



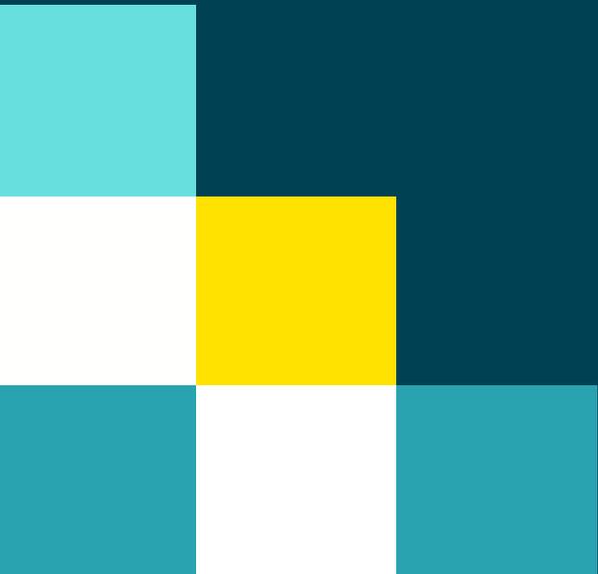
Wales Centre for Public Policy
Canolfan Polisi Cyhoeddus Cymru

Poverty and social exclusion: review of international evidence on fuel poverty

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Summary

- Fuel poverty is a specific dimension of poverty relating to the ability of lower income households to meet basic energy needs. Households in fuel poverty are faced with difficult decisions about how to cover energy costs or how to manage on insufficient levels of energy consumption, with some having to decide between ‘eating and heating’.
- There are known health risks associated with fuel poverty and negative impacts on well-being and inclusion.
- The lack of an agreed definition of fuel poverty creates challenges in reviewing the international evidence and different definitions shape policy responses.
- There are connections between fuel poverty and policy areas covered in other reviews, for instance:
 - **Food insecurity:** Fuel poverty and food insecurity often co-exist as households faced with high energy costs relative to income can be faced with the dilemma of ‘eating or heating’.
 - **Household debt:** Fuel poor households risk accumulating high levels of debt, including the accumulation of arrears, as they struggle to pay for energy costs out of income.
- We conclude the review with some promising actions identified in the international literature that could help to reduce fuel poverty in Wales, namely:
 - Energy efficiency improvements, particularly in the existing rental housing stock where fuel poverty rates are highest, are important for tackling long-term risks of fuel poverty and reducing energy bills.
 - Improvements funded through general taxation are less likely to lead to higher energy costs which negatively impact low-income households. However, pay-as-you-save schemes offer a promising way of bringing in important financing.
 - Personalised energy audits can help elicit positive behavioural changes to energy use. Helping households use energy and energy savings devices efficiently can help to reduce energy bills.
 - It is important not to overlook the fact that one of the key drivers of fuel poverty is low income and any strategy to reduce fuel poverty needs to tackle this driver.

Background

The Wales Centre for Public Policy (WCPP) was commissioned by the Welsh Government to conduct a review of international poverty and social exclusion strategies, programmes and interventions. As part of this work, the Centre for Analysis of Social Exclusion (CASE)¹ at the LSE was commissioned to conduct a review of the international evidence on promising policies and programmes designed to reduce poverty and social exclusion across twelve key policy areas. This report focuses on fuel poverty.

The key questions addressed in each of the twelve policy reviews are:

- What effective international poverty alleviation policies, programmes and interventions exist?
- What are the key or common characteristics/standards and features of these different approaches?

The questions are addressed by providing:

- The Welsh context of each policy area and main initiatives being undertaken by the Welsh Government;
- Detailed information on the relationship between the policy area and poverty and social exclusion;
- A summary of evidence of lived experience, which could help to understand how people may experience and respond to policy interventions;
- An overview of the international evidence of policy effectiveness (including case studies); and
- Challenges and facilitating factors associated with policy implementation.

In addition to the twelve policy reviews, we have produced an overview report which summarises the key evidence from each of the individual reviews, highlights connections between different policy areas and reflects on all the evidence to make a number of policy recommendations, or promising actions, within each of the twelve

¹ The Centre for Analysis of Social Exclusion (CASE) at the London School of Economics and Political Science (LSE) was established in 1997. It is a multi-disciplinary research centre exploring social disadvantage and the role of social and public policies in preventing, mitigating or exacerbating it. Researchers at CASE have extensive experience in conducting policy reviews covering evidence in the UK and international literature.

areas. Please refer to the Annex for detail on methodology, including how the twelve policy areas of focus were chosen.

This work forms part of a suite of reports produced by WCPP as part of its work on poverty and social exclusion for the Welsh Government. As well as this work by CASE, there are two reports on the nature, scale and trajectory of poverty and social exclusion in Wales – one focusing on quantitative data and evidence, and a second focusing on lived experience evidence (Carter, 2022a; 2022b). WCPP also commissioned the New Policy Institute to conduct a review of international poverty alleviation strategies (Kenway et al., 2022) which examines overarching governmental approaches to tackling poverty.

Introduction

Fuel poverty is, notionally, a devolved policy area. This has allowed for differences in how fuel poverty is defined and measured, and in the development of fuel poverty reduction strategies.

There are three main determinants of fuel poverty: energy efficiency of homes; energy prices; and incomes. Households are at greater risk of fuel poverty if they live in properties with low energy efficiency and, to meet their basic energy needs, face high energy costs relative to income. The behaviour of households in fuel poverty is also an important factor (how they use or ration energy, whether they switch energy supplier, etc.). This review considers these main drivers and examines the international evidence of policies and programmes designed to address them. Different ways of defining and measuring fuel poverty can put greater or lesser emphasis on the importance of different drivers and the design of the most effective policy strategy to reduce fuel poverty (Heindl, 2015; Moore, 2012). As this review is of the international literature, the evidence relates to a range of different definitions and measures.

The Welsh Government defines a household as being in fuel poverty if they need to spend more than 10% their full household income to maintain a ‘satisfactory heating regime’ (Welsh Government, 2021). Severe fuel poverty is defined as a spend of more than 20%. Households are classified as living in persistent fuel poverty if they need to pay more than 10% of their full household income to maintain a satisfactory heating regime in two out of the three preceding years. In addition, households are defined as at risk of fuel poverty if they need to pay more than 8%, but less than 10%, of their full household income to maintain a satisfactory heating regime.

According to the Welsh Government a 'satisfactory heating regime' is 23°C in the living room and 18°C in other rooms achieved for 16 hours in a 24-hour period in households with older or disabled people. For other households, a temperature of 21°C in the living room and 18°C in other rooms for nine hours in every 24-hour period on weekdays, and 16 hours in a 24-hour period on weekends is considered satisfactory (Welsh Government, 2021).

The risk of fuel poverty varies according to tenure type, property characteristics, age of a property, insulation, central heating, and energy efficiency (Welsh Government, 2019). The latest statistics available show that in 2018 fuel poverty rates were higher for households in:

- The private rented sector (20% of households in this sector relative to 11% of owner occupiers and 9% of households in the social rented sector).
- Older properties (20% of households living in properties built before 1919).
- Properties with uninsulated walls (21% of households).
- Properties with no central heating (39% of households).
- Properties with poorer energy efficiency (43% of households in Energy Performance Certificates Bands F and G compared to 5% of households living in properties in bands B to C).
- Single-person households without children (50%).

Policy context

Statutory targets for eradicating fuel poverty in Wales were first published in 2003 in *A Fuel Poverty Commitment for Wales*. This was replaced by the *Fuel Poverty Strategy 2010* (Welsh Assembly Government, 2010), although the targets set out in *A Fuel Poverty Commitment for Wales* remained in place. These targets were that, as far as reasonably practicable:

- Fuel poverty will be eradicated amongst vulnerable households by 2010;
- Fuel poverty will be eradicated in social housing by 2012; and
- By 2018, there would be no-one in Wales living in fuel poverty.

