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## **Documenting fuel poverty from the householders' perspective**

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### **Abstract**

Fuel poverty in Scotland is currently measured using a definition based on the Boardman '10% of income' conceptualisation of the condition. However, the definition and the metrics used to identify and target fuel poor households are now under review. What is needed is a reconceptualisation of the condition that reconciles the Boardman definition with a wider assessment of vulnerability to fuel poverty and its impacts, and which could reasonably be implemented as part of Scottish Government policy. This study uses observational ethnographics to examine and challenge the current qualitative characterisations of vulnerability, based on fifteen illustrative case studies from Renfrewshire, Scotland. It demonstrates the value of observational studies as a mechanism to provide a fuller picture of how poverty impacts on householders, through gaining insights into underlying factors which are difficult to disentangle through purely quantitative research. It highlights the diversity of the situations of the fuel poor, as well as the high prevalence of poor mental health and wellbeing, and questions how those needs are addressed through current policy. Finally, it sets out the direction of on-going research to develop a complexity science and risk-based assessment of influences on the vulnerability of householders to fuel poverty and its impacts.

### **Keywords**

Fuel poverty; Households; Perspectives; Observational studies

### **Abbreviations**

CESP - Community Energy Saving Programme;

EAP – Energy Assistance Package;

ECO: Energy Company Obligation;

HES – Home Energy Scotland;

Ofgem – Office of Gas and Electricity Markets (UK);

SEEP – Scotland's Energy Efficiency Programme;

SHCS – Scottish House Condition Survey;

SHQS – Scottish Housing Quality Standard;

WHD – Warm Home Discount

## 1. Introduction

Recent reports for the Scottish Government and other stakeholders have highlighted the need for policies for tackling fuel poverty to do more to identify and address the needs of the poorest and most vulnerable households [1,2,3,4,5]. These and other reports and studies have highlighted evidence of the impacts of fuel poverty on the mental health and wellbeing of Scottish householders [6,7]. As a result, the Scottish Government is now considering revising the Scottish definition of fuel poverty, which is different to that used by England [8] and to definitions of energy poverty [9,10,11], based on current research findings.

To date, the definition of fuel poverty in Scotland [12] has been based on Brenda Boardman's definition of a household needing to spend more than 10% of its income to maintain an acceptable heating regime [13,14], and guidance on this from the World Health Organisation (WHO) [15]. However, following the failure of the Scottish Government to meet its 2016 target of eliminating fuel poverty as far as reasonably practicable, and concerns over future funding renewed attention is being paid to the problem as part of improving the effectiveness of wider measures to tackle social inequalities<sup>5</sup> and improve household energy efficiency [16].

One of the key barriers to revising the definition to incorporate some measurement or assessment of vulnerability is that lack of sufficient understanding of the complex relationships between fuel poverty and the conditions that may be used to define vulnerability. Even within the European Union, definitions of vulnerability vary [17] however, the International Standards Organisation broadly defines a vulnerable group as a "*group of individuals who share one or several characteristics that are the basis of discrimination or adverse social, economic, cultural, political or health circumstances, and that cause them to lack the means to achieve their rights or otherwise enjoy equal opportunities*" [18].

Globally, Bouzarovski and Petrova [19] have identified the main components and implications of energy service and vulnerability approaches as they relate to domestic energy deprivation across the world, as part of a study which addresses and attempts to reconcile the conceptual differences between fuel poverty and energy poverty, and set out a typology of energy vulnerability factors. More specifically, Middlemiss and Gillard [20] apply their understanding by proposing an alternative approach, rooted in risk-based analysis, to defining and understanding vulnerability to the condition through the application of patient welfare analysis [21]. However, in order to apply this to the Scottish context it needs further development and reconciliation with evidence from localised studies on Scottish households.

This paper is intended to advance the development of such a risk-based assessment of vulnerability to fuel poverty and its impacts. We present a series of case studies of householders from Renfrewshire, Scotland, which highlight the high diversity of fuel poor households and household behaviours, and the high prevalence of poor health and mental health and wellbeing, as both contributing factors to vulnerability to fuel poverty and also outcomes of it.

This is ultimately aimed at reconciling how both qualitative evidence on household vulnerability and quantitative evidence on household energy costs and conditions can be used to better deliver support to households in or at risk of fuel poverty. We present the first steps in the development of an assessment framework that bridges the gap in policy approaches from the (generally quantitative and threshold-based) assessment of fuel poverty with the (generally qualitative) assessment of vulnerability. Furthermore, in

accordance with the Scottish Government's Third Report of Proposals and Policies (RPP3) [22], this is also intended to enable the maximisation of the wider benefits of future fuel poverty policies and schemes [23].

## **2. Background**

Whilst the condition of energy poverty is becoming increasingly recognised across the EU and internationally [9,10,11,19], and the European Commission has now intends to establish a broad description of energy poverty and set requirements for Member States to develop tailored definitions [24], the UK currently reports two different measures of fuel poverty. One advantage of this is that it restricts the problem of defining indicators to those relating only to heating costs, whereas defining energy poverty means further defining an acceptable cost of energy, and appropriate indicators, for all 'required' household uses [25].

### **2.1. Measuring Fuel Poverty in Scotland**

In 2015, an estimated 748,000 Scottish households (30.7%) were in fuel poverty, however this figure varies significantly across social, economic, and geographic groups [26]. The Scottish Government continues to use the 10% of income definition of fuel poverty [12,15]. Conceptually, this is a direct application of the Boardman definition [13,14] with the WHO guidance [15], and essentially the same measure is used by Wales and Northern Ireland [25], as well as by Australia and New Zealand [27]. This measure was also in use in England until 2013, when it adopted a 'low income, high costs' definition<sup>8</sup>. It is beyond the scope of this paper to provide an exhaustive critique of this definition, but we note that it has been subject to substantial criticism [28,29].

