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Area-based targeting of fuel poverty in Northern Ireland: An evidenced-based approach

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A B S T R A C T

Government authorities in the UK have implemented a number of anti-fuel poverty policies, given the known adverse health effects associated with cold homes. To date, the targeting of policies has been poor, as those in greatest need cannot be identified easily. Area-based platforms have potential to improve the targeting of these policies. We adopt an evidence-based approach, using Geographic Information Systems (GIS) techniques, to develop a small area fuel poverty risk index for Northern Ireland using a range of environmental and socio-economic variables. We identify areas at highest risk of fuel poverty and find both large- and small-scale spatial variability in risk using analyses of spatial association. Risk is highest in open countryside and in medium-sized towns. Evidence of spatial concentration of fuel poverty risk demonstrates that there is a justified rationale for implementing fuel poverty strategies from an area-based platform. This knowledge has the potential to guide policy-makers and improve the cost-effectiveness of anti-fuel poverty policies.

Introduction

Fuel poverty (or energy poverty) is defined as a household's inability to keep adequately warm at a reasonable cost. It arises from the complex interplay between low incomes, high domestic fuel costs and energy inefficient homes (Boardman, 1991). Those in fuel poverty often inhabit cold, damp homes (McAvoy, 2007) and are exposed to a range of physical and mental health risks, affecting both adults and children (Cochrane Review, 2011; Marmot Review, 2011). Fuel poverty is also associated with environmental consequences related to unsustainable energy consumption and elevated carbon emissions from energy inefficient dwellings (Boardman, 2010; Jenkins, 2010).

This paper focuses on fuel poverty in Northern Ireland, where it is particularly severe: 44% of households were in fuel poverty in 2009 (Northern Ireland Housing Executive, 2011). Northern Ireland households spend more of their weekly expenditure on domestic fuel than any other part of the UK (Northern Ireland Assembly, 2011) as a result of: (1) lower temperatures (Morris, 2007); (2) lower relative incomes (New Policy Institute, 2009) and (3) widespread lack of access to gas (off-grid) leading to high dependence on expensive alternatives such as home heating oil (Kranzl et al., 2007; Shortt & Rugkasa, 2007). Tackling fuel poverty requires an understanding of how these social, economic and environmental factors combine (Huby, Owen, & Cinderby, 2007).

The Northern Ireland Fuel Poverty Strategy (Department for Social Development Northern Ireland, 2004) aimed to eradicate fuel poverty amongst vulnerable households (elderly, disabled or families with children) by 2010 and amongst all households by 2016. Various policies have been implemented to alleviate fuel poverty, aiming to increase incomes, reduce fuel prices and improve the energy efficiency of the housing stock through either free or low-interest home improvement packages. Despite these efforts, the rate of fuel poverty continues to rise. Between 2000 and 2008, the number of households in fuel poverty in Northern Ireland rose by 80% (Boardman, 2010). This is due to a number of factors.

Firstly, energy prices have risen dramatically: for example, the standard cost of home heating rose by 72% between 2008 and 2010 (Liddell, Morris, McKenzie, & Rae, 2011). Secondly, incomes have fallen due to more unemployment during the current recession (New Policy Institute, 2009). Thirdly, fuel poverty remediation programmes are poorly targeted and do not reach many of the fuel poor (Northern Ireland Audit Office, 2008; UK National Audit Office, 2009).

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Current fuel poverty remediation programmes: targeting efficacy

Government policies seek to target public expenditure towards those in greatest need (Baker & Beer, 2007). Improved targeting is critical for fuel poverty policy and has consequently emerged as one of the primary aims of the revised fuel poverty strategy for Northern Ireland (*Warmer Healthier Homes*) (Department for Social Development Northern Ireland, 2011). According to Sefton (2002, p. 372), "a well-targeted programme is one that reaches a high proportion of the target group whilst minimizing the number of recipients who do not fall into the target group". The concepts of 'coverage' and 'leakage' apply to the targeting efficiency of fuel poverty policy. Coverage refers to proportion of the target group (the 'fuel poor') who are assisted by the policy. Leakage refers to the accuracy of the policy in assisting only those in the target group (Sefton, 2002). These two concepts are also termed 'inclusion' and 'exclusion' errors (Bibi & Duclos, 2007).

The Winter Fuel Payment (WFP), for example, is awarded to all pensioners as income support for paying winter fuel bills. Whilst the elderly are at increased risk from the effects of fuel poverty, they account for only 49% of all fuel poor (Northern Ireland Housing Executive, 2011), meaning that the WFP misses the 51% of the fuel poor who are not pensioners. Further, the WFP does not differentiate between pensioners who are fuel poor and those who are not. As a policy it has a theoretically perfect 'coverage' as it should reach all fuel poor pensioners. But rates of 'leakage' are quite high as only 61% of pensioners in Northern Ireland are fuel poor (Northern Ireland Housing Executive, 2011). Further, income support policies such as these do not take account of the energy efficiency of the home and are thus sometimes insufficient to tackle fuel poverty effectively (Healy & Clinch, 2004).

