fuel poverty are complex, with attitudes and experience playing as much; a role as financial circumstances in determining the coping strategies that households employ.					

Authors	Title	Date	Type	Source	Geographical area of study
Guertler, P.	**Can the Green Deal Be Fair Too? Exploring New Possibilities for Alleviating Fuel Poverty.**		Journal article	Energy policy 49 (2012), 91-97.	England
Energy efficiency and social programmes have failed to stem the dramatic increase in the number of fuel poor households in recent years. As the 2016 deadline for eradicating fuel poverty nears, energy efficiency and fuel poverty programmes are undergoing significant changes. The ambitions for Britain's Green Deal, the overhaul of supplier obligations alongside the winding down of Warm Front, and the introduction of an incentive for renewable heat combine to form a sea change in how energy efficiency and fuel poverty objectives are financed and delivered. Green Deal Finance (GDF) eliminates the up-front capital cost of energy efficiency measures to the household by linking repayments to energy savings and spreading them over many years. This paper asks whether and how GDF could be beneficial to fuel poor households. Using scenarios modelled on the English House Condition Survey, it explores the extent to which fuel poverty could be reduced, allowing for repayments incurred by GDF. It examines how much further fuel poverty could be alleviated were the capital cost subsidised or repayments supported, and concludes that a flexible design for GDF is necessary if it is to contribute to alleviating fuel poverty.					

Authors	Title	Date	Type	Source	Geographical area of study
Greater Manchester Low Carbon Economic Area	**The Missing Quarter: Integrating behaviour Change in Low Caron Housing Retrofit**	2011	Commissioned report	http://www.sustainablehomes.co.uk/Portals/63188/docs/behaviour%20change%20report.pdf	Greater Manchester
This report considers how behaviour can be influenced to reduce energy usage in the home in conjunction with retrofit initiatives. It is aimed at decision-makers and programme designers who are committed to minimising the greenhouse gas emissions of the existing housing stock over the next decade. It assumes that the material and technical challenges to treat these properties, while considerable, are at least understandable; but the means required to influence the human behaviour that will maximise the effect of these programme may be less of a known quantity. It therefore seeks to explain the underlying influences on human behaviours and how this applies to energy consumption. It summarises some of the initiatives that have already taken place to influence consumer behaviour and considers whether these might be transferable to Greater Manchester.					

Authors	Title	Date	Type	Source	Geographical area of study
Harrington, B. E., B. Heyman, N. Merleau-Ponty, H. Stockton, N. Ritchie, and A. Heyman.	**Keeping Warm and Staying Well: Findings from the Qualitative Arm of the Warm Homes Project.**	2005	Journal article	Health & Social Care in the Community 13: 3 (2005), 259-67.	UK
This paper presents findings from the qualitative arm of the Warm Homes Project, a programme of research concerned with the nature of fuel poverty, its alleviation and its relationship to family health. Much of the research into fuel poverty, which results from various combinations of low income and fuel inefficiency, has drawn upon quantitative paradigms. Experiences of, and coping with, fuel poverty have not been well explored. Data for the present study were obtained through qualitative interviews with household members about the above issues. The findings suggest that the expectations of those in fuel poverty about staying warm, and their beliefs about the relationship between warmth and health, vary considerably. Fuel poverty often had wider ramifications, impacting on quality of life in complex ways. The respondents took steps to alleviate cold, but their strategies varied. Coping was affected by informational limitations as well as cost constraints. Measures designed to alleviate fuel poverty should take into account its wider social meaning within the lives of household members.					

Authors	Title	Date	Type	Source	Geographical area of study
Jenkins, D., L. Middlemiss and R. Pharoah.	**A study of fuel poverty and low-carbon synergies in social housing**	2011	Report	http://www.sbe.hw.ac.uk/documents/FuelPovertyReport220711(1).pdf	Scotland, England
This paper describes some of the findings of a pilot socio-technical study involving qualitative interviews with social housing tenants, combined with basic energy modelling of the individual dwellings (using the Tarbase model) to estimate the carbon emissions of that house. The results suggest that categorising such a large number of dwellings and families into one large “fuel poor” group risks ignoring the range of responses to fuel poverty by different tenants. In addition, the diversity in construction type of social housing in the UK makes it difficult to gauge the total cost for refurbishing such a large number of buildings. The conflicts and synergies between the low-carbon and fuel poverty agendas are discussed. While energy-saving refurbishments, with their high capital costs, might be proposed as alternatives to fuel subsidies and payments, this will affect different families, in different dwellings, in different ways.					