One of the weakness of the Scottish definition relates to the limitations of the metrics and sampling used to measure it [3,4,30]. These metrics normalise large numbers of variables, for example behaviour is normalised by assuming a standard heating regime. This leads to overly-generalised solutions that are biased towards addressing technical problems, and so serve to over-simplify a complex policy problem which does not lend itself to traditional social-science based approaches to policy making [31,32]. This reflects the findings of previous socio-economic studies conducted in the UK [4,30,33,34,35,36,37,38,39], and the experiences of those working to support those in fuel poverty, who recognise that the condition results from a complex interaction of multiple variables and underlying influences [3,40,41,42,43,44,45,46,47,48,49].

Scottish Government statistics generally reflect the findings of previous studies that have attempted to typify the fuel poor [40,50,51], however with some exceptions, there are no measures of dwelling and household characteristics that emerge as significant differentiating factors [26]. So simply developing more, and more sensitive, metrics would still mean future schemes would be designed around blunt, threshold-based mechanisms for determining eligibility. Furthermore, a study conducted in Northern Ireland [52] using a sample of 1,595 households found that, in many instances, those households in most severe fuel poverty did not fit the criteria for energy efficiency upgrades, despite standing to benefit from significantly reduced fuel poverty.

Using thresholds also fails to address the evidence that the impacts of fuel poverty exhibit a dose-response relationship, whereby occupants experience greater severity of illness, and for longer, in relation to exposure to poor housing conditions [53], and which has been found

to be significant regardless of socio-economic group [54]. This means that those in fuel poverty for longer suffer proportionately greater impacts, so householders with poor health will exhibit more severe symptoms and for longer, and can last even after they have been lifted out of fuel poverty. Nevertheless, threshold-based approaches remain the predominant mechanism for determining eligibility for support for fuel poor households in the UK. Full details of these schemes can be found in the references [55,56,57,58,59].

Thresholds used for UK-level schemes are restricted by age (those over 70 or with children under 5 years) and receipt of welfare benefits, whereas the Scotland-only schemes also prioritise older households with no main heating systems. However, previous studies have shown that these do not effectively target and support those most in need, for example because householders are unwilling to apply for the necessary means-tested benefits due to the associated social stigma [60,61,62,63].

The Scottish Government is currently integrating its energy efficiency and fuel poverty schemes into the Scottish Energy Efficiency Programme (SEEP) [64]. With this in mind, delivering on the Scottish Government's aspirations to tackle fuel poverty amongst the most vulnerable and isolated households will require a substantial reassessment of how those most in need are defined, identified, and supported. However, doing so effectively means reconciling the current definition with evidence from the fields of health and welfare.

## **2.2. Reconciling Fuel Poverty, Health, and Vulnerability**

Housing quality, poverty, and physical and mental health and wellbeing are all both influences on and outcomes of the condition of fuel poverty. To date, much research on the health impacts of fuel poverty has focused on housing quality, and particularly the relationships between dampness, mould, indoor air pollution, and householders experiencing respiratory illness [53,54,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85]. Furthermore, the difficulties, costs and ethical considerations of conducting pre- and post-intervention studies on the health of householders receiving energy efficiency interventions mean very few such studies have been conducted [86], and any comparisons drawn with them are limited by the context of the dwelling type and measures applied. These relationships also appear to be largely unaffected by socio-economic group [54]. This evidence is invaluable for reconciling technically-led policy approaches to administering support for fuel poverty with those used for determining eligibility for interventions and support to improve physical health however, to date these relationships have received relatively little attention.

Internationally, Liddell and Guiney [87] have identified several significant relationships between housing and mental wellbeing:

- Cold and damp homes are associated with sub-optimal mental health;
- The stressors are associated with being unable to afford solutions to adverse living conditions;
- The stressors are multiple and diverse, including environmental, social and economic factors;
- The risks to wellbeing they generate are equally diverse, and can be both positive and negative.

These findings are used to define a cycle of risk associated with living in fuel poverty that incorporates aspects such as worsened physical health, increased stress, and increased coping behaviours such as smoking and over-eating.

Recent Scottish studies have found new evidence that poor mental health is a contributing factor to fuel poverty and an outcome of it [88], and suggest that involving the health sector in engaging with the fuel poor could deliver “*huge potential benefits*” to tackling ill health and social inequality [89]. However, yet another problem is to understand (and predict) how households will respond to an intervention. This arises from two related problems - how effectively support services engage with fuel poor households, and the behaviours those households adopt as a result of receiving support (including any limitations on that behaviour).

The former problem is largely one of resourcing. At present the primary delivery route for energy efficiency and fuel poverty advice in Scotland is the national Home Energy Scotland (HES) telephone helpline [90]. HES has the advantage of providing a single point of contact for advice, inducting / referring householders into relevant schemes, however the provision of energy advice by phone (and online), has been found to present substantial barriers to disabled and vulnerable households [57,91,92].

Furthermore, even amongst households who are neither fuel poor nor vulnerable there is a high degree of uncertainty in the savings from interventions due to the rebound [93] and prebound [94] effects. The former refers to the phenomenon that actual energy savings are often lower than models predict because households tend to take some of the energy efficiency gains in the form of increased thermal comfort rather than reduced energy use. The effect is not simply limited to heating and may include wider behaviour changes which result in increased household energy consumption [93,95,96].

