BRIEFING PAPER FEBRUARY 2018

COLD HOMES AND EXCESS WINTER DEATHS

A PREVENTABLE PUBLIC HEALTH EPIDEMIC THAT CAN NO LONGER BE TOLERATED

PEDRO GUERTLER AND PETER SMITH

A large share of excess winter deaths is attributable to the entirely preventable experience of living in a cold home. This has got to stop, argue E3G's Pedro Guertler and National Energy Action's Peter Smith.

Introduction

As the UK experiences one of the harshest winters for several years, it is important to remember that this causes needless hardship, places health at risk and, in some cases, leads to premature death. It is a sad fact that in a modern country like Britain even during milder weather the cold kills. As well as the devastating impacts cold homes have on their occupants lives, this problem extends to all of us; queues at GPs and A&E as well as delaying the discharge of vulnerable patients from hospital. The authors of this paper argue this entirely preventable situation has to stop.

The new research presented in this briefing is based principally on the latest figures for excess winter deaths (EWD) and excess winter mortality (EWM) from the UK's four nations, the last annual releases of which were published in October and November last year. In England and Wales the figures revealed the second highest numbers in five years. It is however important to investigate these trends over a longer time frame and so the new research provides context from the last few years' worth of EWM as well as comparing the UK with its European neighbours. The briefing investigates the extent to which excess winter mortality is exacerbated by our homes not being as resilient to the cold as they should be – which makes them expensive to heat and keep adequately warm.

Summary of key findings

Our research finds the **UK has the 6th highest long-term rate of excess winter mortality out of 30 European countries**. Only Malta, Portugal, Cyprus, Spain and Ireland have a higher rate.

Malta, Portugal, Cyprus and Spain come top because excess winter mortality looks at death rates in December through to March compared to the rest of the year. In colder countries – where the need to heat homes for them to be adequately warm prevails beyond these months – the effect of cold-related health risks on mortality can be severely underestimated relative to warmer countries. When the results are adjusted – accounting for length of the heating season beyond just the winter months – **this more comparable measure of mortality in relation to cold conditions puts the UK second-worst (after Ireland) amongst 30 European countries**.

The UK experiences, on average, **32,000 deaths in each December to March period that are in excess of mortality rates across the rest of the year**.

Of these, **9,700 deaths are attributable to the avoidable circumstances of living in a cold home** – about the same as the number of people who die from breast or prostate cancer each year.

The majority of the 9,700 deaths, **6,900, are linked to the coldest 25% of homes in the UK**, where vulnerable occupants – typically elderly people with existing health conditions – succumb to ill-health including cardiovascular and respiratory diseases and fatal trip and falls. This is comparable to the number of people who die each year from alcohol-related causes or high blood pressure.

Alongside this, approximately **3,200 excess winter deaths are linked directly to people experiencing fuel poverty**: that is when low incomes and high, or relatively high, energy bills combine to make a warm home unaffordable. This also leads to poor mental health such as chronic depression and in many tragic cases suicide. Fewer people die each year from drug misuse or skin cancer.

Tackling cold homes as a contributor to excess winter mortality brings multiple benefits and is already recognised as a priority by the National Institute for Health and Care Excellence. **NICE states that excess winter deaths attributable to cold homes are avoidable**; that these deaths are just one part of a story that encompasses opportunities to improve public health while **saving the NHS £1.36bn in England alone**. This estimated saving currently excludes relieving pressures on social care services and NICE also notes that there are **further fuel poverty and climate change benefits to fixing cold homes**.

Given that alongside NICE, **the National Infrastructure Commission now recognises energy efficiency improvement as a top infrastructure priority for achieving low-cost, low carbon energy**, there is an even stronger imperative to fix the cold homes public health crisis. As well as leveraging private investment from green finance, utility providers, energy networks, home owners and landlords; the UK Government also needs to support the strong case for the re-introduction of adequate central investment in residential energy efficiency. The **most appropriate long-term funding stream is public infrastructure capital – as opposed to revenue expenditure – which must be made available for this vital area**.

The authors note the Department for Business, Energy & Industrial Strategy (BEIS) must commit to stronger regulations, addressing key gaps in existing provision, with **HM Treasury needing to commit in Budget 2018 to trialling new area-based approaches and building the strong case for adequate investment overall to bring the approach to nation-wide scale by 2022**. In the short-term, this will require BEIS to enhance co-operation from HM Treasury and other Government departments such as the Ministry of Housing, Communities & Local Government (MHCLG) and the Department of Health & Social Care (DHSC). All of the UK Government must be committed to this cause to realise the full benefits.