Authors	Title	Date	Type	Source	Geographical area of study
Langevin, J., P. L. Gurian, and J. Wen.	**Reducing Energy Consumption in Low Income Public Housing: Interviewing Residents About Energy Behaviors.**	2012	Journal article	Applied Energy 102 (2012), 1358-70.	United States
Low-income housing constitutes an important but often overlooked area for energy use reductions within the US residential sector. Given the scarcity of existing information on this subject, this study uses a semi-structured interview format to explore the key behavioural tendencies, energy knowledge gaps, and attitudes among low-income public housing residents, with the goal of demonstrating a process for developing, scoring, and analyzing the interviews that will be useful to other researchers when first engaging complex subjects like behavior in contexts that are not well covered by existing literature. Methods for sampling subjects and iteratively developing an interview guide and response-scoring framework are described, and the usefulness of this approach in allowing both quantitative and qualitative analysis of behavior response data is demonstrated. The paper concludes by illustrating how themes that emerge from the response analysis can be used to inform future surveying and intervention efforts. Key themes include the varying definitions for “comfort” amongst residents; the lack of resident control over the household environment; the tendency for residents to evaluate energy conservation measures (ECMs) in terms of costs, savings, and comfort; the muted differences in behavior between those who do and do not pay energy bills; and the importance of building maintenance and resident energy education to ongoing efficiency efforts.					

Authors	Title	Date	Type	Source	Geographical area of study
Lomax, N., and F. Wedderburn.	**Fuel Debt and Fuel Poverty: A Case Study of Financial Exclusion.**	2009	Report	http://www.infohub.moneyadvicetrust.org/content_files/files/cen__fuel_poverty__full_report.pdf	UK
This study provides a nuanced view of households' behaviour in relation to fuel poverty by considering the impact of their financial behaviour. It explores how differences between households living in similar properties, particularly relating to their financial behaviour, can result in very different circumstances that require different types of assistance The study used an in-depth qualitative methodology. Participants were recruited from people who called fuel advice helplines, energy efficiency survey respondents, and via relevant agencies and organizations. The study comprised two phases of in-depth interviews 6 to 12 months apart, conducted either by telephone or at respondents' homes. Energy advice was given after the first round of interviews. One aim of the second interviews was to establish changes in behaviour as a result of this advice. In total 109 households were interviewed during phase 1; of these, 86 were re-interviewed during phase 2. Owner-occupiers (60 per cent), single person households (40 per cent) and older occupants (50 per cent) made up the largest groups of respondents.					

Authors	Title	Date	Type	Source	Geographical area of study
Lusambili, A., A. M. Tod, C. Homer, J. Abbott, J. M. Cooke, and K. A. McDaid.	**Keeping Warm: Social Connectedness and Technology - a Case Study of Rotherham, England 'Technology and Health in the Elderly'**	2011	Journal article	International Journal of Health, Wellness & Society 1: 3 (2011), 27-42.	England
The purpose of this paper is to discuss the relationship between social connectedness and modern technology with the ability of older people to keep warm during winter. Findings from previous research in England found that high fuel prices, low income and changing patterns of fuel consumption are key barriers to keeping warm in winter for many families. Living in a cold home increases the risk of winter hospital admissions, especially among the elderly with respiratory problems. This multi disciplinary interview-based project conducted in Rotherham (England) involved social care professionals, public health specialists, and user–representatives, sociologists and medical anthropologists. We have identified many ways in which modern technology is a barrier in heating homes in winter. Using the sociological theory of Symbolic Interaction (SI) we will discuss how social connectedness and use of modern technology influences older people in heating their homes and ultimately how these factors affect their health and well being. This paper is aimed at social care professionals, policy makers, public health specialists and governments.					