The Scottish Government currently applies an adjustment of 20% for the rebound effect when modelling savings from interventions using its DEMScot2 model [97]. We have recommended this be revised to 35% [3], but this use of an average could still be disadvantaging vulnerable households if the effect is stronger amongst households in lower socio-economic groups [98]. The model does not attempt to account for the prebound effect, which arises from householders consuming less energy than models based on standard assumptions predict, for example by choosing or adapting to lower internal temperatures, or consciously rationing consumption. This effect may result from householders preferring lower temperatures, but can result from conscious behaviours to limit energy use, which can be a strong indicator of fuel poverty. Furthermore, as the two effects appear to act independently it cannot, for example, be assumed that a fuel poor householder suffering health problems from living in a cold home will adopt optimal heating behaviours following an intervention.

This example includes a group who are of key concern to policy makers, the ‘self-limiters’ who actively ration heating and other energy uses, and in some cases disconnect their utility supplies. These households are both particularly vulnerable and difficult to identify directly unless they report that behaviour to a support worker. As such evidence on these households has been largely anecdotal however, one UK [41] study found evidence of energy (and food) rationing as the result of financial stress, and three Scottish studies [4,57,99] have found evidence of energy rationing amongst lower socio-economic groups. However, as illustrated in this paper, reactions to and due to fuel poverty, are much more

diverse and nuanced than can be adequately described by using basic technical, social and economic measures.

Yet treating fuel poverty as a health and welfare issue is entirely contiguous with related Scottish Government policies as enabling personal capacity. This is because enabling individual and community capacity, empowerment and resilience, are common themes in Scottish policy making, for example under the Scottish Government's wider Community Empowerment and Engagement agenda [100].

However, if we are to effectively address vulnerability to fuel poverty the approach will also need to be cognisant of the complexity of household responses to intervention measures, i.e. we need to account for the risk of them adopting behaviours that lead to them gaining insufficient benefits from interventions and / or falling back into fuel poverty. Therefore, our next step will be to incorporate evidence on the use of computational modelling to explore complex systems in health and social inequalities from a case-based perspective [101,102,103,104,105,106]; and on using a quantitative computational analysis (QCA) approach to address the problem that we can never establish universal / nomothetic accounts of causality in complex systems by using variable-based methods [107,108,109,110,111].

### **3. Theory**

The triangulation of qualitative evidence with the findings from quantitative analyses enables a more complete picture of how poverty impacts peoples' lives [40,41,112,113,114,115], and as a means to evidence some of the impacts of living in fuel poverty, such as societal exclusion [48]. The descriptions of vulnerability classifications and their interpretation have an important role to play in fuel poverty policy since they are used to define qualifying criteria, for example super-priority grouping [116].

Observational ethnographic studies have an important role to play in developing that qualitative evidence [117], as they use trusted agents to enable access to specific groups, and observe and report on the status and other influencing factors of the individuals being studied [118,119]. In this context, researchers, unless they happen to come from the local community, are unlikely to be viewed as trusted agents by participants, and are 'etic' observers, in that their perspective are rooted outwith the communities that they are studying. This is illustrated by our decision to engage a similar local energy advice service as part of related work in a village in the highlands, following advice from a project partner that, *"they won't talk to me, and I come from the next village"* [120].

The Energy Advocates employed for this study all live within the communities they serve, and engage with their clients through referrals from the health service, social service and other community based organisations, meaning they are viewed as a trusted agent by the majority of their clients. Though the advocates offer an empathetic service, they try do so with impartiality as they may have to resolve disputes on behalf of the clients.

### **4. Materials and Methods**

Case studies in various forms are used by local authorities and government, to better understand the needs, challenges and potentials of their populations, and specific groups within them [121,122,123,124]. However, there are understandably greater challenges for

researchers working with vulnerable and ‘hard to reach’ groups, which emphasise the value of using ‘trusted agents’ to conduct the research.

The Energy Advocacy Service from Renfrewshire Council is a council-based service that offers a universal service to all residents in the area. The case studies presented here are transcribed from referral forms completed face-to-face by the Energy Advocates and held centrally by the council. Referrals are received from the health service clinics such as head injuries, memory, palliative care, hospital discharge services and degenerative diseases. From social work services referrals are received from childrens’ services, adoption and fostering services, and mental health services. Other referrals come from food banks, Citizens Advice Bureaux, registered social landlords, and HES. The service is integrated into a multi-agency support service aiming for early intervention for ‘just coping’ families with children under the age of 12.

The advocates engage with the clients in their homes, ascertain their immediate concerns with energy use, and support them in resolving their specific needs. The duration of any visit and the number of visits per client is wholly determined by the clients’ needs. Each client visit produces a case study, and all clients sign a consent form which includes comprehensive consent statements, a clear indication that consent can be withdrawn at any point, and a clear process to achieve this. Note that for confidentiality reasons the case study summaries do not reflect of the number of times or duration of visits per client.

Over a 12 month period the Energy Advocates visited 998 clients in their homes. Of the 998 visits, 877 are classed in one of the identified vulnerability groups, leaving 12% which are not. The proportions of vulnerable individuals by vulnerability class within Scotland, Renfrewshire, and the study population are given in Table 1.

**Table 1. Breakdown of household vulnerability groupings for Scotland, Renfrewshire and the Advocacy project**

<b>Vulnerability class</b>	<b>Scotland</b>	<b>Renfrewshire</b>	<b>Advocacy clients</b>
<b>Over 65</b>	17%	17.1%	12%
<b>Children under 15</b>	24.1%	24.3%	32%
<b>Single adults</b>	36%	39%	44%
<b>Total</b>	77.1%	80.4%	88%

Sources: Study data and data held by the National Records of Scotland [125]. Figures in each column are not mutually exclusive.