By 2022, the UK must be seeing area-based schemes improving our housing stock in every part of the country if we are to meet both fuel poverty and carbon emission reduction commitments. Beyond ending the individual suffering caused by cold homes, delivering energy efficiency on this scale would contribute towards achieving other UK Government objectives; a successful industrial strategy, supporting small business growth in every region and achieving carbon emissions reductions. In turn, this will also help improve local air quality, reduce health and social care costs and provide real benefits to households who are struggling financially.

Method and full findings

Excess Winter Deaths in recent years across the UK

This briefing uses official data on excess winter deaths (EWD). It is a measure of how many more people die in the winter (measured as the four months from December through to March) than do on average in the four months either side of winter. It is calculated simply as[1]:

$$EWD = deaths\ in\ Dec\ to\ Mar - \frac{deaths\ in\ Aug\ to\ Nov + deaths\ in\ Apr\ to\ Jul}{2}$$

Table 1 shows the number of excess winter deaths since 2011 until the latest available data for last winter. Five-year totals and averages are shown encompassing the latest five years for which data are available[2].

Table 1: Excess winter deaths across the UK since 2011 (ONS, 2017c; NISRA, 2017; NRS, 2017)

Winter	England	Northern Ireland	Scotland	Wales	UK total
2011/12	22,820	500	1,420	1,250	25,990
2012/13	29,370	560	2,000	1,840	33,770
2013/14	16,330	590	1,600	1,010	19,530
2014/15	41,300	870	4,060	2,580	48,810
2015/16	22,780	640	2,850	1,790	28,060
2016/17 (provisional)	32,500	-	2,720	1,800	37,020
Latest 5-year average	*27,520*	*630*	*2,440*	*1,710*	*32,200*
Latest 5-year total	*142,280*	*3,160*	*13,230*	*9,020*	*167,690*

The data show that over the last five years across the UK, there were approximately 167,000 excess winter deaths. Year-on-year, the data show considerable fluctuation, moving from 48,810 in 2014/15, down to 28,060 in 2016/17, and back up to 37,020 in 2016/17.

While excess winter mortality increases the colder it is, temperatures only explain part of the fluctuations seen. Other issues, such as particular strains of influenza predominant in a given year, interact with temperature and other factors to produce fluctuations[3] (ONS, 2017d).

This is why moving five-year averages are typically used to illustrate long-term trends in excess winter mortality. On this basis, EWM has been falling steadily since 1950/51, although the rolling average has seen slight increase since 2012/13[3].

[1] (ONS, 2017d)

[2] In Northern Ireland's case, this means 2011 to 2016. For England, Scotland and Wales, this covers 2012 to 2017.

[3] *Ibid.*

Excess winter deaths, cold housing conditions and fuel poverty

Public Health England[4] cites studies that 10% of excess winter deaths are directly attributable to fuel poverty[5], and that a fifth[6] of EWDs are attributable to the coldest quarter of homes. This was regarded by the authors as a ‘conservative’ estimate as separately the World Health Organisation stated that 30% is the best estimated share – based on European evidence – of EWDs that can be considered attributable to cold housing conditions[7]. This suggests that poor energy performance – manifested in homes that are hard and/or expensive to heat, thereby exacerbating the risks of respiratory and circulatory problems and poor mental health – is a significant contributory factor to the number of EWDs in the UK.

The three measures can be viewed as subsets, contained in and intersecting with each other as illustrated in Figure 1.