Authors	Title	Date	Type	Source	Geographical area of study
Marmot Review Team	**Fair Society Healthy Lives**	2010	Review of evidence	http://www.instituteofhealthequity.org/projects/fair-society-healthy-lives-the-marmot-review	England

In November 2008, Professor Sir Michael Marmot was asked by the then Secretary of State for Health to chair an independent review to propose the most effective evidence-based strategies for reducing health inequalities in England from 2010. The final report was published in February 2010, and concluded that reducing health inequalities would require action on six policy objectives:

1. Give every child the best start in life
2. Enable all children, young people and adults to maximise their capabilities and have control over their lives
3. Create fair employment and good work for all
4. Ensure healthy standard of living for all
5. Create and develop healthy and sustainable places and communities
6. Strengthen the role and impact of ill-health prevention.

Authors	Title	Date	Type	Source	Geographical area of study
Helena Meier & Katrin Rehdanz	**Determinants of residential space heating expenditures in Great Britain**	2010	Journal article	Energy Economics	Great Britain

In Great Britain several policy measures have been implemented in order to increase energy efficiency and to reduce carbon emissions. In the domestic sector, these targets can be achieved by improving space heating efficiency and, hence, decrease heating expenditures. However, before implementing policy measures it is necessary to better understand determinants of heating expenditures. In this paper, we examine determinants of heating expenditures which include socio-economic and building characteristics as well as heating technologies and meteorological observations. In contrast to most other studies, we use Panel data for investigating household's demand for heating in Great Britain. Our analysis covers 15 years, starting in 1991, and more than 5,000 households that have been re-interviewed annually; altogether our sample covers more than 64,000 households. Our empirical findings suggest that in Great Britain owners generally have higher heating expenditures than renters. These differences in expenditures can be explained by building characteristics. Renters mainly live in flats and most of the owners live in detached/semi-detached houses. Generally, flats are more energy efficient than houses. Our results also imply that a number of socio-economic criteria have a significant influence on heating expenditures, independent from the central heating fuel type. Policy measures should not only focus on insulation standards but also on different household types. Especially elderly people and households with children should be target groups

Authors	Title	Date	Type	Source	Geographical area of study
Mummery, H., and H. Reilly.	**Cutting Back, Cutting Down, Cutting Off: Self-Disconnection among Prepayment Meter Users**	2010	Report	http://www.consumerfocus.org.uk/files/2010/10/Cutting-back-cutting-down-cutting-off.pdf	UK
Cutting back, cutting down, cutting off is the biggest ever study of prepayment meter (PPM) energy customers. It shows that around one in six pre-pay households, or up to 1.4m people, are living in homes that have cut off their own energy supply in the last year. The findings are particularly worrying as almost half of households that disconnect their energy are home to someone with an illness or disability, and two in five are home to children under 16. Furthermore, almost half of people who cut themselves off say it happens more in winter, when people most need to keep themselves warm.					

Authors	Title	Date	Type	Source	Geographical area of study
National Energy Action and Consumer Futures.	**Smart for All Understanding consumer vulnerability during the experience of smart meter installation**	2013	Report	http://www.consumerfocus.org.uk/files/2012/11/Smart-for-All-Understanding-consumer-vulnerability-during-the-experience-of-smart-meter-installation.pdf	UK
National Energy Action (NEA) and Consumer Focus are concerned that some vulnerable consumers may struggle to access some of the benefits that smart metering offers. People with physical or mental health problems, and those with low levels of literacy or numeracy, for example, may find it harder to understand the IHD and how it works, and hence successfully take advantage of its benefits. NEA and Consumer Focus wish to help vulnerable consumers to engage positively with the smart meter and in-homes display (IHD) and help enhance the user experience, thus encouraging customers to engage with smart metering. In conjunction with the Department of Energy and Climate Change (DECC), Consumer Focus and National Energy Action (NEA) wish to identify issues experienced by low-income and vulnerable consumers in relation to the installation of smart meters. A key aim of the research is to make recommendations to DECC on how any negative experiences can be overcome and positive experiences built upon and shared to promote customer engagement and consumer benefit. This research is designed to inform all stakeholders on best practice for the roll-out of smart meters and other energy efficiency services to low-income and other vulnerable consumers.					