Although the Welsh Government made progress, these targets were not reached. Official statistics estimated that in 2018, 155,000 households in Wales were living in fuel poverty (Welsh Government, 2019). In 2019, the Wales Audit Office carried out a value for money examination of the Welsh Government's efforts to tackle fuel poverty (WAO, 2019) They noted that the targets were ambitious given the complexity of

tackling fuel poverty, with the causes and responses spanning organisational boundaries (WAO, 2019). An important constraint is that powers to tackle the main drivers of fuel poverty are only partially devolved with a limited degree of control over incomes and energy prices.

The WAO also identified some inherent tensions between different policy aims. In particular, tensions were identified between goals of eradicating carbon emissions from domestic housing and prioritising efforts and funding on fuel poor households who tend to use less energy and may indeed need to increase their energy use in order not to live in a cold, unhealthy home (WAO, 2019). They concluded that the Welsh Government's actions, in particular the investment in energy efficiency, seemed to have helped to reduce the levels of estimated fuel poverty but more needed to be done to demonstrate that particular programmes, such as the Warm Homes programme, directly led to reductions in fuel poverty (WAO, 2019).

In March 2021, the Welsh Government published a new 2022-2035 fuel poverty strategy with a new set of targets (Welsh Government, 2021). The targets to be reached by 2035 are:

- No households are estimated to be living in severe or persistent fuel poverty as far as reasonable practicable;
- Not more than 5% of households are estimated to be living in fuel poverty at any one time as far as reasonably practicable; and
- The number of all households 'at risk' of falling into fuel poverty will be more than halved based on the 2018 estimate.

The Coronavirus pandemic, particularly during periods of lockdown, led to increased domestic demand for energy due to people spending more time in their homes. These increases in demand were recorded in all affected countries. The combination of financial hardship for many households and increased residential energy needs exacerbated pre-existing fuel poverty (Mastropietro, Rodilla and Batlle, 2020). Governments introduced a range of emergency measures such as: disconnection bans, payment extension plans, enhanced assistance programmes, energy bills reduction or cancellation and creation of financing mechanisms, with mixed success on fuel poor households due to insufficient targeting (Mastropietro, Rodilla and Batlle, 2020). Research on EU member states concludes that the negative impact of the pandemic on fuel poverty will be long-lived (Carfora, Scandurra and Thomas, 2021). This assessment was made prior to the sharp rise in energy prices occurring towards the end of 2021 which is putting further upward pressure on fuel poverty.

Overcoming high levels of fuel poverty 'sits at the heart of Wales' decarbonisation and social justice objectives' (Future Generations Commissioner for Wales, 2021).

Wales has some of the oldest and least efficient housing in Western Europe and a large share of ‘hard to treat’ housing (Future Generations Commissioner for Wales, 2021). Action to improve the quality of this stock will be essential for meeting the new fuel poverty reduction targets as well as the Welsh Government’s decarbonisation goals. The infrastructure investment needed to improve (retrofit) homes in Wales is large, but the benefits can be measured in terms of fuel poverty reduction, decarbonisation, improvements in health outcomes and the creation of thousands of new jobs (Future Generations Commissioner for Wales, 2021).

Defining fuel poverty

To estimate who is living in fuel poverty in Wales, information collected in the Welsh Housing Conditions Survey, which is derived from inspections by qualified surveyors, is used to establish the energy efficiency of homes and, therefore, how much energy is required to meet the satisfactory heating regime. To estimate household fuel costs, the required energy consumption of a household is combined with the known fuel price for the method of payment used by the household and the location of that household in Wales. It is then possible to compute the share of household income that would be required to spend on fuel to meet the satisfactory heating regime.

This method is preferable to estimates based on actual expenditure on fuel which could underestimate the problem if lower income households do not heat their homes adequately in order to reduce expenditure. However, it does not specifically identify lower income households and higher income households who may choose to live in energy inefficient homes that require more than 10% of their income spent on fuel to meet the satisfactory heating regime, meaning higher income households are classified as fuel poor under this definition even though they could afford to do this. In addition, as Hills (2012) outlines in his review of fuel poverty measurement in England, there are a number of problems with this measure including difficulties establishing household energy needs and using a measure of income from surveys not mainly focused on income measurement:

“The result is an indicator that is highly sensitive to factors such as fuel prices, [and] the precise assumptions made for what are seen as adequate temperatures for people to live at.” (Hills, 2012, p.8)

In light of the Hills review, England moved to a Low Income High Cost (LIHC) measure of fuel poverty which identified households on a low income who were faced with higher than average fuel costs. In 2021 England introduced a new measure of fuel poverty, the Low Income Low Energy Efficiency (LILEE) measure which classifies people who are living below the poverty line (below 60% median income after housing and energy costs) and are living in a property with an energy efficiency

rating of band D, E, F or G (BEIS, 2021). The disadvantage with this measure is that it rules out the possibility that people living in energy efficient properties can be fuel poor due to low income and the price they pay for energy. This deficiency is particularly stark during periods of high and rising energy prices; such as that faced by households towards the end of 2021.

An inquiry by the Senedd Climate Change, Environment and Rural Affairs Committee into fuel poverty in Wales highlighted concerns that the Welsh Government's fuel poverty definition does not lead to sufficient focus on households in greatest need. One of its key recommendations is that 'the Welsh Government should adopt a more appropriate definition of fuel poverty: one that more accurately reflects the lived experience of fuel poor households in Wales' (CCERA, 2020).

Relationship to poverty and social exclusion

Fuel poverty, or energy poverty, is a specific dimension of poverty relating to the ability of lower income households to meet household energy needs. Although there exist a range of different definitions and measures, key features include the imbalance between the energy costs required to cover the basic energy needs of a home and the income of the family living in it, and how the cost of meeting basic energy needs drag lower income households into, or further into, poverty. Households in fuel poverty are faced with difficult decisions about how to cover the costs. This can lead to some being forced to make a choice between 'heating or eating' in cold weather, highlighting an interconnection between fuel poverty and food poverty (Beatty, Blow and Crossley, 2014; Bhattacharya et al., 2003). The costs of meeting energy needs can also force households into debt both in terms of arrears on energy bills but also other forms of household debt. In Great Britain, lower income households spend almost twice the share of their income on energy bills than average (8% versus 4%) (Ofgem, 2019).

One of the main concerns is that fuel poor households do not heat their homes adequately in cold weather and this has a negative impact on health and well-being. In a European study covering 32 countries, Thomson, Snell and Bouzarovski (2017) found a higher incidence of poor health (both physical and mental) amongst energy poor populations, relative to non-energy poor households. Other evidence shows that fuel poverty lowers subjective well-being (Churchill, Smyth, and Farrell, 2020). The most severe consequences include higher rates of mortality which can contribute to excess winter deaths.

From a social exclusion perspective, fuel poverty can affect family and social life. People living in fuel poverty can be reluctant to invite friends and family to visit if their home is cold. It can also force them to withdraw to restricted parts of their home which they keep at a warmer temperature.

The Welsh Government already has a good understanding of the negative impacts of fuel poverty. For example, the Fuel Poverty Strategy 2010 identifies that reducing fuel poverty will contribute towards tackling a number of negative impacts across a number of domains:

Health

- Increased respiratory illnesses including asthma.
- Increased blood pressure and risk of heart attack and stroke (cardiovascular disease).
- Increased levels of slips, trips and falls, particularly in older people as cold can reduce mobility and cause a worsening in the symptoms of arthritis.
- Stress and mental health issues driven by concerns over bills and/or energy debt.
- Increased pressure on and cost for health and care services.
- Excess winter deaths.

Education

- Negative impacts on education achievement, for example where only one room may be properly heated, resulting in the lack of a quiet, warm space to study, or increased levels of absenteeism as a result of sickness.

Social exclusion

- Increased social isolation because of a reluctance to invite friends into a cold, damp home.
- High fuel bills leave householders with less money available for food, other day-to-day expenses and social activity.

Economy

- Negative impacts on the economy because of increased levels of sickness.
- Tackling fuel poverty and reducing the amount of money spent on energy bills can have positive effects on local regeneration because people have more money to spend in the local economy.