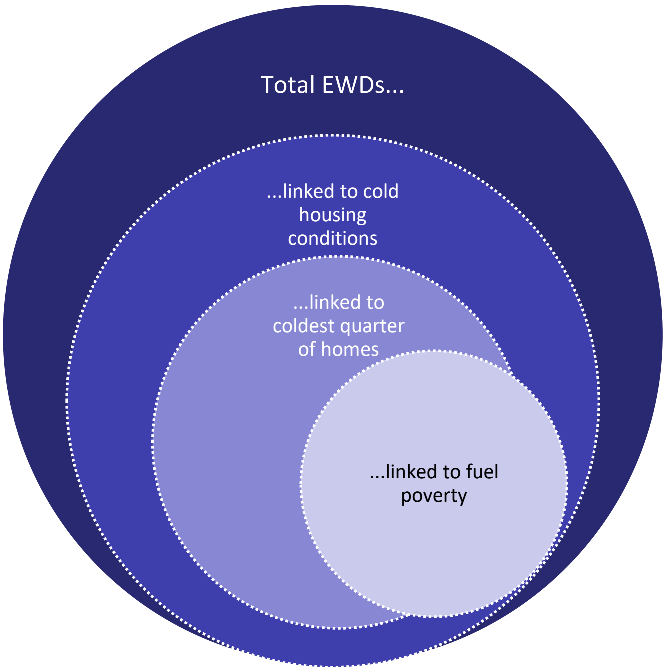

Figure 1: Schematic relationship between total EWDs and different measures of EWDs attributable to cold housing

Table 2 shows the number of EWDs attributable to cold housing conditions on these three measures.

[4] (Public Health England & UCL Institute of Health Equity, 2014)

[5] (Hills, 2012)

[6] Precise number used is 21.5% (Marmot Review Team, 2011).

[7] (WHO, 2011)

Table 2: Excess winter deaths considered attributable to cold housing conditions

Winter	UK total EWDs	UK EWDs attributable to…[8]		
		…fuel poverty	…coldest quarter of homes	…cold housing conditions
2011/12	25,990	2,600	5,590	7,800
2012/13	33,770	3,380	7,260	10,130
2013/14	19,530	1,950	4,200	5,860
2014/15	48,810	4,880	10,490	14,640
2015/16	28,060	2,810	6,030	8,420
2016/17 (provisional)	37,020	3,700	7,960	11,110
Latest 5-year average	*32,200*	3,220	6,920	9,660
Latest 5-year total	*167,690*	16,770	36,050	50,310

Based on the average of the last five winters, an estimated **9,660 people die in the UK each winter from conditions attributable to living in a cold home**, 6,920 of whom live in the coldest quarter of homes. Alongside this, 3,220 deaths each year are estimated to be directly linked to experiencing fuel poverty – people on low incomes who would have had to spend more than a typical amount of money on their energy bills to keep their homes adequately warm.

There is considerable geographical variability in where excess winter deaths attributable to cold housing are likely to occur, based on the distribution of the coldest homes and the spatial pattern of fuel poverty – some light is shone on this in the Appendix. In addition, the ill-effects of cold homes do not just extend to excess winter mortality and the elderly, but also to other groups of people – as outlined in the box below.

[8] Rounded to nearest 10.

Beyond excess winter mortality

Cold homes have a devastating impact of cold homes on people and their life-chances:

> A baby born today and living in cold housing is also almost three times more likely to suffer from coughing, wheezing and respiratory illness. Existing evidence also highlights infants living in cold conditions have a 30% greater risk of admission to hospital or primary care facilities (CHIWG, 2007).

> As the child develops, this in turn impacts on long-term educational attainment, either through increased school absence through illness or because they are unable to find a quiet, warm place to study in the home (*ibid.*). In adolescence, one in four teenagers living in cold housing are at risk of multiple mental health problems (NEA, 2013).

> Home energy improvements help to tackle these issues and one detailed study showed an 80% decrease in the rate of sickness absence from school for children with asthma and recurrent respiratory infections (Somerville *et al.*, 2000). Despite this progress, almost one in five households with a child under 16 lives in fuel poverty and the risk increases for lone parent households, one in four of whom are fuel poor (Mahony, 2016).

> As noted above, as an adult enters work, low wages and sluggish growth currently mean many are in-work but still struggle to afford the increasing cost of living, including heating and powering their homes[i]. Fuel poverty mirrors this trend with 47% of fuel poor households in full or part-time work[ii].

> Many other low income households also face increasingly unmanageable situations; repaying large or growing debts whilst being excluded from signing up to the cheapest energy deals[iii]. This can create huge anxiety which exacerbates existing mental health problems, leading to further depression and potentially suicide (Gregory, 2015).

> In later life, the impact of a cold home often compounds poor physical health and loneliness. The cold badly enhances the risks of health conditions including cardiovascular and respiratory diseases, falls and injuries and mental ill health, costing the NHS an estimated £1.36 billion each year (Age UK, 2012).

> Despite being unpalatable premature mortality has a clear cost[iv] and this impacts on family members.