Authors	Title	Date	Type	Source	Geographical area of study
O'Neill, T., C. Jinks, and A. Squire.	**"Heating Is More Important Than Food": Older Women's Perceptions of Fuel Poverty.**	2006	Journal article	Journal of Housing For the Elderly 20: 3 (2006), 95-108.	UK
The aim of this study, therefore, was to investigate the perceptions and experiences of older women in relation to fuel issues. Ten qualitative semi-structured interviews were undertaken during the winter of 2005. The interviews were tape-recorded and transcribed verbatim. A phenomenological approach was used for analysis. Four main themes emerged: causes of fuel poverty; managing money; heating is a priority; and government initiatives. The results from this study show that fuel poverty is an important health and financial concern for older women.					

Authors	Title	Date	Type	Source	Geographical area of study
O'Sullivan, K. C., P. L. Howden-Chapman, and G. Fougere.	**Making the Connection: The Relationship between Fuel Poverty, Electricity Disconnection, and Prepayment Metering.**	2011	Journal article	Energy policy 39: 2 (2011), 733-41	New Zealand
Fuel poverty, or inability to afford adequate heating for a reasonable outlay of expenditure, is a significant and under-researched problem in New Zealand. The connection between fuel poverty, and electricity disconnection or 'self-disconnection' is analysed for four cities using prepayment metering to pay for electricity. A price comparison analysis on a government-sponsored website showed that prepayment metering was more expensive than other payment options. This website analysis was supplemented by qualitative data from older people with chronic respiratory disease expressing their views about electricity disconnection and prepayment metering. We show that prepayment metering for electricity is more expensive than other payment methods in New Zealand and that older people's insights provide valuable context to these issues. Under the present payment schedule, the use of prepayment metering to pay for electricity is not a suitable policy instrument to address fuel poverty, which remains problematic. The deregulated electricity market continues to lead to increases in the real price of residential electricity and in the number of people in fuel poverty. We offer policy suggestions for reducing fuel poverty in New Zealand.					

Authors	Title	Date	Type	Source	Geographical area of study
Palmer, A.	**Evaluating and Improving Energy Efficiency Grant Leaflet Information for Older People in Fuel Poverty,**	2008	Thesis	http://www.eagacharitabletrust.org/index.php/projects/item/masters-thesis-evaluating-and-improving-energy-efficiency-grant-leaflet-information-for-the-elderly-fuel-poor	Scotland
The aim of this research is to investigate the elderly fuel poor's understanding and evaluations of existing Scottish Government energy efficiency grant leaflets. Despite the 'success' of the Scottish Government's Central Heating Programme and Warm Deal grants only a low percentage of recipients were actually in fuel poverty. This research is hoping therefore to aid more effective targeting of grant take-up by the fuel poor. As fuel poverty is more likely to affect the elderly, this research focuses on investigating how to improve existing grant leaflets so that grant information receives greater understanding by this group. It is hoped that the outcomes of the project will help inform future grant leaflet design.					

Authors	Title	Date	Type	Source	Geographical area of study
Rohe, W. M., S. M. Cowan, and R. Quercia.	**Supporting Low-Income Homeowners: Lessons from a Program to Coordinate Weatherization and Rehabilitation Services.**	2010	Journal article	Housing Policy Debate 20: 3 (2010), 523-46.	United States
Homeownership is the primary way most families build wealth in this country. Low-income homeowners are less likely to get that benefit because they are more likely to own older houses that are more costly to operate and need more essential maintenance. Rapidly escalating home energy costs are straining the budgets of many low-income homeowners, increasing the likelihood of under maintenance and mortgage default. This paper presents an evaluation of a demonstration program designed to coordinate weatherization and rehabilitation programs in order to assist low-income households, decrease energy costs, and to improve the condition and value of their homes. The experience of 11 local non-profit organizations, funded to develop programs to coordinate weatherization and housing rehabilitation services, were studied over a five-year period. The results of the evaluation indicate that there are many obstacles to coordinating weatherization and rehabilitation programs, but that it can be accomplished under the right conditions. Major gaps exist between program eligibility thresholds and in the types of assistance available to low-income homeowners. Policy recommendations for facilitating coordination are presented.					