Relationship to lived experience of poverty and social exclusion

The lived experience of fuel poverty highlights how it has a bearing across different aspects of poverty and social exclusion. As shown in the previous section, **the impact of fuel poverty can have a negative effect across multiple dimensions of life**. In addition, responses to fuel poverty in the form of strategies and other behavioural changes can also affect the quality of people's lives.

Evidence from Austria on the lived experience of people in fuel poverty finds a large number of different coping strategies regarding heating practices which are classified as **strategies for efficiency and strategies for sufficiency** (Brunner, Spitzer and Christanell, 2012). Strategies for efficiency involved low-cost investments such as sealing draughty windows or covering them with thick curtains. Sufficiency strategies included cutting back on energy consumption which often involved heating a single room, keeping heating off as much as possible, putting on extra layers of clothing, and 'slipping under the covers', even during the day (Brunner, Spitzer and Christanell, 2012, p.55; Gibbons and Singler, 2008). Other research has found that fuel poor households limit hot water consumption (Brunner, Mandl and Christanell, 2013) or turn down the temperature of heated water and reduce the use of lighting (Day and Hitchings, 2009).

A recent review of the lived experience of fuel poor households in Scotland found:

- There were difficulties in accessing and making sense of energy-related information;
- A preference for pre-payment meters which are easy to control and understand;
- A general lack of knowledge how heating systems work (particularly electric powered);
- Gendered and generational differences in perceptions of warmth and comfort which could bring tension between family members; and
- A tendency for distrust or difficult relationships with housing providers/ landlords and energy suppliers but greater trust with intermediaries such as energy advisors (Scottish Government, 2020).

Qualitative research on Welsh households living in fuel poverty has shown that people adopt a range of behaviours and strategies when confronted with cold weather (Radcliffe, 2010). Those that disregarded the cost of fuel were faced with

having to reduce consumption of other essentials such as food, or suffer financial difficulties such as debts. Other households rationed their consumption of fuel. This could involve avoiding using heating appliances, wearing extra clothes, heating a single room, leaving their homes, or simply remaining cold through self-disconnecting (Radcliffe, 2010).

Other lived experience research from Wales identified three key factors which impacted upon people's experiences of fuel poverty – housing, social relationships and finances (Groves, et al., 2020; Shirani, et al., 2021). Poor quality housing exacerbated people's experience of fuel poverty. Social relationships were used to mitigate the impact of poverty through sharing activities, such as visiting the homes of others to stay warm, but were also negatively impacted by fuel poverty when they felt that they could not invite others to visit because their home was too cold. Financial precarity was also a key issue that contributed to energy insecurity and fuel poverty. People on low income and variable income, including those whose main income was a state pension or social security, reported a high level of vulnerability to short-term financial shocks which left them feeling insecure about their ability to consistently afford their fuel bills.

Some behaviours are particularly harmful, albeit understandable decisions in particular circumstances, such as self-disconnection and self-rationing by households using prepayment meters. Some fuel poor households have expressed a preference for these meters due to the control it gives them, simplicity in understanding and rationing energy use and removal of the possibility of accumulating arrears (Barnes and McKnight, 2014). However, there can be disadvantages in terms of the deals available. Extreme behaviours of self-rationing and self-disconnection are much easier with prepayment meters as households can limit the amount they top-up meters each week and can choose to go without once the credit has run out. Ofgem's Consumer Survey 2019 found that of the four million British households using prepayment meters, around one in seven had self-disconnected their supply in the past 12 months (Ofgem, 2020). Citizens Advice research found that 50% of people with prepayment meters said that keeping the meter topped up and connected is a major daily concern (Citizens Advice, 2018a).

Self-rationing and self-disconnection also occur among households reliant on oil, liquefied petroleum gas (LPG) or solid fuel to heat their homes. Interrupted supply of heating oil can occur due to the orders for heating oil often needing to be made well in advance. Where payment for a delivery needs to be paid in advance, fuel poor households may self-disconnect until they can afford to pay for a new bulk delivery. In addition, households may self-ration as supply runs low.

One area that has received less attention is how policy makers and householders tend to understand energy efficiency, with householders relating the term to 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 (Barnes and McKnight, 2014).

Evidence of policy effectiveness

Intervention	Strength of evidence	Effectiveness
Home energy efficiency improvements	Good	Effective (important that they do not result in higher energy prices)
Energy prices	Weak (little international evidence of the effectiveness of different approaches)	Effective (although the evidence base is weak, reducing energy prices for low-income households will reduce fuel poverty)
Financial assistance with energy costs	Weak	Promising (clearly an important policy lever but little evaluation evidence of impact on fuel poverty)
Behaviour	Good	Effective

As mentioned in the policy context section, there are three main drivers of fuel poverty: poor energy efficiency of homes; high energy prices; and low incomes. The behaviour of households in fuel poverty is also an important factor. This review is structured around these main drivers and examines the international evidence of policies and programmes designed to address them. Different ways of defining and measuring fuel poverty can put greater or lesser emphasis on the importance of different drivers and the design of the most effective policy strategy to reduce fuel poverty (Heindl, 2015; Moore, 2012; Thomson, Snell and Liddell, 2017). As this review is of the international literature, the evidence relates to a range of different definitions and measures.

Countries with a warmer climate, for example southern European countries and countries in the Southern Hemisphere such as Australia, are more likely to be

affected by warm climate fuel poverty (for example, the need to keep properties cool rather than warm). The impact on lower income households struggling to pay for their energy needs is similar but some of the evidence from these countries is less relevant.

Home energy efficiency improvements

Reducing energy consumption through improving the energy efficiency of homes is often the most cost-effective way of making a sustained reduction in household energy costs and reducing the risk of fuel poverty (DECC, 2012).

There are numerous energy efficiency measures, such as loft, cavity wall and solid wall insulation, heating system upgrade, draught proofing, and energy efficient behaviour such as powering off electrical equipment when not in use. The costs and benefits of different measures vary across types of dwellings, household types, different geographies and socio-economic groups (Citizens Advice Scotland, 2016). Some properties are particularly 'hard to heat' and 'hard to treat'. These are dwellings that, for whatever reason, cannot accommodate 'staple' or cost-effective fabric energy efficiency measures' (BRE Housing, 2008). They include dwellings with solid walls, dwellings off the gas network, dwellings with no loft and high-rise flats. Wales has a high proportion of hard-to-treat dwellings, especially pre-1919 housing (including terraced housing) (Community Housing Group, 2011).

Improving energy efficiency not only reduces the risk of fuel poverty but helps to tackle climate change by reducing the use of energy and carbon emissions. However, the relationship between improving energy efficiency and fuel poverty is complicated by how the financing of energy efficiency improvements can impact energy costs, which can lead to higher risks of fuel poverty. In a recent research brief on fuel poverty by the House of Commons (HOC) Library, it is noted that:

“Any higher fuel costs from decarbonisation will have a greater impact on those in fuel poverty and could risk the numbers fuel poverty increasing. As such, the Climate Change Committee (CCC) argue that energy efficiency is also important to address fuel poverty to ensure decarbonisation takes place as part of a ‘just transition’.” (HOC, 2020, p.4)

In addition, improving energy efficiency in fuel poor households may not lead to large reductions in energy usage as households may choose to use all, or part of, the savings on keeping their homes warmer. While greater warmth is a positive outcome for these households, unless improvements are sufficient to cut energy bills after any increase in usage, households can remain in fuel poverty. In the literature the observed increase in energy usage following improvements in

energy efficiency is often referred to as the ‘rebound effect’ (or ‘prebound effect’) and reflects that the fact that fuel poor households often consume sub-optimal levels of energy (Galvin, 2015).