[i] *NEA estimates that some families in fuel poverty are facing an income shortfall of up to £9,331 per year (£778 per month) to cover basic essentials, including energy. As noted below, NEA has also warned many low income households could miss out on energy rebates and the proposed new safeguard price cap. The findings are included as part of our "Bridging the Gap" report which highlights the scale of the impossible choices families will be making this winter. The report also illustrates the catastrophic impact Universal Credit could have on these families who have no savings to insulate them from falling into debt, going hungry and not heating their homes over the current 6 week waiting period.*

[ii] *Across the UK, 22% of individuals (14 million people) are in relative poverty after housing costs (they have a household income below 60% of the median). Net disposal income after housing costs of a low income household is £248 per week (£12,933 per year), equating to 60% of the UK median of £413 per week. The income after housing costs of a fuel poor household is even lower: £10,118 per year, equating to a net disposal weekly income of £194. Investigating income deciles shows the poorest 10% of UK society have a gross average weekly household income of £130 (£6,760 per year). Fuel poor households overwhelmingly comprise the poorest fifth of society: 85% of households in fuel poverty in England are located in the first and second income deciles and 78% of English households in those two deciles are fuel poor.*

[iii] *Many low income and vulnerable consumers, have a poor credit history; they are worried about losing out on support like the Warm Home Discount; or they face cost barriers if they attempt to switch back to a standard meter.*

[iv] *For example burial fees and exclusive rights to burial in a particular plot, cremation fees, including the cost of the doctor's certificate, funeral director's fees, flowers, coffin travel to arrange or go to the funeral, the costs for moving the body within the UK. An indication of the scale of these to a surviving family member or society are that a direct cremation costs c. £1,600, a cremation using a funeral director £3,214 and a burial using a funeral director costs £4,136. Whilst some costs are covered for low income households via a state Funeral Payment, often this is paid for on credit or often loans from a more affluent family member. This in turn inhibits a low income families spending.*

Understanding the scale of EWDs from cold housing

Using national death registration statistics for England and Wales produced by the Office for National Statistics (ONS), it is possible to provide context for the scale of cold homes-related excess winter deaths. Figure 2 shows the England and Wales EWDs in 2016/17 linked to cold housing, to the coldest quartile of homes, and to fuel poverty in red – alongside a selection of causes of death from ONS data for 2016.

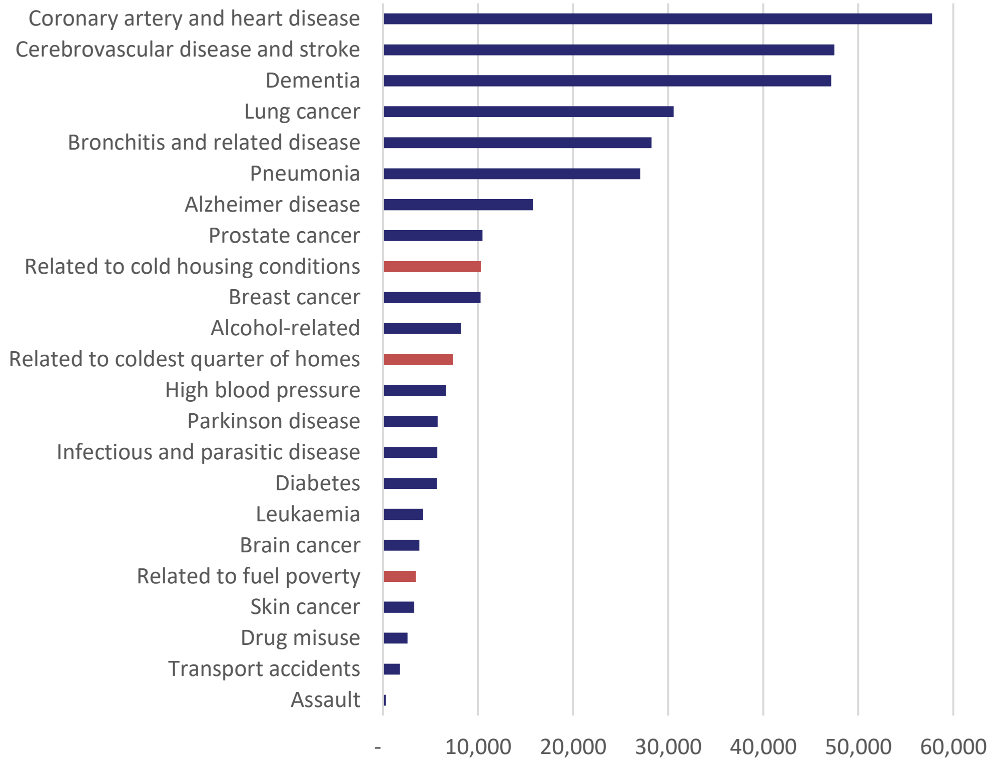

Figure 2: Deaths in England & Wales in 2016, selected causes (ONS, 2017b, 2017a, 2017e)[9]