Authors	Title	Date	Type	Source	Geographical area of study
Ramsay L &J Pett	**"Hard to Help and Hard to Reach: Bringing energy efficiency to elusive audiences"**	2003	Commissioned report	http://www.ukace.org/wp-content/uploads/2012/11/ACE-Proceedings-2003-06-Hard-to-Help-and-Hard-to-Reach-Bringing-energy-efficiency-to-elusive-audiences-ECEEE-Summer-Study-20031.pdf	Great Britain

Programmes and policies to promote domestic energy efficiency on a generic, national level invariably neglect a proportion of the population that do not receive, or cannot act on the information that they provide. Furthermore, tackling these 'hard to reach' and 'hard to help' audiences is not usually considered cost-effective, as they require unconventional marketing methods and non-standard energy efficiency measures. However, for reasons of social equity and environmental protection these audiences must be addressed. They include the most vulnerable in society and represent a significant proportion of the domestic sector. If CO2 emissions reduction targets are to be reached then new and innovative programmes must be developed to deal with them.

In Britain, established national programmes offering standard measures to a defined audience are realising that emissions reduction targets will not be met using these methods alone. Based on examples from two recently completed research and evaluation projects, as well as feedback from ongoing local initiatives this paper outlines the scope of the problem in Britain and discusses why and how attention can be turned on these elusive audiences to bring about further energy saving in the domestic sector.

Case studies are used to illustrate how new approaches to marketing energy efficiency; such as utilising other groups (e.g. health professionals) to promote the message, can help to access the 'hard to reach'. Analysis of unconventional energy efficiency measures and sustainable energy solutions in specific circumstances shows how they can be cost effective in assisting the 'hard to help' audiences.

Authors	Title	Date	Type	Source	Geographical area of study
Saunders, R. W., R. J. K. Gross, and J. Wade.	**Can Premium Tariffs for Micro-Generation and Small Scale Renewable Heat Help the Fuel Poor, and If So, How? Case Studies of Innovative Finance for Community Energy Schemes in the UK.**	2012	Journal article	Energy policy 42 (2012), 78-88.	UK
In the UK, the introduction of micro-generation Feed in Tariffs (FiTs) and a proposed Renewable Heat Incentive (RHI) for domestic and small scale schemes have re-energised the market for investment in domestic scale renewable energy. These incentives may provide financial opportunities for those with capital to spend but for the record numbers with low incomes in 'fuel poverty', these benefits may seem out of reach. This paper shows that with appropriate financial intermediaries it is possible for renewable energy incentives to be used to alleviate fuel poverty. Simple financial analysis demonstrates the theoretical potential of FiTs to help those in fuel poverty. Two case studies of renewable energy projects in low income areas investigate how the incentives may be used in practice, what barriers exist and what success factors are evident. The analysis shows that local energy organisations (LEOS) are key if the poor are to access benefits from premium tariff schemes. Low interest finance mechanisms, good information sharing and community involvement are found as key success factors.					