Coyne et al. (2017) evaluated the impact of a government programme in Ireland designed to reduce energy consumption in social housing through the installation of efficiency measures, such as replacement boilers, double glazing and cavity wall insulation. Although it was found that energy consumption fell, energy savings were 50% lower than predicted as householders chose to use part of the savings on heating their homes to a higher standard. Other studies find similar effects (see, for example, Teli et al., 2016). The rebound effect may also explain why households living in the most deprived areas of the UK experience lower energy consumption reductions after energy efficiency improvements (both in absolute and percentage terms) than those in more affluent areas (McCoy and Kotsch, 2020). From a fuel poverty perspective, the increase in energy consumption is a positive outcome but overall better monitoring is needed to understand the likely impact of energy efficiency measures on fuel poor households (Citizens Advice Scotland, 2016).

One policy approach to improving energy efficiency is to set minimum standards in domestic properties through legislation. Setting minimum standards is most straightforward for new builds but is likely to increase the cost of these homes, potentially undermining housing affordability. For existing properties, legislation can require homeowners to improve energy efficiency of homes at the point of sale with the cost passed on (at least in part) to the purchaser.

One of the challenges is that investments in energy efficiency improvements in existing homes (sometimes referred to as ‘retrofit’) require an upfront cost which can be large, particularly in the case of heating system upgrades, while the incremental savings flow back over quite long periods of time. This is one of the key challenges to improving energy efficiency in homes. To help overcome this, governments can:

- Make grants available to lower income households;
- Require energy suppliers to fund some of the improvements; and
- Offer pay-as-you-save financing mechanisms, whereby the beneficiary incrementally contributes part of their fuel cost savings towards the cost of the investments. These schemes can be administered through government finance initiatives, by energy suppliers or through Energy Service Companies (ESCOs).

All require reliable estimates of the long-term savings associated with different forms of energy efficiency investments.

As Hills (2012) notes, the financing of energy efficiency initiatives is key to understanding the impact of various schemes on lower income households and their effectiveness at reducing fuel poverty. Where the requirement is for energy suppliers to cover the upfront cost of improvements to energy efficiency, suppliers will redeem the cost through increasing energy prices. Higher energy prices in turn have distributional effects. As lower income households spend a higher share of their income on energy, they face the greatest potential negative impact on their finances and risk being drawn into fuel poverty or increasing the depth of fuel poverty. **What is crucial is whether the energy efficiency programmes result in sufficient reductions in the use of energy in lower income households to offset any increase in energy prices.** Schemes financed by governments and paid for through general taxation are more progressive and have greater potential to benefit lower income households and reduce fuel poverty (Hills, 2012).

Different financing models are likely to be required to target owner occupiers, landlords and renters in the private sector, and the social housing sector. The most straightforward group to reach are owner occupiers. They face the clearest incentive to make energy efficiency improvements as they will also be the beneficiary in terms of cost savings. The main factors they need to consider are how to fund the upfront cost of investments and whether they expect to remain in the property long enough to redeem the cost through savings on energy bills. There are a variety of ways in which to assist with the upfront costs of investments. For example, government grants can cover the cost of particular types of investment (e.g. insulation and heating system upgrades) and these can be targeted at lower income households who would otherwise be unable to cover the cost of the investment. ESCOs can supply and install energy efficiency equipment or refurbish dwellings (retrofit) and can also finance, or arrange financing, with their remuneration directly tied to energy savings achieved.

Improving energy efficiency in properties in the rental market is more challenging because those able to make decisions on such investments generally do not benefit from any energy cost savings. This is called the split incentive problem which is explored further in Case Study 1. If the cost of major energy efficiency refurbishments is passed on to tenants in terms of rent increases this can force lower income tenants to move (see evidence from Sweden in Mangold et al., 2016).

Case Study 1: Overcoming split incentives/the owner-tenant dilemma

Fuel poverty rates are generally highest in private sector rented homes, in Wales as elsewhere. What is known as the ‘split incentive’ or ‘owner-tenant dilemma’ presents a major challenge to improving energy efficiency in private rented accommodation. This arises because landlords (property owners) are responsible for paying for large energy efficiency upgrades but are unable to recover the savings which accrue to tenants through lower energy bills (Castellazzi, Bertoldi and Economidou, 2017; Barton, 2014). Although tenants are the main beneficiaries, they are unlikely to be able to redeem the cost of upgrades completed when they are living in a property (even if landlords allowed them to make changes to the property) as tenancies are often short. Similar barriers also apply to multi-apartment buildings where multiple owners (occupiers or landlords) need to agree to infrastructure investments beyond individual accommodations. Split incentives also exist in the social rented sector.

A number of solutions are available. One option is for the cost saving to be shared between the landlord and the tenant through an increase in rent. This can be less than the value of the total cost saving so that overall housing costs fall. Sector level solutions can be found if more energy efficient properties have a higher rental value. In the Netherlands social housing rents are regulated through a ‘points system’ linked to maximum rental prices (points are awarded on the basis of quality, location and size). In 2011 the points system was expanded to include energy performance of properties. With higher rents available for more energy efficient properties, the scheme encourages housing corporations to invest in energy efficiency and this can help solve the problem of split incentives between investments and savings (Hoogelander, 2017).

In Sweden there is high utilisation of district heating systems, particularly in dense urban areas (Werner, 2017). District heating supplies around 90% of multi-family buildings and 60% of total building heat demand, with biofuels and waste now the dominant energy source for these systems (IEA, 2019). A system of ‘gross rents’, which include the cost of heating and hot water, creates incentives for landlords to improve energy efficiency, thereby solving the split incentive problem (Lind, 2012).

There are also models where suppliers pay for the upfront cost. In the UK, the Energy Company Obligation requires energy suppliers to install insulation or new heating systems in fuel poor, vulnerable or low-income homes. The costs for the scheme are redeemed through higher energy prices for all households. As lower income households spend a higher share of their income on energy costs, for these schemes to reduce fuel poverty, the cost saving from greater energy efficiency needs to be greater than the impact of higher energy prices on energy bills for households at risk of fuel poverty. The National Audit Office estimated that in 2016, energy policy costs which are added to UK households' gas and electricity bills account for 13% of the average total energy bill (NAO, 2016). However only 17% of these costs fund energy efficiency programmes supporting low-income households (Barrett, Owen and Taylor, 2018). As lower income households spend a disproportionately higher share of their income on energy, the financing of the scheme is regressive (Barrett, Owen and Taylor, 2018). An alternative option is for the energy supplier and the beneficiary to share the savings resulting from energy efficiency improvements funded by the supplier, until the investment cost is paid back (Di Turi and Stefanizzi, 2015). This could be in the form of a pay-as-you-save finance model provided by energy suppliers or ESCOs.

For all of these financing models to work, and for homeowners to make good investment decisions, an accurate assessment of the cost-effectiveness of different energy efficiency investments is required. The effectiveness estimates require reliable evidence on changes in energy consumption for different types of measures. Recent estimates for the UK have found that **higher energy savings are associated with cavity wall insulation and heating system replacement** (installation of a condensing gas boiler), saving about 10% of annual consumption, while loft insulation results in approximately a 3% reduction (McCoy and Kotsch, 2020).

The cost-effectiveness of different energy efficiency measures is dependent on the investment, energy prices and discount rates (Mata, Kalagasidis and Johnson, 2015). In addition, limited options are available for 'hard to treat' dwellings. It is beyond the scope of this review to evaluate the evidence on the cost effectiveness of different types of energy efficiency investments, but it is clearly a factor that policy makers need to take into account. As we noted earlier, overall reductions in consumption can be lower in fuel poor households due to the rebound effect. Improving energy efficiency in fuel poor homes is likely to require a more complex set of interventions and behavioural changes that add significant uncertainty when modelling the likely costs and savings (Jenkins, 2010). In addition, studies have found that building energy models which calculate savings under theoretical (often optimal) conditions are rarely experienced in real life (Citizens Advice Scotland, 2016). This means that

policy makers need to be aware of the strengths and limitations of different models and approaches on estimates of cost-effectiveness of different investments.