EWDs linked to cold housing conditions are comparable in scale to the number of people dying of breast and prostate cancers. The number of EWDs attributable to the coldest quarter of homes is comparable to the number of alcohol-related deaths, and EWDs linked to fuel poverty are similar in number to deaths from brain and skin cancers.

[9] Note that most causes of death shown are mutually exclusive and based on the ONS' use of the World Health Organisation's classification system. Deaths related to cold homes are estimated based on the sources discussed above and cold homes not a 'cause' of death in a statistical sense and thus not mutually exclusive from other categories. In other words, deaths related to cold homes would be recorded under sub-categories of 'diseases of the respiratory system' (e.g. pneumonia) and 'diseases of the circulatory system' (e.g. ischaemic heart diseases). Also, the figures for alcohol and drug misuse related deaths are reported separately by ONS and cut across a range of WHO classifications (e.g. liver disease in the case of alcohol-related causes).

Cold housing conditions are avoidable and their prevalence and contributory factors in the UK – highlighted by the 'Cold Man of Europe' briefings[10] – may go some way to explaining why the UK experiences higher excess winter mortality than nearly all its European peers.

The UK amongst its European peers

Liddell *et al. (*2016) have conducted the most recent cross-European comparison of excess winter mortality. Their study examined EWM across 1980 to 2013 for 30 European countries.

To make comparisons between different groups, years, and geographies – in this case, 30 European countries – Liddell *et al. (*2016) use the excess winter mortality index (EWM index) measure, calculated as follows[11]:

$$EWM\ index = \frac{EWD}{average\ non\ winter\ deaths} * 100$$

The EWM index corresponding to the excess winter deaths shown for the four nations of the UK in Table 1 is shown below.

Table 3: Excess winter mortality index across the UK since 2011 (ONS, 2017c; NISRA, 2017; NRS, 2017)

Winter	England	Northern Ireland	Scotland	Wales
2011/12	15.6%	11.0%	8.0%	12.6%
2012/13	19.6%	12.0%	11.0%	18.0%
2013/14	11.2%	13.0%	9.0%	10.3%
2014/15	27.2%	17.8%	23.0%	25.1%
2015/16	14.7%	13.1%	16.0%	17.4%
2016/17 (provisional)	21.2%	-	15.0%	17.6%

The EWM indices for the 30 countries over the 33 years to 2013 is shown in Table 4, with those countries experiencing the highest rate of excess winter mortality shown first.

[10] (Guertler & Royston, 2013; Guertler, Carrington & Jansz, 2015)

[11] (ONS, 2017d)

Table 4: EWM index for 30 European countries, 1980-2013 (Liddell et al.*, 2016)*

Country	EWM index	Country	EWM index
Malta	29.4	Slovenia	13.2
Portugal	28.0	Hungary	12.3
Cyprus	23.6	Denmark	12.2
Spain	20.6	Norway	12.1
Ireland	19.7	The Netherlands	11.8
UK	18.6	Germany	11.7
Greece	17.9	Poland	11.7
Bulgaria	17.8	Latvia	11.5
Romania	17.5	Lithuania	11.5
Italy	16.0	Luxembourg	11.2
Switzerland	14.2	Estonia	10.9
France	13.8	Czech Republic	10.8
Belgium	13.6	Finland	9.5
Sweden	13.3	Iceland	8.4
Austria	13.2	Slovakia	8.2

The UK has the sixth-highest EWM index out of 30 European countries. The fact that of the five countries with higher excess winter mortality than the UK, four are 'warm' southern European countries, highlights what Liddell *et al.* refer to as the excess winter mortality paradox, in which people are more likely to die in such countries during cold snaps than in northern countries where winters are consistently severe: Finland and Iceland are amongst the countries with the lowest EWM index.

The authors highlight how numerous factors contribute to the paradox, such as higher spending on heating in northern countries being an accepted necessity, the thermal efficiency of building fabric, and different lifestyles in response to cold weather (being indoors more, wearing more suitable clothing outdoors).