Authors	Title	Date	Type	Source	Geographical area of study
Sunikka-Blank, M., J. Chen, J. Britnell and D. Dantsiou,	**Improving Energy Efficiency of Social Housing Areas: A Case Study of a Retrofit Achieving an "A" Energy Performance Rating in the UK,**	2012	Journal article	European Planning Studies, 20:1, (2012), 131-145	Cambridge
Currently, the majority of the European housing stock falls towards the bottom of the energy efficiency rating scale on the EU Energy Performance Certificate. If governments and businesses are to successfully address ambitious CO2 reduction targets, then it will be imperative that energy-efficient measures and policies focus on existing housing. In order to understand what kind of retrofit is needed to achieve an "A" energy performance rating in social housing, the paper reports the findings of an on-going research project in the UK. The paper draws on a case study from the Technology Strategy Board's "Retrofit for the Future" competition entry in Cambridge. The upgrade strategy improved the home's energy performance rating to A, aimed to radically reduce carbon dioxide emissions (17 kg m−2 year−1) and provided affordable warmth for the tenants. In order to get an impression of the actual energy consumption in the case study, energy use behaviour of the household was observed. Based on the barriers identified in the case study, the feasibility of the current UK policy strategies (e.g. Smart Meters and Feed-in-Tariffs) to facilitate the acceptance of energy measures in social housing is discussed.					

Authors	Title	Date	Type	Source	Geographical area of study
Thanos, S., and N. A. Dunse.	**The Changing Effects on Domestic Energy Expenditure from Housing Characteristics and the Recent Rapid Energy Price Movements.**	2012	Report	http://www.rics.org/uk/knowledge/research/research-reports/domestic-energy-expenditure/	UK
This research estimates econometric models for the domestic energy expenditure in the UK. These models include a number of relevant household socioeconomics characteristics along with income levels. Exploiting the gaps in the literature, it specifically focuses on the effects of dwelling attributes on energy spending, aiming to produce policy relevant results. We also consider the significant events in the recent years that have directly and indirectly affected domestic energy use, such as the soaring oil and energy prices, the subsequent economic crisis and the Russia–Ukraine gas dispute. This study employs the latest data from the English Housing Conditioning Survey (EHCS) of 30,926 observations collected from April 2006 to March 2010. This is a combination of four annual cross-sectional datasets across England. Except the energy expenditure and full family income, the dataset also includes: tenure, occupation, number of families in a dwelling, number of children and elderly in the household, length of residence in dwelling, number of rooms, region, construction period of the dwelling, dwelling type, attic or basement, double glazing, type of fuel and heating system/equipment, age of the heating system/equipment, loft insulation, payment method of energy bills and council tax band. We employ the model of conditional demand to derive an econometric model for energy expenditure. We use energy expenditure per square meter as the depended variable and a double-log functional form. First a pooled model across all study years is employed. We subsequently estimate separate models for each year.					

Authors	Title	Date	Type	Source	Geographical area of study
Tod, A. M., A. Lusambili, C. Homer, J. Abbott, J. M. Cooke, A. J. Stocks, and K. A. McDaid.	**Understanding Factors Influencing Vulnerable Older People Keeping Warm and Well in Winter: A Qualitative Study Using Social Marketing Techniques.**	2012	Journal article	http://bmjopen.bmj.com/content/2/4/e000922.full.pdf:html	England
Objectives: To understand the influences and decisions of vulnerable older people in relation to keeping warm in winter. Design: A qualitative study incorporating in-depth, semi-structured individual and group interviews, framework analysis and social marketing segmentation techniques. Setting: Rotherham, South Yorkshire, UK. Participants: 50 older people (>55) and 25 health and social care staff underwent individual interview. The older people also had household temperature measurements. 24 older people and 19 health and social care staff participated in one of the six group interviews. Results: Multiple complex factors emerged to explain whether vulnerable older people were able to keep warm. These influences combined in various ways that meant older people were not able to or preferred not to access help or change home heating behaviour. Factors influencing behaviours and decisions relating to use of heating, spending money, accessing cheaper tariffs, accessing benefits or asking for help fell into three main categories. These were situational and contextual factors, attitudes and values, and barriers. Barriers included poor knowledge and awareness, technology, disjointed systems and the invisibility of fuel and fuel payment. Findings formed the basis of a social marketing segmentation model used to develop six pen portraits that illustrated how factors that conspire against older people being able to keep warm. Conclusions: The findings illustrate how and why vulnerable older people may be at risk of a cold home. The pen portraits provide an accessible vehicle and reflective tool to raise the capacity of the NHS in responding to their needs in line with the Cold Weather Plan.					