It is important to bear in mind that the reasons for improving energy efficiency in lower income households' homes are not just about cost savings but also have the potential to improve a range of social exclusion outcomes which are associated with fuel poverty (for example, poor physical and mental health and social isolation). A systematic review of evidence from 39 experimental and control studies in high-, middle- and low-income countries which assessed change in any health outcome following housing improvement, found evidence of positive effects on general health, respiratory health and mental health (Thomson et al., 2013). In addition, interventions which targeted those with inadequate warmth and existing chronic respiratory disease were most likely to lead to health improvement. Warmth improvements were associated with increased usable space, increased privacy, and improved social relationships; absences from work or school due to illness were also reduced (Thomson et al., 2013). These findings are consistent with an evaluation of the impact of two home energy efficiency programmes in Wales (Warm Homes Nest and Warm Homes Arbed) which found positive effects on the respiratory health of recipients (Welsh Government, 2019).

For interventions to be effective at reducing fuel poverty, three important steps have been identified: policy targeting, identification of households and implementation of measures (Dubois, 2012). However, each of these steps are costly and can face feasibility problems (Dubois, 2012).

Energy prices

Price-based policies are designed to reduce the cost to households for the energy they use and thereby reduce the risk of fuel poverty. Policies include supplier rebates and discounts on energy bills, regulation of energy prices and payment methods.

Cross-country evidence from Europe finds that higher energy prices have statistically significant negative effects on subjective well-being and the effects are strongest for individuals in the lowest income households (Welsch and Biermann, 2017).

In general, in countries with private energy providers, a range of tariffs are offered to consumers. These are often for specified periods of time (fixed term) but this is not the case in all countries. For example, in France energy suppliers are prevented from offering fixed-term contracts or charging for switching supplier (Tyszler, Bordier and Alexia Leseur, 2013). Where fixed-term contracts are offered, prices may be guaranteed for some of the contract length and there can be a range of conditions attached to contracts. This is a complex area, and a detailed review of energy pricing

is beyond the scope of this policy review, so here we focus on aspects that are most likely to impact households at risk of fuel poverty. These are:

- The ease of switching providers; and
- Default tariffs – these are the tariffs which customers are moved to automatically when a contract ends and they haven't selected a new tariff.

The most competitively priced contracts are available to consumers able to research options online and who are prepared to switch when an existing fixed-term contract comes to an end. This puts some groups, such as digitally excluded people, who as a result will pay more for their energy, at a disadvantage. In recent years steps have been taken in the UK to increase the ease of switching energy providers and online price comparison websites have made it easier to compare tariffs (although as these sites take a fee and receive financial incentives from providers, they may not offer the best deals).

In recent years the proportion of people in Wales switching energy provider over a twelve-month period has increased, with the highest increases in younger age groups (Welsh Government, 2018). For example, in 2017/18, 26% of people aged 25-44 years switched energy provider, up from 17% in 2014/15 (Welsh Government, 2018). However, the switching process continues to be 'marred by issues with reliability and speed' (Ofgem, 2019). For those who do not switch provider or agree a new tariff rate with their existing provider when their contract comes to an end, they are automatically moved to a default tariff (standard variable tariff) which are much more expensive than other tariffs, and higher tariffs increase the risk of fuel poverty. In 2019 the Tariff Cap Act led Ofgem, Britain's energy regulator, to introduce an energy price cap which limits how much suppliers can charge per unit of energy (electricity or gas) and includes prepayment, standard variable and default tariffs.² Ofgem estimated that in 2019, 11 million British consumers were on these higher price tariffs prior to the cap being introduced (Ofgem, 2019). Fifty-three percent of electricity customer accounts and 51% of gas accounts, excluding pre-payment meters, were on default tariffs in 2019 and around one half had been on default tariffs for more than three years (Ofgem, 2019).

More could still be done to help households at risk of fuel poverty switch providers and find the best energy price deals. But it is not a policy area where there is a lot of relevant international evaluation evidence to review – some relevant

² The cap is updated twice yearly and under the current legislation is due to cease in 2023.

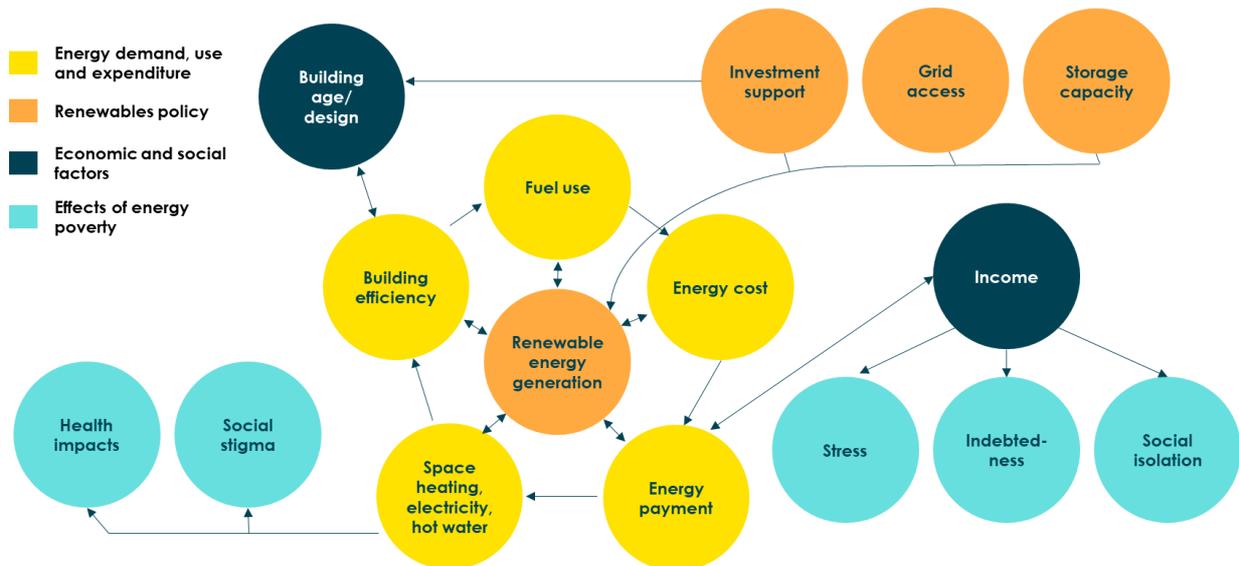
evidence is covered in the section on behaviour. Digital exclusion is one of the main contributory factors and is covered in a separate policy review.

Other aspects of energy supply contracts that can have a bearing on prices include the payment type with the best deals being available for those able to pay by Direct Debit (which is more difficult for lower income households and the financially excluded) and poor deals for households paying by pre-payment or pay-as-you-go meters. Other issues related to meters include disconnection (and self-disconnection) which is explored in the behaviour section.

An additional challenge in Wales is the high share of households in rural areas who are off the gas grid and reliant on heating their homes using oil, LPG, solid fuel or electricity. Department for Business, Energy and Industrial Strategy (BEIS) estimates show that in 2019, 19% of households in Wales were not connected to the gas grid; relative to 15% in Scotland and 14% in England (BEIS, 2020). Very high shares are seen in Ceredigion (75%), Pembrokeshire (42%) and Carmarthenshire (39%) (BEIS, 2020). Households off the gas grid are more likely to experience fuel poverty and poor energy efficiency; to live in rural areas; and to include householders aged over 60 years (Citizens Advice, 2018b). The prices for heating oil, LPG and solid fuel are higher than for gas, and there are generally fewer opportunities to switch supplier and suppliers are not regulated by Ofgem. In addition, households can be required to pay for heating oil upfront, for a large quantity (although some suppliers offer monthly payments spread across the year).

Some schemes seek to increase the number of households in rural areas who are on the gas grid. An alternative option, which can also help off-grid households, is domestic-scale renewable energy generation (for example, solar panels or ground source heat pumps). Households effectively become 'prosumers' of energy (producers and consumers), with excess, from some sources, sold back to energy providers at an agreed tariff (which can be set by governments to increase incentives) (Lowitzsch and Hanke, 2019). Options can include co-ownership with energy providers or solar panel 'rent-a-roof' schemes through companies and groups. One suggestion to allow low-income households to benefit from renewable energy generation is Consumer Stock Ownership Plans (Lowitzsch and Hanke, 2019). Households reduce the price they pay for energy and can have a second source of income depending on the model. Figure 1 shows how renewable energy interconnects with the drivers of fuel poverty and the impact on fuel poverty.