In a project which aims to support vulnerable householders it is expected that there will be a higher proportion of the vulnerable in the client numbers than the general population. The highest disparity is between the proportions of the advocacy population of households with children under 15 years old. This was expected as the one element of the referral mechanism involves an integrated multi-agency support service targeted at families with children under the age of 12. There was no specific partnership to target elderly householders and this is reflected in the lower portion of elderly in the sample (12%) compared to the local and national statistics (17.1% and 17%). Therefore the sample has a higher representation of vulnerable than the general population of Scotland.

Of the 887 that do fall into a vulnerability class, 214 fall into two of those classes. This is illustrated in Table 2. Since there are 214 examples of multiple vulnerability class, this leaves



a total of 663 which meet at least one of the vulnerability classes and 335 (34%) which do not match any current vulnerability classifications.

**Table 2. Vulnerability groupings for Renfrewshire energy advocacy clients**

<b>Vulnerability class</b>	<b>Number of clients</b>	<b>Number in additional classes</b>
<b>Over 65</b>	118	2
<b>Children under 15</b>	321	214
<b>Single adults</b>	438	212
<b>Total</b>	877	

The case studies were then filtered for those which reflect the vulnerability classification, and those that challenge the validity of the classification system (following Green 2007 [40]). The sample was also limited to those case studies approved for release by the Data Protection Officer at Renfrewshire Council. Reasons for withholding the publication of a case study primarily relate to cases where it may have been possible to identify individuals from their statements.

## **5. Results**

### ***The vulnerable elderly***

The elderly have been identified for particular concern in poverty and fuel poverty research [48,126] and through policies at UK and Scottish Government levels which have created targeted intervention schemes. The Scottish Government in their qualitative analysis of the characteristics of the fuel poor have highlighted a higher prevalence of fuel poverty in those over 60 years old [26]. We therefore sought to identify any common themes or ways in which they exceeded this classification. Many elderly clients supported by the service were those who had persevered without change to their living conditions over many years, even though they met the qualifying criteria of existing schemes. Case Study 1 is typical of these.

**Case Study 1:** *Client is 75 year old lady who is a home owner, on pension with a top-up from pension credit who was struggling to afford to heat her home. She had an old back boiler in her home. As such she qualified for the Energy Assistance Package level 4 which provided, at no cost to the client, a new central heating system and insulation upgrades.*

It was more usual to find vulnerable elderly that also meet additional criteria. For example, in Case Studies 2 and 3, the householders were carers for either their own or other family members' children. In Case Study 2 it was the client's concern for the child's well-being that was the primary driver to contact the advocacy service.

**Case Study 2:** *A single pensioner, sole carer for her disabled son living in a social rented property. Her heating system consisted of a single storage heater with additional panel heaters in a four bedroom flat. The registered social landlord was informed that the property was below tolerable standards. A new gas CH system was installed once and respite care was arranged for the client's disabled son while the work was undertaken.*

**Case Study 3:** *A 75 year old foster mother who had moved to a new tenancy and had arranged for the existing pre-payment meters to be removed and credit meters to be installed. She stated that although she had set up new Direct Debits to pay for her fuel*

*nothing had been taken from her bank account. Subsequently she had accrued debts, had been subject to debt collection procedures, and had been unable to resolve the situation despite spending a significant amount of time on the phone to the energy suppliers. The advocate phoned the power suppliers on behalf of the client, during which it was ascertained that though the engineer had replaced the card meters this had not been registered on the power company's records, and as a result the direct debit payments had not been processed. The company acknowledged that they were at fault and compensated the client for the debt incurred, the time spent resolving the situation, and the inconvenience caused.*

Case Studies 2 and 3 are examples of single pensioner households, but they are also examples of single parent and disabled households, demonstrating how multiple factors can be instrumental in exacerbating the isolation of the householders.

### ***The vulnerable children***

The Scottish Government's statistics [26] identify single parent households as most likely to be in fuel poverty, and Green [40] identifies households where doctors voiced concern about the diets of their patients as likely to be living in fuel poverty. The choice between eating and heating is not a simple one, and the impacts on children can be diverse and long term [127]. Robinson (2015) [128] found evidence that living in fuel poverty can result in lower educational levels at the age children enter the school system, and Royston (2014) [129] shows that this can lead to an increase in winter deaths amongst children. Case Studies 4 and 5 illustrate that there are potential impacts which can have long term effects beyond the immediate physical wellbeing of children.

**Case Study 4:** *Single father with significant debt collection procedures against him. He thought he had paid this debt off as he had his meter replaced with a card meter set to pay £5 per week against that debt. Debt had accrued because he reported that his ex-wife had been spending much of the household income on drugs. Having received the notification of proceedings, he had stopped paying any money into the meter and had stopped heating the property. However following a successful court action, he was awarded the custody of his daughters, but was required to resolve his debt issues prior to them moving in. In the meantime social services discovered that the girls' mother had abandoned them whilst she went to source drugs, and the children were placed in emergency care. Advocates identified that the money paid into the meter had not been registered and in reality the householder owed significantly less. This money was refunded, supplies were restored to the home, and the girls were able to move in.*

**Case Study 5:** *Single mother of a disabled child, fleeing domestic violence, re-housed four months previously. The client had had problems setting up the accounts and as a consequence had not made any payments. The Advocate was able to set up monthly Direct Debit arrangements to spread the existing debt. The client was transferred to a cheaper tariff, the Warm Home Discount (WHD) was applied for and the client was placed on the supplier's priority register. The power company accepted a complaint against their poor handling of the account set up and debts incurred. The repayments were reduced and the repayment period increased.*