More importantly, they highlight how the winter period used to measure EWDs – December through to March – easily overestimates EWM in a warmer country and underestimates it in a colder country. In a warmer country, the cold-related health risks people face are much more confined to those months. In colder countries, the period of vulnerability is longer. In other words, where there is cold-related mortality either side of the December to March period – which is likely in a country with more severe and longer winters – then this serves to reduce the rate of 'excess' winter deaths in the December to March period. Similarly, in warmer countries, where cold-related deaths are much more confined to that period, the rate of EWDs is higher.

To partially account for the EWD paradox in the results and make the impact of cold conditions on mortality more comparable across all European countries examined, Liddell *et al.* go on to propose an alternative measure which takes account of the length and depth of time homes need to be heated to be safely warm in each country, as measured by heating degree days (HDDs)[12]. They find that the December to March period used to calculate excess winter mortality only encompasses heating degree days (where homes are cold if not heated) adequately in two of the 30 countries. For those countries where a large share (>40%) of HDDs fall outside of the December to March period, excess winter deaths, and the effect of cold homes, may be severely underestimated.

The approach they tested to make a better comparison between countries was to divide the EWM index by an index of heating degree days (IHDD). IHDD is calculated as follows:

$$IHDD = \frac{(\%\ of\ degree\ days\ falling\ in\ winter\ months)}{0.5 * (\%\ of\ degree\ days\ falling\ outside\ of\ winter)}$$

The results are shown in Table 5, and the ranking is a better reflection of the degree to which cold conditions affect mortality across different countries. On this more comparable measure the UK performs second-worst out of 30 European countries. A factor that is likely to play a significant part is the fact that the UK has amongst the oldest and thus least efficient and most cold-vulnerable housing stock in Europe[13].

Table 5: Ranking of 30 European countries' ratio of EWM index to IHDD (Liddell et al.*, 2016)*

Country	EWM index to IHDD ratio	Country	EWM index to IHDD ratio
Ireland	9.9	Latvia	4.0
UK	8.9	Estonia	3.9
Norway	6.1	Germany	3.9
Sweden	5.9	Luxembourg	3.9
Portugal	5.7	Lithuania	3.8
Iceland	5.6	Bulgaria	3.8
Switzerland	5.1	Poland	3.7
Spain	5.1	Italy	3.6
Denmark	4.8	Slovenia	3.6
Belgium	4.7	Czech Republic	3.5
France	4.2	Greece	3.0
Austria	4.2	Hungary	2.9
Romania	4.1	Malta	2.4
The Netherlands	4.1	Slovakia	2.3
Finland	4.0	Cyprus	1.8

[12] Heating degree days (HDDs) are a measure of the need for space heating. They are typically based on an expectation of an internal temperature of 18°C. Heating is assumed to be required when the average daily external temperature is more than 3°C colder than this (i.e. colder than 15°C). For example, if the average external temperature on January 1 was 4°C, then January 1 had 11 HDDs. These are added up over the course of a year to provide annual HDDs.

[13] (Guertler & Royston, 2013; Guertler, Carrington & Jansz, 2015)

Discussion and conclusion

The National Institute for Health and Care Excellence (NICE) has recognised excess winter deaths and illness, and the health risks associated with cold homes as a priority and published guidance for health and care professionals in 2015. The guidance identifies that reducing the risks associated with living in cold homes serves a wide range of goals (box to the right).

These goals illustrate a number of key points: that EWDs attributable to cold homes are avoidable; that avoidable deaths are just one part of a story that encompasses opportunities to improve public health while alleviating NHS which is estimated – without taking account of health benefits foregone – to cost £1.36bn per year in England alone[14]. This analysis also does not fully include the costs cold homes puts on social care services.