Figure 1: How renewable energy generation fits into the interconnected causes of fuel poverty, its effects and potential measures to alleviate it.



Source: Lowitzsch and Hanke (2019), Figure 1.

Financial assistance with energy costs

Clearly, inadequate levels of income are a key driver of fuel poverty. From a policy perspective, income poverty and low income need to be addressed through a range of policies which are too broad to cover in this review. In this section we focus on financial assistance through social security payments, designed to help vulnerable households meet the cost of energy bills, and schemes run by energy providers which are designed to reduce energy bills for such households.

In relation to fuel poverty, income-based measures are used in the UK and elsewhere to assist vulnerable households with the cost of energy, particularly during periods of cold weather. In the UK, these include the Cold Weather Payment and the Winter Fuel Payment. Although in practice these payments simply increase general household income, evidence for the UK finds that labelling these additional benefits does affect how households use them – on average, households spend 47% of the Winter Fuel Payment on fuel. If the payment were treated as cash, this figure would be 3% (Beatty et al., 2014).

Many other countries also provide financial assistance with fuel bills, including Denmark (where some assistance with heating bills is available for older households), France (where an annual lump-sum deduction from energy bills is available), Italy (where a reduction in energy bills is available for eligible households),

and Spain (where a discount energy tariff is available for vulnerable households) (Lowitzsch and Hanke, 2019).

Common forms of financial assistance are energy bill concessions, emergency grants, special circumstance concessions and hardship programmes (Azpitarte, Johnson and Sullivan, 2015). National energy regulators are commonly required by governments to implement customer hardship policies for people who are having difficulties paying energy bills. For example, the Australian Energy Regulator requires all energy providers to offer hardship programmes and seek to identify customers struggling with energy bills. These hardship programmes include alternative options for paying bills, reviews of energy plans, and advice for customers on government assistance (relief schemes, energy rebates etc.).

While some schemes are national, others operate on a more local level. Queensland Australia has a small annual flat-rate energy grant which is available for older age groups. Recent analysis shows that **a grant based on a percentage of energy bills rather than a flat rate, and changes to targeting to means-testing used elsewhere in the social security system (i.e. widening eligibility to low-income households in the working age population), would be more effective at reducing the extent and depth of fuel poverty** (Simshauser, 2021).

In conducting this review of the international evidence, no comparative evaluation evidence was found on the effectiveness of different forms of financial assistance on fuel poverty.

Behaviour

An important aspect of policy and the effectiveness of interventions to reduce fuel poverty is the behaviour of households. Fuel poor households adopt a series of coping strategies for:

- How they use energy (particularly in colder weather);
- How they live with inadequate heating; and
- How they cut back on other areas of expenditure in order to pay fuel bills (Barnes and McKnight, 2014).

In some aspects of energy use, households are more likely to be aware of energy saving options than in others. For example, a study in Sweden found that most loaded washing machines fully before use but appeared to make limited effort to avoid leaving appliances on stand-by. And when buying new appliances, product price was more of a concern than energy efficiency (Vassileva and Campillo (2014).

Not only is it important to understand the behaviour of households in general but there is a growing body of evidence highlighting the importance of understanding householders' responses to energy efficiency investments. These behaviours can play a key role in determining the cost-effectiveness of measures and their capacity to reduce fuel poverty. Household behaviour and response is likely to be more important for some types of investment than for others and for some types of recipients than for others. For example, loft insulation and double glazing do not require any understanding of how the measures work as all the consumer needs to do is adjust heating thermostats. Other interventions, such as new heating systems, require greater knowledge to increase effectiveness.

Tenants may also need more assistance with new energy efficiency measures than owner occupiers. Owner occupiers will largely have played a more proactive role in deciding on a measure and understanding how it works. Tenants on the other hand may have played a more passive role with the decision made by the property owner or housing association. Large scale retrofit programmes in the social housing sector are an example of where engagement with tenants at every stage is important for the success of these interventions (Bates et al., 2012).

Some interventions specifically target behaviour to improve energy efficiency. One example of this is the installation of smart energy meters. The principle is that giving energy consumers (households) access to real-time information on energy consumption will help them to understand which appliances and energy uses consume the most energy and where savings can be made. An evaluation of smart meters in the Netherlands highlighted the importance of effective in-house displays for behavioural changes (Van Aubel and Poll, 2019). Evidence suggests that while smart meters can benefit vulnerable and low-income households, in most cases additional support and advice is required (NEA, 2018). Ofgem's Consumer Survey 2019 found disappointing levels of behaviour change as a result of smart meter installation in Britain, and individuals getting smart meters more recently were even less likely to report behaviour change (Ofgem, 2020). Helping households understand their smart meters and in-home display can have a positive impact and increase their effectiveness. However, effective operation of smart meters alone is not enough to solve the problem of fuel poverty. In addition, smart meters may in fact promote harmful rationing of energy consumption in fuel poor households.

Other interventions can combine energy audits with advice and improvements, for example the Stromspar-Check programme in Germany (see Case Study 2). In Wales, under the Warm Homes Programme NEST scheme, free advice and support is offered to help people improve their energy efficiency. A package of energy efficiency measures can also be offered to low-income households and those struggling to pay their energy bills.

Case Study 2: Germany – Stromspar-Check

The Stromspar-Check programme in Germany provides free energy audits to low-income households by ‘Energy Efficiency Checkers’, or ‘Energy Saving Assistants’. The national scheme is funded by the German Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The aim is to reduce energy costs in low-income households, initially set up in 2008, with the current project ‘Stromspar-Check Aktiv’ running between 2019 and 2022. Based on the audit, households can be provided with a range of energy and water saving devices. Households are visited on three occasions:

- 1) An initial visit which involves the audit;
- 2) Following the identification of the most appropriate interventions, a second visit involves free installation of devices and advice on energy efficient behaviour; and
- 3) A final visit occurring more than one year later to monitor progress.

Energy and water saving devices include LED bulbs (most common), tap aerators, plug connectors and other stand-by stops, fridge thermometers and time switches. The scheme also includes a Refrigerator Exchange Programme providing a 100/150 € voucher for households with refrigerators over ten years old. Another important feature is that the Energy Efficiency Checkers are trained by the scheme and are recruited from the long-term unemployed.

A 2019 evaluation (Geißler, Marx and Preißler, 2019) found:

- 344,184 households across Germany had participated in the Stromspar-Check since 2008.
- Each household was able to save 276 € and 533 kg of CO₂ on average every year.
- Advice and a personal approach are essential quality features of the Stromspar-Check.
- Tips for how users could change their behaviour were found to be at least as important as installation of equipment to save energy and water.

The scheme demonstrates how significant savings in energy and water can be achieved through the use of simple energy saving devices and advice to low-income households. The training of long-term unemployed people as ‘Energy Efficiency-Checkers’ also helps to reintegrate unemployed people into the job market (Seifried and Albert-Seifried, 2015).

Some behaviours relating to fuel poverty are particularly harmful, albeit understandable decisions in particular circumstances, such as self-disconnection and self-rationing by households using prepayment meters. Prepayment meters require payment upfront, before energy is consumed. In addition to covering the standing charge and per unit charge, meters can be set up to pay off arrears on energy debts with providers. They are often installed in rental properties as a way of landlords ensuring that energy bills are paid; they can be installed by energy providers to recover arrears; and some consumers request meters to aid budgeting (Hodges et al., 2016). However, there can be disadvantages in terms of the deals available and they can lead to extreme behaviour of self-rationing and self-disconnection.

Self-rationing and self-disconnection also occur among households reliant on oil, LPG or solid fuel to heat their homes. As mentioned, interrupted supply of heating oil can occur due to the orders for heating oil often needing to be made well in advance. Where payment for a delivery needs to be paid in advance, fuel poor households may self-disconnect until they can afford to pay for a new bulk delivery. In addition, households may self-ration as supply runs low.