**Case Study 6:** *A single mother of three children, one partially deaf. She reported that gas had been installed a year ago but no payments had been made to the supplier as she had been unable to set up an account. She claimed she had applied for the WHD. The Advocate*

*contacted the supplier, clarified the contract status, and secured the WHD. The client was placed on 'Fuel Direct', which limits the level of payments required.*

These cases show how the impacts of fuel poverty on children can be significant. Since parents are more likely to contact advice services, there are numerous cases where children are subject to unexpected impacts arising from the levels of fuel poverty. It is apparent that impacts to children arise directly and indirectly when their carers are struggling to control their energy use and finances, or failing to secure a supply as they are unable to interact with the power companies. Case Studies 4 and 5 show that children may become part of a fuel poor household as they are transferred from another situation and also that the movement from one household may be in part influenced by fuel poverty in their original home. These observations are consistent with findings of a previous study from Northern Ireland [130] and a more recent Scottish study [131].

### ***The vulnerable disabled and those suffering ill health and mental health***

There is a complex relationship between living in cold damp homes and a spectrum of ill health [3,41] making it difficult to separate the ill health impacts caused by the living conditions from the health conditions that are instrumental in the individuals finding themselves in fuel poverty [132]. However, it is clear that long term physical disabilities can severely restrict the earning potential of individuals and result in them living in fuel poverty.

***Case Study 7:*** *This case was a single lady with fibromyalgia. She worked 16 hours a week, but due to her medical condition was physically unable to work more than this. Also due to her disability she had a need for higher and constant temperatures. As a result she had accrued debt and was struggling to resolve this with her supplier.*

Case Study 7 illustrates one physical reason why some disabled persons may find subsisting on benefits preferential to entering employment. This was also a concern voiced in Green [40], where a disabled participant reported choosing to remain on benefits on the fear that they would be worse off if they had a job (possibly because of the additional costs incurred in managing a disability outside the home).

There is also a high prevalence of poor mental health amongst the fuel poor. Mental health service partners working with the Advocates reported less than 1% of the clients engaging with the service would be considered to have good mental health. The relationship between poor mental health, debt and ill health is complex, with each factor having the potential to exacerbate the others. Poor mental health and mental disabilities can therefore be a causative agent in households living in fuel poverty.

***Case Study 8:*** *A family with four children, both parents with learning difficulties. The clients struggled to understand their energy bills and how to use the central heating and energy in general in their home. Basic energy saving advice was provided, supported by printed advice which contained graphic prompts that they understood. Readings were provided to the supplier to bring the account up to date. They were switched to an alternative tariff and an application for the WHD was made.*

The high prevalence of poor mental health in low income households [75,133] may be a cause of and / or be caused by, their living conditions, but it remains unclear whether the relationship is a simple cause and effect one [47]. Over half of those people reporting debt issues also suffer from mental health issues [134]. As such it is not surprising to find a high

prevalence of mental health issues amongst those in fuel poverty. These issues can also impact on the householders' abilities manage the complexity of dealing with suppliers, and thereby exacerbate their situation [88,89]. This may then lead to increased debt, disconnections and self-rationing of power.

**Case Study 9:** *The client suffered from severe anxiety and depression. As a result he would go for long periods without actively engaging with anyone. During these periods he would not buy credit for his meter-cards and therefore self-disconnect. He reported that living in an unheated property without any power exacerbated his sense of isolation and depression. Initial contact was established through the local mental health services.*

The case studies also included many examples that illustrated the co-benefits of taking a holistic approach to addressing fuel poverty.

**Case Study 10:** *A mother of three children who had poor mental health. When she moved into her home she didn't know who the supplier was and had made no payments. The supplier was identified and contacted, an account was set up, and agreement was secured to pay her debt and bills through 'Fuel Direct' [which pays the energy supplier directly from household benefits]. The WHD was secured.*

### ***The vulnerable due to behaviour and self-regulation***

Many households choose not to maintain a reasonable heating regime in a mistaken believe that they are using less fuel.

**Case Study 11:** *Family household struggling to afford heating costs. Central heating was used briefly to heat the property but the thermostat and all boiler settings were set on maximum. The clients were supported in switching their energy provider, the WHD was applied for, and their heating system was explained to them. A follow up visit found they had continued to follow the advice and had noticed an improvement in comfort and a reduction in fuel costs.*

In Case Study 11 the householders' behaviour was exacerbated by the location of their wall thermostat. Changes in behaviour were achieved through householder education, while changes were made to the system settings and their billing to achieve immediate savings. The Advocates reported many households on low incomes restrict their fuel use in order to manage their bills or in fear of their potential bills however, the difficulties of engaging with these households means that little empirical evidence of this phenomenon has been gathered within Scotland [3,4]. For these households investment in energy efficient improvements are of limited value - they benefit from insulation improvements but changes to more economical heating systems do not deliver any direct improvements to their living conditions.

However, there are also instances where the behaviour of the residents is beyond the influence of standard interventions.