NICE guideline

Public health and other goals served by reducing risk of death and ill health associated with living in a cold home (NICE, 2015):

> Reducing preventable excess winter deaths

> Improving health and wellbeing among vulnerable groups

> Reducing pressure on health and social care services

> Reducing fuel poverty and the risk of fuel debt or being disconnected from gas and electricity supplies

> Improving the energy efficiency of homes, reducing unnecessary fuel consumption

There are additional social and environmental benefits to fixing cold homes. Not quantified in this briefing, the economic benefits that could be achieved with the introduction of adequate investment in this area are considerable:

> The direct value of reductions in bills and energy arrears for households or how this would increase spending within poorer communities;

> The avoided cost of reducing carbon emissions or improving air quality via alternative actions;

> The avoided costs of investment in non-efficient forms of embedded power generation which can increase local air pollution;

> The value of reductions in rent arrears, void periods for landlords[15] and higher stamp duty yields to HM Treasury;

> Uplifts in VAT yields to HM Treasury for energy efficiency measures compared to the lower rates applied to VAT on gas and electricity;

> The positive impact of reducing inflation, gas imports and the effect on the UK's balance of payments;

> The extent of the creation of a healthier workforce and jobs from a more buoyant energy efficiency industry;

[14] (Age UK, 2012)

[15] (Sustainable Homes, 2016)

- The value to the UK economy of wider benefits such as upskilling the workforce;
- The value of avoided costs to energy consumers of reducing network reinforcement by distribution network operators[16]. In turn, the positive impacts of also reducing civil utility works taking place in UK streets.

There is governmental recognition of these facts – encapsulated for example by the Department for Business, Energy & Industrial Strategy's increasingly rigorous efforts to quantify (if not yet formally incorporate into policy appraisal) the health benefits of home energy performance improvements.

Action in recent years, however, is not keeping pace with need. According to the Committee on Climate Change, progress has stalled, with insulation rates having fallen by 90% since 2012[17].

Nevertheless, the ambitions newly set out in the Government's Clean Growth Strategy with respect to home energy performance are set at the right level, consisting of[18]:

- All fuel poor homes in England to be upgraded to an energy performance certificate rating of C by 2030
- As many rented homes in the UK as possible to achieve this standard by 2030
- And as many homes as possible to be upgraded to EPC C by 2035

There is now a large gap between action to deliver warm and efficient homes, and the ambition to do so, which needs to be urgently filled.

E3G and National Energy Action are members of the Energy Efficiency Infrastructure Group (EEIG), which commissioned a milestone report setting out a vision for a Buildings Energy Infrastructure Programme, prioritising cold homes and low income households on the path for all homes to achieve the EPC C standard by 2035.

Specifically, the vision includes the goal for all low income households' homes in the UK to be upgraded to an EPC C standard by 2030. To achieve this, it recommends funding a coordinated programme of locally-led, area-based schemes supporting low income households with home energy performance improvements in every local authority area – alongside a UK-wide referrals network to nationally available 'safety net' grant support for households who miss out on, or cannot wait for, area-based schemes to reach them[19]. This combination of area schemes and safety net has been

---

[16] In 2015, NEA and AgilityEco produced a report investigating the possibility to divert budgets currently allocated to load-related network upgrades into local schemes that improve energy efficiency. In the report this concept is explained fully and is referred to as Alternative Investment Strategy (AIS). Specifically, the report looks to analyse the 'Size of the Prize' on Northern Power Grid's network, the economic feasibility of investment in local energy efficiency and how this compares to conventional network reinforcement and practical feasibility. See (AgilityEco, 2015).

[17] (CCC, 2018)

[18] (HM Government, 2017)

[19] (Thornhill & Deasley, 2017)

the hallmark of energy efficiency delivery for low income households in the devolved nations of Northern Ireland, Scotland and Wales in recent years.

On the 'safety net', the commitment in the Clean Growth Strategy to extend at least the current level of support provided by the Energy Company Obligation for low income households beyond 2022 until 2028 is welcome and could complement a programme of area-based schemes well. However, without area-based schemes, it is insufficient in scale to meet the Clean Growth Strategy's ambitions and insufficient in reach and adaptability to adequately serve the varying patchwork quilts of cold homes, fuel poverty and excess winter mortality the UK represents[20].

There is an urgent need to commit to trialling systematic infrastructure investment at Budget 2018 – taken to mean in every local authority area based on need, trialled in strategically selected areas at first – in home energy performance for fixing the cold homes public health crisis.

As well as leveraging private investment from green finance, utility providers, energy networks, home owners and landlords; the UK Government also needs to support the strong case for the re-introduction of adequate central investment in residential energy efficiency. The most appropriate long-term funding stream is public infrastructure capital – as opposed to revenue expenditure – which must be made available for this vital area.