Suppliers have a key role to play in limiting self-disconnection and some third-sector organisations have stepped in to help prevent self-disconnection. For example, in Britain, The Fuel Bank Foundation,³ which was set up to support homes in fuel crisis and unable to top up their prepayment meters, operates through foodbanks and advice agencies, and can provide vouchers to households in crisis to avoid self-disconnection.

³ <https://www.energy-uk.org.uk/about-us/about-us/about-our-members/item/fuel-bank.html>

Challenges and facilitating factors

A summary of the challenges and facilitating factors relating to fuel poverty and policies and programmes to address the issue is provided in Table 1.

Table 1: Challenges and facilitating factors

Challenges	Facilitating factors
<ul style="list-style-type: none">• How fuel poverty is defined and measured shapes policy responses. There is currently no international agreed definition and there are clear weaknesses with some approaches.• Home energy efficiency schemes can involve large upfront costs. Split incentives create additional challenges in the rental sector as property owners are unlikely to benefit from energy cost savings in relation to improvements, as these typically accrue to tenants.• Difficulties involved in accurately estimating the cost-effectiveness of energy efficiency investments create a barrier to investment.• The Welsh Government does not currently have control over some of the key policy levers to reduce fuel poverty (e.g. key cash transfers).• For interventions to be effective, three important steps have been identified: policy targeting, identification of households and implementation of measures – but each can be costly and face feasibility problems.	<ul style="list-style-type: none">• Development of pay-as-you-save finance schemes have the potential to increase investment in energy efficiency improvements. These can be run by energy suppliers or Energy Service Companies (ESCOs) and can help address the split incentives challenge and fill the funding gap.• A greater focus on climate change and the role of improving energy efficiency in domestic properties in reducing carbon emissions is likely to push fuel poverty further up the policy agenda.• A good understanding of fuel poverty within the Welsh Government is likely to help facilitate policy change in the area. The recently published Welsh fuel poverty strategy reflects a renewed effort to tackle fuel poverty.

Conclusion

Fuel poverty, or energy poverty, is a specific dimension of poverty relating to the ability of lower income households to meet household energy needs. Households in fuel poverty are faced with difficult decisions about how to cover energy costs or how to manage on insufficient levels of energy consumption, with some having to decide between 'eating and heating'. There are known health risks associated with fuel poverty and negative impacts on well-being and inclusion. Tackling fuel poverty not only has beneficial effects for households affected by it but there are potentially wider benefits gained through lower carbon emissions.

The lack of an agreed definition of fuel poverty creates some challenges in reviewing the international evidence in this area and different definitions and measures shape the policy response. There is universal agreement that the drivers of fuel poverty are low energy efficiency of homes, high energy prices and low income. In addition, the behaviour of households is key to understanding how fuel poor households cope, how receptive they are to different measures and how they respond to interventions.

The review found evidence of a range of different interventions available to improve the energy efficiency of low-income households' homes. **Some of the most effective investments, such as the installation of energy efficient heating systems, are very costly and the savings will only be redeemed over a long period of time.** Financing models need to overcome issues such as split incentives in the rental sector, 'rebound effects' and a tendency to overestimate cost saving.

To take advantage of the best energy price deals, households need to be prepared and able to switch provider. Switching rates are generally low (although rising in Wales) and households can get stuck on more expensive default tariffs as a result. **Energy price caps and regulation can help but behavioural change is also required.** Some countries require providers to offer lower tariffs to low-income households (social tariffs).

Broader policies are required to reduce low-income risks and address inadequate levels of social security. Additional income supplements can be targeted at fuel poor households in the form of payments during cold weather and fuel vouchers to households in crisis, and providers can offer assistance on fuel bills. However, **there is a lack of comparative evaluation evidence on which forms of financial assistance are most effective at reducing fuel poverty.**

Understanding the behaviour of fuel poor households can help to improve the design of policy interventions and tackle some of the most harmful behaviours, such as

rationing and self-disconnection. It is also important to understand how households respond to other interventions such as energy efficiency measures, and more broadly, how they currently use energy and appliances.

The Coronavirus pandemic, particularly during periods of lockdown, led to increased domestic demand for energy due to people spending more time in their homes, with emergency measures showing mixed success on fuel poor households due to insufficient targeting (Mastropietro, Rodilla and Battle, 2020). The negative impact of the pandemic on fuel poverty is likely to be long-lived (Carfora, Scandurra and Thomas, 2021). This assessment was made prior to the sharp rise in energy prices occurring towards the end of 2021 which is putting further upward pressure on fuel poverty.

Transferability to Wales

This is an area of policy where the Welsh Government has been actively involved for some time. The Welsh Government is able to:

- Decide on how to define and measure fuel poverty in Wales;
- Set targets for fuel poverty reduction;
- Develop strategies for how to meet these targets which can include:
 - Setting standards for energy efficiency in new private housing and all social housing;
 - Helping with costs of retrofitting housing with energy efficiency measures;
 - Providing advice and support on home energy efficiency and cost reduction strategies (e.g. switching supplier); and
 - Helping with energy costs in an emergency (e.g. through the Discretionary Assistance Fund).

However, not all of the policy levers required to tackle the causes of fuel poverty are within the control of the Welsh Government, such as key elements of social security and regulation of the energy market, and some of the drivers of fuel poverty need to be addressed at the UK level. However, the Welsh Government can use its influence to put pressure on the UK Government to make changes where these are required.

Promising actions

This section concludes with **promising actions** to consider in the Welsh context as emerging from the analysis of the international literature.

- 1. Home energy efficiency improvements**, particularly in the existing rental housing stock where fuel poverty rates are highest, are important for tackling long-term risks of fuel poverty. Options are available to overcome the split incentive problem (e.g. through grants and pay-as-you-save financing models).
- 2. Energy efficiency** improvements funded through general taxation are less likely to lead to higher energy costs which negatively impact low-income households. However, pay-as-you-save financing schemes, such as those provided by Energy Service Companies (ESCOs), offer a promising approach which can bring in important financing alongside delivering energy saving improvements (including retrofit).
- 3. Energy audits** can help elicit positive behavioural changes in relation to energy use. Helping households use energy and energy savings devices efficiently can help to reduce energy bills.
- 4.** One of the key drivers of fuel poverty is low income and any strategy to reduce fuel poverty needs to tackle this driver. Targeted **financial assistance** can take the form of 'labelled' social security payments or help with energy bills. More evaluation evidence is required to assess which is the most effective at reducing fuel poverty.

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Annex: Methodology

Definition of poverty and social exclusion

For the purposes of this project it was agreed that a multidimensional concept of disadvantage, including social as well as economic dimensions, would be adopted. The Bristol Social Exclusion Matrix (B-SEM) (Levitas et al., 2007) provides the theoretical structure that underpins the selection of policy areas. The B-SEM uses the following working definition of social exclusion:

“Social exclusion is a complex and multi-dimensional process. It involves the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole.” (Levitas et al., 2007, p.9).

It is structured around three main domains and ten sub-domains (see Table A1).

Table A1: B-SEM domains and sub-domains

A. Resources:	
A1: Material/ economic resources	Includes exclusion in relation to income, basic necessities (such as food), assets, debt and financial exclusion.
A2: Access to public and private services	Relates to exclusion from public and private services due to service inadequacy, unavailability or unaffordability. The range of services encompass public services, utilities, transport, and private services (including financial services).
A3: Social resources	Reflects an increasing awareness of the importance of social networks and social support for individual well-being. A key aspect relates to people who are separated from their family and those who are institutionalised.

B. Participation:

B1: Economic participation	Includes participation in employment – which is not only important for generating resources but is also an aspect of social inclusion in its own right. Whether work is a positive, inclusionary experience depends partly on the financial rewards it brings, and partly on the nature and quality of work. Work is understood broadly and includes caring activities and unpaid work.
B2: Social participation	Comprises participation in common social activities as well as recognising the importance of carrying out meaningful roles (e.g. as parents, grandparents, children).
B3: Culture, education and skills	Covers cultural capital and cultural participation. It includes the acquisition of formal qualifications, skills and access to knowledge more broadly, for instance digital literacy inclusion. It also covers cultural and leisure activities.
B4: Political and civic participation	Includes both participation in formal political processes as well as types of unstructured and informal political activity, including civic engagement and community participation.