**Case Study 12:** *A resident reported having difficulty managing their power bills. This was flagged as a property which required a joint visit. [A requirement if housing officers, social workers and health visitors have previously suffered abuse, felt threatened, have been subject to false accusations, or where the householder requires additional support]. The client was in an apparently confused state and materials used for drug taking were*

*observed. He stated that he was in arrears with his energy bills. The Advocate inspected the meters to take appropriate readings. The gas meter had been capped. The electric meter had been bypassed with the live feed cut and patched onto the domestic supply circuits. However, the client stated that he was unaware of this. At this point the advisors were forced to leave the property as he became aggressive when this was pointed out.*

Intervention to resolve the energy issues in Case Study 11 would have been financially detrimental to the client. For example, they would be charged by the power company for any remedial works required to make the supply safe and tamper-proof. Additionally, this intervention would not begin to address the wider issues that were potentially the cause and the symptom of the individual's problems. It is common to refer to lifestyle choices of many low-income households as 'chaotic' lifestyles [135,136], and although there is a danger of over generalisation here, Case Study 12 illustrates that there are households which do indeed maintain such highly non-standard lifestyles.

Collectively, Case Studies 4, 5 and 12 show how fuel poverty can be an outcome and an influence on multiple complex conditions related to householders struggling to subsist on low incomes and in difficult living conditions. The relationship between chaotic homes and children's behaviour has been studied, with a correlation found between childrens' behaviours and the chaotic nature of their households, and concluding that disruptive activities within the home environment are precursors to subsequent disruptive behaviour from the children affected [137].

### ***The vulnerable due to sudden change in circumstance***

Many people find themselves in fuel poverty through circumstances outwith their control, and therefore they do not fit the stereotypes of benefits claimants portrayed in the popular press.

***Case Study 9:*** *A woman whose husband worked abroad and had established another family, and as a result was divorcing him. He was intent on her not receiving any settlement and was forcing the home to be repossessed, through failing to cover the mortgage and actively blocking any progress in the sale to reconcile the outstanding debt. As a result she had no household income other than basic benefits but was unable to secure social housing as she was not homeless nor deemed to be in significant need. She also suffered brain injuries and damage to both legs due to a car accident during the protracted house sale process, and as a consequence suffered from mental health issues. She found herself in a situation she could not cope with and bills she could not pay, and so accrued debt on her energy meters.*

In Case Study 13 the advocacy services were able to secure a suitable tenancy with a local housing association. This illustrates that fuel poverty is an easy condition for people to fall into, and from there generate negative feedback loops with other factors which serve to further exacerbate the condition. Another example is private sector tenants with little prior experience of renting.

***Case Study 10:*** *A student flat where the students fed their card meter with £20 and only received £5 credit. The students had not formally taken ownership of the supply when they moved in. They assumed they needed to use the card left by the landlord. The Advocates were able to temporarily move the debt accrued by previous tenants off the meter. The advocates spoke to the supplier to resolve the ownership and arrange the total removal of*

*the debt. Since the students had been paying someone else's debt they were also over £500 in credit, which the power company refunded.*

For many students, fuel poverty is a transient state during term time. The advocates report that often when people move into a home with a card meter and a live card they do not consider that they may be paying off those previous tenants' debts. This is a common problem found in social and private rented accommodation where card meters are more prevalent. However, meters can also cause problems simply because of where there are sited.

**Case Study 15:** *Client in her 80s, who due to her failing mobility had recently moved into a ground floor, socially rented property, with card meters. The electric meter was readily accessible but the gas meter was installed above the kitchen units, well out of her reach. With limited family members close by the householder had difficulty keeping credit on her gas meter. Through a request to the power company to move the meter she was told that they would move the meter but it would cost £500. Intervention by the Advocate ensured that the meter was moved at no cost.*

This final case study illustrates that there are those who cannot maintain a heating regime through circumstances particular to them at a specific time, and which can only be resolved through in-home assistance. This also illustrates a form of fuel poverty which is not covered within the current Scottish definition - that is those that are simply physically excluded from accessing the energy (and information) they need.

## 6. Discussion

Conventional policy responses to fuel poverty tend to focus on material improvements to homes delivered to those deemed to be vulnerable through quantitative data analysis, however this paper illustrates how fuel poverty is frequently with multiple vulnerabilities, and as such that the simple classifications of vulnerability derived from qualitative analysis oversimplify the reality of the living conditions of the fuel poor. We also offer some explanations as to why conventional building 'fabric first' approaches neither address householders' vulnerabilities nor empower and enable householders to help themselves.

This emphasis on empowerment is heavily rooted in Scottish culture and policies [89,100], and is useful as it allows us to treat behaviour as a moderating factor in the strengths of the relationships between other influences in a wider conceptual definition of fuel poverty. This is because policies to encourage empowerment seek to increase the enabling conditions for more complex lifestyle changes [138] which traditional approaches, focussed on single / simple behaviours, struggle to address [139]. As a result, we argue that a comprehensive fuel poverty mitigation policy should not simply improve thermal performance of housing stock and improve household income. It should also empower householders to address energy issues and feel confident in their ability to afford a reasonable heating regime (or all 'required' energy needs), and to be confident in being resilient to changes in their energy costs.

We therefore propose a further interpretation of the Middlemiss and Gillard [20] application of Speirs' attributes of emic vulnerability [21] (Table 3).