Authors	Title	Date	Type	Source	Geographical area of study
Thomson, Snell and Bevan	**Fuel poverty and disability: a statistical analysis of the English Housing Survey**	2013	Secondary analysis	http://www.york.ac.uk/media/spsw/documents/research-and-publications/Thomson-Snell-Bevan_Fuel-Poverty-And-Disability_Report.pdf	England
The results presented are taken from the 2010 to 2011 year of the English Housing Survey (EHS). Household level data have been used to consider two key variables based on the presence of at least one household member with a disability or illness and the two definitions of fuel poverty described above. These results are then analysed against a number of other factors often associated with fuel poverty; household composition, tenure type, and measures of low income (see for example Fahmy *et al* 2011, DECC 2012, Walker and Day 2012, Baker *et al* 2003). Region has also been considered as fuel poverty rates have been found to vary significantly across England (DECC 2012), as do numbers of disability related benefit claims such as incapacity benefit (Beatty and Fothergill 2011). In addition to this analysis, household and individual level data have been combined in order to examine the extent of fuel poverty in households that contain one or more individuals with a particular type of disability (for example, a visual impairment). Payment methods have also been considered as a result of feedback on the first draft of this report.					

Authors	**Title**	**Date**	**Type**	**Source**	**Geographical area of study**
Wade, J., and E. Jones.	**Local Councils and the Green Deal**	2012	Report	http://www.eagacharitabletrust.org/index.php/projects/item/local-councils-and-the-green-deal	UK
Local councils (e.g. Parish or Community Councils) are uniquely placed to work on energy action at a very local level with their communities. This project aims to encourage and enable local councils to engage in local energy action that helps to cut fuel poverty, and also to explore the extent to which such action can help potentially excluded local communities to benefit from the Green Deal. Linked to this, the project will explore what more is needed to enable local councils to play a full role in the equitable implementation of Government sustainable energy policy					

Authors	Title	Date	Type	Source	Geographical area of study
Wade, J., E. Jones, and J. Robinson.	**Going Local: A Report for Consumer Focus on Local Authorities' Work to Tackle Fuel Poverty.**	2012	Report	http://www.consumerfocus.org.uk/publications/going-local-a-report-for-consumer-focus-on-local-authorities-work-to-tackle-fuel-poverty	UK
Consumer Focus wanted to get a better understanding of local authority fuel poverty activity with a view to identifying good practice and suggesting improvements. We therefore commissioned Joanne Wade and Impetus Consulting to carry out a survey of local authority fuel poverty work, highlight exemplars of good practice and identify the scope for greater local action and the barriers that prevent this. The research finds that some authorities have developed comprehensive strategies that encompass all the key council responsibilities that impinge on fuel poverty and involve close working relationships with local partners.					

Authors	Title	Date	Type	Source	Geographical area of study
Wallenborn, G., M. Orsini, and J. Vanhaverbeke.	**Household Appropriation of Electricity Monitors.**	2011	Journal article	International Journal of Consumer Studies 35: 2 (2011), 146-52.	Belgium
In the perspective of smart grids, 'smart' electricity meters are distributed in European households. When households possess an immediate feedback on their consumption, it is usually stated that they can save between 5 and 15% of their electricity. How households learn to reduce their consumption is hardly ever addressed. In order to know whether 15% saving is a limit or not, it is necessary to understand what people do and learn with the use of an electricity monitor. This question is related to the way the societal energy transition could be achieved. Electricity is invisible, but it is produced, transported and consumed through material devices. This paper explores the dimension of material culture in household energy consumption through the introduction of electricity monitors in different types of households. Through a social experiment, we investigate both how households appropriate an electricity monitor and what they learn when using it. The paper addresses the question of appropriation of such monitors and how it is related to different dimensions: comfort, values, knowledge, skills, material culture. On the basis of an original protocol that intends to interfere as little as possible with users, we installed different meters in 21 Belgian households (including low-income households) and collected data on energy consumption, material culture (appliances, heating system, etc.), different representations of energy, energy-using practices and the effects induced by the introduction of the monitor. We have observed that the meter can change electricity perception, but that only households already interested or involved in energy savings are willing to use and learn with the monitor. We suggest that these devices should accompany a deeper transformation of the 'culture of energy', but they have to become much 'smarter' if their aim is to support more sustainable energy consumption patterns.					