A variety of strategies have been implemented to tackle the high cost of domestic fuel. Oil stamp schemes have been introduced to allow customers to spread the cost of heating, allowing them to budget and save effectively. Local electricity suppliers offer discounted electricity to almost half a million households, focussing on particularly vulnerable demographic groups who are missed by other fuel poverty policies (Boyd, 2008). Energy brokering is another proposed strategy, where area-based co-operatives or syndicates act as intermediaries to achieve reduced fuel costs for vulnerable households (Northern Ireland Assembly, 2011). However, these schemes also suffer leakage and coverage issues and remain constrained by a lack of access to the gas grid.

Policies that aim to improve the energy efficiency of homes are more promising. *Warm Homes* is the main home energy scheme in Northern Ireland. The programme has a remit to retrofit homes with heating and insulation measures at low or no cost. It also carries out benefit entitlement checks and gives energy saving advice to recipient households (Department for Social Development Northern Ireland, 2011). The scheme focuses on private sector housing, as these homes are known to be at elevated risk from fuel poverty (Northern Ireland Housing Executive, 2011). Households are eligible for the scheme if they are in receipt of state means-tested benefits ("passport benefits") and/or contain a 'vulnerable' person ('vulnerable' is defined as an elderly person (aged 60 or over), child(ren) under the age of 16, or a disabled person).

This highlights the need for fuel poverty to be tackled in a holistic manner (Lucas, Brooks, Darnton, & Jones, 2008). For example, the combination of practical improvements to the heating system and income support means that *Warm Homes* has the potential to tackle 2 of the 3 causes of fuel poverty at once (increasing the energy efficiency of a home and raising income) (Shortt & Rugkasa, 2007). A recent study of *Warm Homes* clients, where retrofits were supplemented with benefit entitlement checks, yielded a combination of energy efficiency gains and an additional disposable income averaging £47 per week per household (Liddell, Morris, & McCreadie, 2011). There is a large, international body of literature on the effectiveness of these kinds of interventions for increasing indoor temperatures, reducing anxiety about fuel costs, and improving health (Frank et al., 2006; Green & Gilbertson, 2008; Howden-Chapman et al., 2007; Oreszczyn, Hong, Ridley, Wilkinson, & Warm Front Study Group, 2006; Shortt & Rugkasa, 2007).

However, fuel poor homes are not always accurately identified under schemes such as this. According to findings from the *Warm Front* scheme (the English equivalent of *Warm Homes*), only 42% of fuel poor households receive the required welfare benefits to be eligible for the scheme (poor coverage) and the majority (75%) of the policy's expenditure was directed towards those who were not fuel poor (Sefton, 2004). The most inefficient dwellings (a key driver of fuel poverty) cannot be identified by such schemes, since energy efficiency is not a criterion for selection into these government schemes; thus measures may be installed in relatively efficient homes (Boardman, 2010). *Warm Homes* also relies on self-selection which means that not everyone will know about, or choose to apply for assistance (Armstrong, Winder, & Wallis, 2006; Boardman, 2010; Sefton, 2002).

New initiatives in tackling fuel poverty: targeting efficacy

National and regional governments are incentivising local Councils to tackle fuel poverty through the production of Regional or Local Affordable Warmth Strategies. However, the National House Condition Surveys from which fuel poverty prevalence is officially estimated in the UK rely on sample sizes which are too small to assist Councils in targeting their Affordable Warmth Strategies. Sample sizes for England can estimate fuel poverty prevalence for nine regions (e.g. West Midlands, London, North East), and in Northern Ireland statistics can be disaggregated into 11 so-called Super-Council areas (Liddell, Morris, McKenzie, et al., 2011). Hence, although official fuel poverty statistics have been cross-tabulated with a wide range of demographic variables such as income, housing tenure, household type, age of house, etc. the only commonly reported spatial indicators are a rudimentary comparison of urban and rural prevalence, and some broad regional disaggregations.

More refined area-based approaches have, however, begun to be piloted, and many of these are GIS-based. GIS methods lend themselves to analysis of multi-dimensional issues, such as fuel poverty (Liddell, Morris, McKenzie, et al., 2011), as they provide "a flexible environment in which all relevant information can be brought together and analysed" (Morrison & Shortt, 2008, p. 707). The integration of social and environmental factors should aid understanding of the needs for policy intervention (Huby et al., 2007), yield valuable insights for fuel poverty policy, and help target local Affordable Warmth strategies.

Area-based approaches which use GIS rely on data from sources other than the National House Condition Surveys; these data have the advantage of being drawn from more comprehensive samples, including censuses. Baker and Beer (2007) used GIS to determine areas in South Australia where housing intended for vulnerable households was poorly targeted. In the specific context of fuel poverty, Baker, Starling, and Gordon (2003) developed a 'Fuel Poverty Indicator' from statistical analysis of a range of socio-economic Census variables. This predicted the number of households in fuel poverty at ward level (which contain 2500 households on average) in England. Fahmy, Gordon, and Patsios (2011) updated the model and refined it to a finer spatial resolution – Census Output Areas (OA) – which contain 125 households, on average. Morrison and Shortt (2008) carried out similar analysis (at OA level) in the Stirling district in a Scotland. They also incorporated individual, georeferenced household characteristics, allowing an