**Table 3. Speirs' attributes of emic\* vulnerability and their application in an energy vulnerability context**

<b>Speirs' attributes of emic vulnerability</b>	<b>Definitions</b>	<b>Application to energy vulnerability</b> (Middlemiss and Gillard, 2015)	<b>Further interpretation based on the evidence reported above</b>
<b>Integrity</b>	The person's sense of soundness in the various dimensions of her or his life.	The ability to keep warm/cool and therefore live a decent life.	Sustaining a reasonable heating regime is dependent on the quality of the home, the heating system, the affordability of the fuel and the health and well-being of the residents. Although this relates to building fabric, from an individual vulnerability perspective it brings into question the applicability of defining a 'reasonable' heating regime.
<b>Challenge</b>	Vulnerability is experienced when there is a perceived challenge to the integrity with a corresponding uncertainty about the ability to respond adequately.	Anything that challenges a household's ability to keep warm/cool.	The quality of building fabric, household income, physical and mental health and well-being, and potentially the quality of the local environment and community.
<b>Capacity for action</b>	Capacity for action refers to the individual's perceived ability to withstand, integrate or cope with the challenge.	How a household copes with (and perceives itself coping with) the challenges to its ability to keep warm/cool.	An individual's response as constrained by any challenge. Individuals can be constrained by their physical capacity and / or mental health however situational influences may also compromise households. .
<b>Multi-dimensional</b>	The fact that vulnerability varies from one person to another and from one experience to another.	The fact that energy vulnerability is experienced differently by different people in different circumstances.	The variability of individuals and their lives means that it is unlikely that two households living in near identical properties may be in the same degree of fuel poverty. There needs to be recognition that through a variety of behavioural responses and the variety of specific heating patterns required to sustain the health and well-being of individuals.
<b>Power</b>	The extent to which a challenge directs or constrains action, and the extent to which the person perceives the potential for change.	The extent to which challenges allow a household to act to avoid energy vulnerability, and the household's perception of their own agency in energy matters.	The degree to which the challenge can restrict capacity and how that challenge might be mitigated. Though there may be a degree of universality, in order to empower individuals it will be necessary to engage with them individually and address their personal challenges.

\* Defined as defining or relating to cultural phenomena viewed from perspective of someone within that society, as opposed to an observer outwith the society (etic).

This further interpretation is not proposed as the basis for a replacement of the Scottish definition, but as a means of developing policies and schemes that better identify and support those most vulnerable to fuel poverty and its impacts. Aligning the alleviation of fuel poverty, and its causes and impacts, more closely with health and welfare goals, however, better positions the problem as a complex societal one, rather than a predominantly

technical one. This sets alleviating fuel poverty apart from the problem of improving the energy efficiency of homes occupied by non-vulnerable householders.

Figure 1 builds on this interpretation by showing how the non-technical factors encompassed by the attributes may be reconceptualised and reconciled with the Scottish / Boardman definition in a way that allows the problem of highly (potentially irreducibly) complex behaviour to be abstracted from the system, and emphasises those factors which can be measured directly. It represents the current state of our attempts to visualise fuel poverty as a product of the complexities of society, and understand why efforts to define it appear to rely on an over-simplification of the underlying influences [31,101,102,103,104,105,106,107,108,109,110,111].

The upper box contains the key elements of the current Scottish definition, and the central box groups the technical factors, which are reported in government statistics. The lowest box defines the wider non-technical system, in a way which is both consistent with other studies and the Scottish policy context. The dashed line between the lower box and fuel poverty indicates that the condition may be an emergent property of this subsystem, but that the subsystem is not measured directly as a component of fuel poverty (recognising that it is entirely possible for a healthy, non-vulnerable household to be in fuel poverty for technical reasons alone).

It is entirely possible to retain the Boardman definition as part of any future revision of the Scottish definition. The necessary data collection and modelling is long established as part of the Scottish House Condition Survey, and whilst these methods could be improved, they are all inputs into an entirely technical subsystem that are measured directly and ultimately expressed as fuel costs and housing quality. (It could be argued that sub-optimal behaviour results in poor choices however, this should be mitigated if the technical measures offered under any scheme are limited to those most appropriate for the dwelling and the household). This and related data are also required for reporting under current legislation [140,141].

Combined with an assessment of income, the current metric for which has been criticised for being insufficiently fit for purpose [1,2,3], these technical measures and metrics form the current definition (the upper box). Note that the heating regime is outwith the central box because it is not measured directly, rather policies assume technical interventions will deliver the (modelled) improvements in thermal comfort necessary to enable the specified heating regime. This means that any changes to the modelling only effect the measure of housing quality (and also fuel costs where these are modelled).