Authors	Title	Date	Type	Source	Geographical area of study
Wright, F.	**Old and Cold: Older People and Policies Failing to Address Fuel Poverty**	2004	Journal article	Social Policy & Administration 38: 5 (2004), 488-503.	England, Scotland and Wales
Research, funded by the British Gas Help the Aged Partnership and carried out by the Institute of Gerontology, King's College London, explored the multidimensional issues of fuel poverty. A sample of older homeowners and private renters living in England, Scotland and Wales were interviewed in the Spring of 2003 to explore their experiences of keeping their homes warm in the preceding winter. It was found that almost half of the sample for whom full information was available were in fuel poverty. Government schemes failed to address some important issues. Grants were only available to those with “passport benefits”, excluding those who had minimal occupational pensions. Although most respondents had central heating, it was often old and ineffective, yet grants were not available to modernize them. Government schemes did not extend to paying for external and internal insulation for solid wall properties yet many older people live in such property. Several older people lived in rural areas not connected to mains gas. As mains gas currently provides the cheapest fuel, they faced high bills, yet government policies do not address the differential fuel costs in these areas. The culture of many older people in the study contributed to their living in cold homes. They lived frugally and usually turned heating off in daylight hours during winter. It was also a common practice to sleep in an unheated bedroom during winter and to keep the window open at night. Such practices are acknowledged to be unhealthy.					

Authors	Title	Date	Type	Source	Geographical area of study
Young, D.	**When Do Energy-Efficient Appliances Generate Energy Savings? Some Evidence from Canada.**	2008	Journal article	Energy policy 36: 1 (2008), 34-46.	Canada
Improvements in the energy efficiency of household appliances have the potential to decrease residential energy use, but these reductions accrue gradually over time as newer appliances replace older models. SHEU-2003 data are used to examine appliance replacement patterns in Canada for refrigerators, freezers, dishwashers, clothes washers and clothes dryers. The data indicate that the ages at which appliances are replaced tend to be lowest for dishwashers and highest for freezers, with over 40% of freezers in use for more than 20 years before being retired. The life spans of Canadian appliances are compared to the underlying assumptions regarding appliance lifetimes used in models of residential energy demand. We find that Canadian appliance retirement patterns differ from those assumed in the previous literature. Socioeconomic factors related to appliance replacement are also examined. We find that replacement patterns can be sensitive to household characteristics such as income, providing evidence that there may be scope for targeted policies aimed at inducing earlier replacements of older household appliances with new energy-efficient models.					

Authors	Title	Date	Type	Source	Geographical area of study
Zhao, T., L. Bell, M. W. Horner, J. Sulik, and J. Zhang.	**Consumer Responses Towards Home Energy Financial Incentives: A Survey-Based Study.**	2012	Journal article	Energy Policy 47 (2012), 291-97.	United States
Residential energy-efficient and renewable energy (EERE) products play an important role in energy conservation and carbon emissions reduction. Various financial incentive programs have been developed to promote the adoption of these products. However, their effectiveness in attracting consumers is not very well understood. In this study, we investigated impacts of financial incentives on homeowner's decision making towards six EERE products. Two forms of incentives, tax credits and interest-free loans, were examined through a household mailing survey in Florida, the United States. Results showed that, although half of the respondents were interested in EERE products, the high investment cost was a major concern that hindered their purchase activities. Homeowners were attracted to financial incentives and valued tax credits much higher than interest-free loans. The current federal home energy tax credit levels were found to attract only 2–12 percent of homeowners to buy EERE products. The willingness of participation was especially low for the costly products (such as solar panels). The participation rate was also very low for lower income (i.e., annual household income below $50,000) families living in older residences. This study contributes to the understanding of economic and social aspects of consumer decision making on energy efficiency and alternative energy.					

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