C. Quality of life:

C1: Health and well-being	Covers aspects of health. It also includes other aspects central to individual well-being such as life satisfaction, personal development, self-esteem, and vulnerability to stigma.
C2: Living environment	Focuses on the characteristics of the 'indoor' living environment, with indicators of housing quality, inadequate housing and exclusion in the form of homelessness; and the 'outdoor' living environment, which includes neighbourhood characteristics.
C3: Crime, harm and criminalisation	Covers exposure to harm, objective/ subjective safety and both crime and criminalisation. This reflects the potentially exclusionary nature of being the object of harm, as well as the exclusion, stigmatisation and criminalisation of the perpetrators.

Notes: the descriptions of the sub-domains are the authors' understanding of what each sub-domain includes based on Levitas et al. (2007).

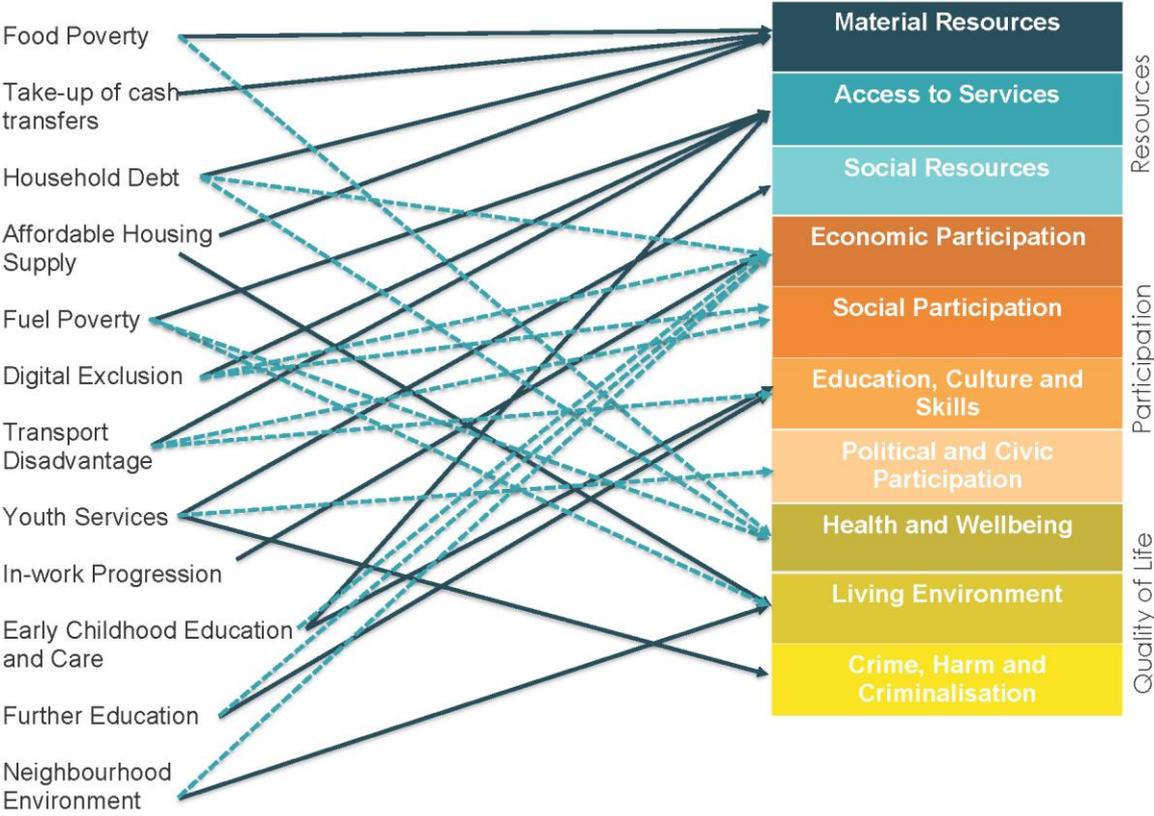
Selection of policy areas

The first step involved the research team identifying a long list of 40 policy areas with reference to the domains and sub-domains of the B-SEM. The long list was, in part, informed by a review of key trends in poverty and social exclusion in Wales, across the ten sub-domains, conducted by WCPP (Carter, 2022a); a consideration of the Welsh Government's devolved powers across policy areas; and meetings with experts. From this long list a shortlist of 12 policy areas was agreed. The shortlisting process took into account advice on priority areas identified by a focus group of experts, but ultimately the final list of 12 policies was selected by the Welsh Government.

The final set of 12 policy areas covers a broad spectrum within the B-SEM, and most are related to more than one sub-domain within the B-SEM (Figure A1). However, the final selection should not be considered exhaustive from a poverty and social exclusion policy perspective. This is because some important policy areas are not devolved to the Welsh Government and, therefore, were not included. For example, while adequacy of social security is a key driver of poverty the Welsh Government currently has no powers to set key elements of social security policy (e.g. rates and eligibility criteria for the main in-work and out of work benefits) and this is the reason why we focus on one aspect of social security, take-up of cash transfers, that the Welsh Government has power to influence.

Another factor was the project's scope and timescales, which limited the selection to 12 policy areas and meant that other important areas had to be excluded (for instance, social care, health care and crime). To make the reviews manageable, it was also necessary to identify a focus for each of the 12 policy areas. The research team identified a focus for each of the reviews on the basis of a brief initial scope of the research evidence and consultation with WCPP who, where relevant, consulted sector and policy experts. This means that there are likely to be additional policies which could be included in a poverty and social exclusion strategy by the Welsh Government *within* the 12 policy areas and *in addition to* the 12 policy areas reviewed.

Figure A1. The selected policy areas mapped to relevant B-SEM sub-domains



Source: prepared by the authors

Notes: The figure outlines the mapping of the 12 selected policy areas to the B-SEM matrix: bold lines show the relationship between each policy area and main B-SEM sub-domain(s), light dotted lines identify selected secondary B-SEM sub-domains the policies are related to (a full list of these ‘secondary subdomains’ is included in the specific reviews).

Review stages

In the ‘evidence of policy effectiveness’ section, while it was not possible to produce a full systematic review (although evidence from existing systematic reviews and meta-level analyses were included where available), a structured approach was adopted. This first involved an evaluation of the state of the relevant literature, focusing on whether effectiveness was assessed via methods standardly considered better suited to establish causality (e.g. on the basis of hierarchical grading schemes such as the Maryland Scientific Method Scale (Sherman et al., 1997) or the Oxford Centre for Evidence-Based Medicine’s (OCEBM) levels of evidence (Howick et al., 2011) such as randomised controlled trials (RCTs), meta-analyses of RCTs and other quasi-experimental studies. While RCTs are particularly powerful in identifying whether a certain intervention has had an impact in a given context, other forms of evidence, such as quasi-experimental and observational studies with appropriate

controls may be better suited, depending on the type of intervention, to establish the range of outcomes achieved as well as providing an understanding of distributional effects and allowing sub-group analysis (i.e. 'for whom' did the intervention work). In the process of assessing evidence, case studies were selected to further elaborate some of the key findings resulting from the review and to identify specific examples of promising policy interventions.

In a few areas, the literature review highlighted a lack of robust evaluations – the reviews underscore this and present the best available evidence found along with an assessment of the strength of the evidence. Where possible, an evaluation of the underlying mechanisms of change was also considered, allowing an explanation of not just whether, but why a certain intervention works, thus also facilitating the identification of challenges and facilitating factors, which is crucial in thinking about not just 'what' should be done but also 'how' it can best be implemented.

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- improved our understanding of the transferability of policies to Wales; and
- informed our consideration of implementation challenges and facilitating factors.

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