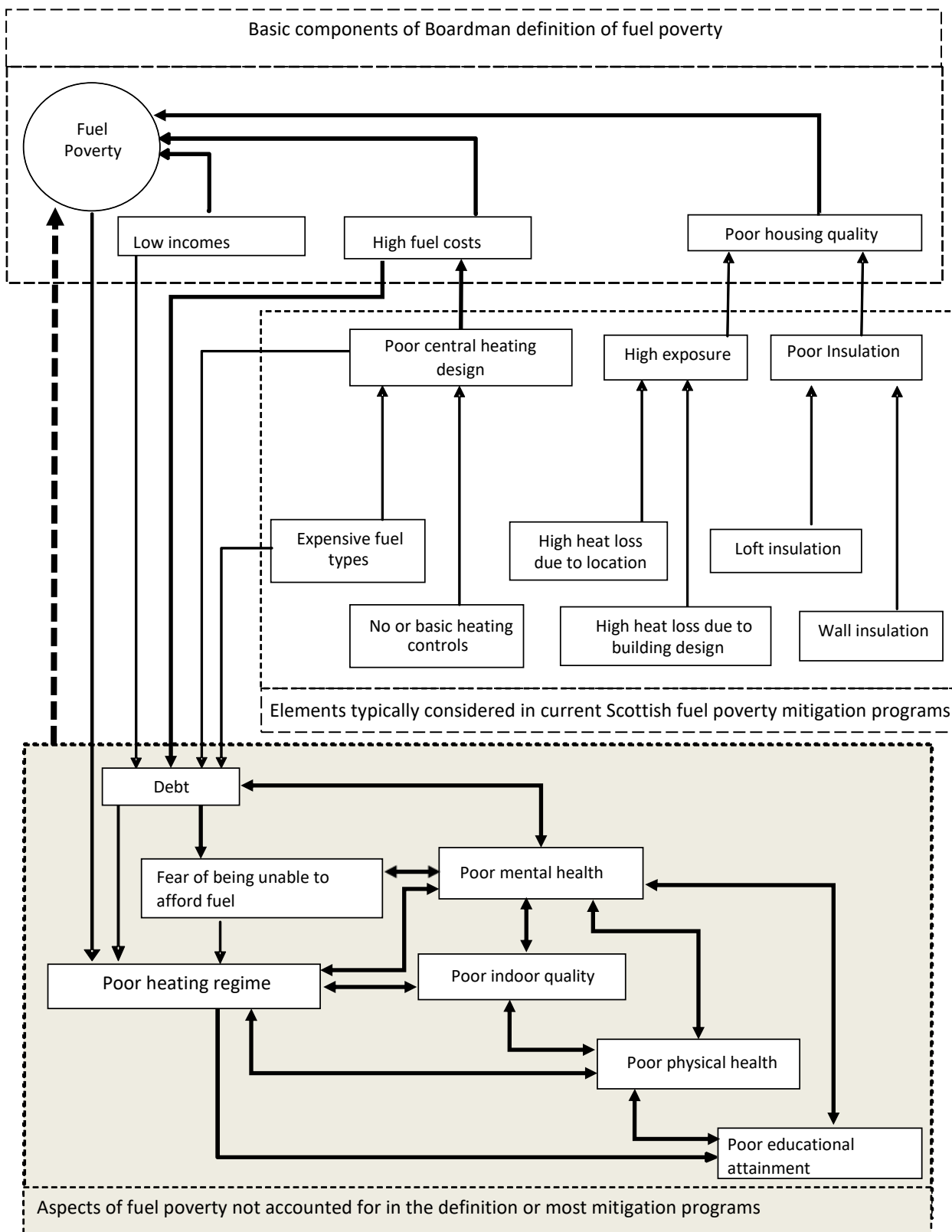
The lower box includes aspects of fuel poverty which are not addressed within the existing definition, and which are related to the behaviour and behavioural responses of tenants. We can thus identify these as aspects which are related to the behaviour and behavioural responses of tenants - i.e. each linkage in this box has one or more known and common behaviours and / or behavioural responses associated with it.

Within this box we also identify debt, or fear of debt as being a frequent causative agent (case studies 3, 4, 5, 6, 8, 9, 10, 11, 13, and 14), often resulting in self-limiting behaviours and poor heating regimes, and being both a potential contributor to and outcome of poor mental health. Poor mental health may also be a direct cause of householders restricting energy use, and therefore living in a poor conditions (case studies 8, 9 and 12). It also describes the influences of fuel poverty on children (case studies 4, 5, 6, 8, 10 and 11), and illustrates how improving the provision of educational support may have co-benefits that



make them less vulnerable to fuel poverty. Finally, despite age being a common criterion for access to support, Figure 1 illustrates why such a blunt threshold-based measure may be proving so ineffective. In many cases (case studies 1 and 2) these households are already captured by the technical criteria (the number of elderly, income-poor households living in 'hard to treat' properties in Scotland is a known problem [142]), or could be captured by other measures of health and welfare. And in some cases (case study 15) all that is needed is a bit of empowerment at the right time.

At this stage, the factors and linkages in this lower box are included as possible vectors for use in the development of a more advanced risk-based model, and should in no way be considered as absolutes. However, they illustrate what we understand to be key feedback loops within the extended scope of the definition. For example, how a poor heating regime may be the result of low income but also a product of poor physical and / or mental health, while poor health may also be a product of living in poor housing conditions. This is one of numerous inter-related negative feedback loops into which the vulnerable may become trapped (Poor heating regime → Poor indoor quality → Poor mental health → Poor heating regime) without the power to break out of them. Another example is the loop incorporating attainment (Poor heating regime → Poor educational attainment → Poor mental health/Poor physical health → Poor heating regime → Poor indoor quality → Poor mental health → Poor heating regime). This is also consistent and contiguous with the pathways and cycles identified by Liddell and Guiney [87], and the findings of Liddell et al. [75,130].



**Figure 1. Interconnection of influencing factors associated with a wider conceptualisation of fuel poverty**

## **7. Conclusions**

We have set out how it is entirely possible, and indeed reasonable, to develop a conceptualisation of fuel poverty that retains the Boardman definition, whilst also accounting for the highly complex non-technical factors and relationships that influence householders' vulnerability to fuel poverty and its impacts.

In common with other authors [28], and the recent recommendations made to the Scottish Government [1,2,3], we are of the view that abandoning the Boardman definition for a 'low income, high costs' definition would be a retrograde step for Scottish policy. However, it is also clear that the existing definition, and more importantly the metrics used to identify and target support to fuel poor households, have proven inadequate for reaching the most vulnerable and supporting them not only in lifting themselves out of fuel poverty, but also becoming resilient to it.

The case studies collected here represent different aspects, and combinations of aspects, of the problem of understanding who the fuel poor really are [143], and are intended to provide a qualitative illustration of this complex problem. This will now require further reconciliation with quantitative evidence on the 'real' distributions of fuel poverty across Scotland [4,30], and with more detailed conceptualisations of the subsystems, such as the relationships between fuel poverty and health [75] and mental health [87], and ultimately reconciliation with the wider definition of energy poverty.

This research will be the subject of future publications, and we welcome any comments from other authors as the work progresses.

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