The authors note the Department for Business, Energy & Industrial Strategy (BEIS) must commit to stronger regulations, addressing key gaps in existing provision, with HM Treasury committing in Budget 2018 to trialling new area-based approaches and building the strong case for adequate investment overall to bring the approach to nation-wide scale by 2022. In the short-term, this will require BEIS to enhance co-operation from HM Treasury and other Government departments such as the Ministry of Housing, Communities & Local Government (MHCLG) and the Department of Health & Social Care (DHSC). All of the UK Government must be committed to this cause to realise the full benefits.

By 2022, the UK must be seeing area-based schemes improving our housing stock in every part of the country if we are to meet both fuel poverty and carbon emission reduction commitments. Beyond ending the individual suffering caused by cold homes, delivering energy efficiency on this scale would contribute towards achieving other UK Government objectives; a successful industrial strategy[21], supporting small business growth in every region and achieving carbon emissions reductions[22]. In turn, this will also help improve local air quality[23], reduce health and social care costs and provide real benefits to households who are struggling financially[24].

[20] See Appendix.

[21] (NIC, 2017)

[22] (CCC, 2016)

[23] (GLA, 2017)

[24] (NEA, 2017)

Bibliography

Age UK (2012) *The cost of cold: Why we need to protect the health of older people in the winter*. [Online]. Available from: https://www.ageuk.org.uk/Documents/EN-GB/Campaigns/The_cost_of_cold_2012.pdf?dtrk=true [Accessed: 15 February 2018].

AgilityEco (2015) *Supporting Local Energy Efficiency as an Alternative to Network Reinforcement*. [Online]. Available from: http://www.northernpowergrid.com/downloads/1704 [Accessed: 17 February 2018].

BEIS (2017) *Sub-regional fuel poverty data 2017: Fuel poverty data measured as low income high costs (2015 data)*. [Online]. Available from: https://www.gov.uk/government/statistics/sub-regional-fuel-poverty-data-2017 [Accessed: 15 February 2018].

CCC (2018) *An independent assessment of the UK's Clean Growth Strategy - From ambition to action*. [Online]. Available from: https://www.theccc.org.uk/wp-content/uploads/2018/01/CCC-Independent-Assessment-of-UKs-Clean-Growth-Strategy-2018.pdf [Accessed: 15 February 2018].

CCC (2016) *Next steps for UK heat policy*. [Online]. Available from: https://www.theccc.org.uk/wp-content/uploads/2016/10/Next-steps-for-UK-heat-policy-Committee-on-Climate-Change-October-2016.pdf [Accessed: 17 February 2018].

CSE (2015) *Mapping domestic energy efficiency in Great Britain: A report, data set and maps for Citizens Advice*. [Online]. Available from: https://www.cse.org.uk/projects/view/1305 [Accessed: 15 February 2018].

GLA (2017) *Draft fuel poverty action plan for London*. [Online]. Available from: https://www.london.gov.uk/sites/default/files/draft_fuel_poverty_action_plan.pdf [Accessed: 17 February 2018].

Guertler, P., Carrington, J. & Jansz, A. (2015) *The Cold Man of Europe - 2015*. [Online]. Available from: http://www.ukace.org/wp-content/uploads/2015/10/ACE-and-EBR-briefing-2015-10-Cold-man-of-Europe-update.pdf [Accessed: 14 February 2018].

Guertler, P. & Royston, S. (2013) *Fact-file: The Cold Man of Europe*. [Online]. Available from: http://www.ukace.org/wp-content/uploads/2013/03/ACE-and-EBR-fact-file-2013-03-Cold-man-of-Europe.pdf [Accessed: 14 February 2018].

Hills, J. (2012) *Getting the measure of fuel poverty: final report of the Fuel Poverty Review*. [Online]. Available from: http://eprints.lse.ac.uk/43153/1/CASEreport72%28lsero%29.pdf [Accessed: 7 February 2018].

HM Government (2017) *The Clean Growth Strategy: Leading the way to a low carbon future*. [Online]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf [Accessed: 15 February 2018].

Liddell, C., Morris, C., Thomson, H. & Guiney, C. (2016) Excess winter deaths in 30 European countries 1980–2013: a critical review of methods. *Journal of Public Health*. [Online] 38 (4), 806–814. Available from: doi:10.1093/pubmed/fdv184.

Marmot Review Team (2011) *The Health Impacts of Cold Homes and Fuel Poverty*. [Online]. Available from: https://friendsoftheearth.uk/sites/default/files/downloads/cold_homes_health.pdf [Accessed: 7 February 2018].

NEA (2017) *Bridging the Gap: Addressing the cost of living facing UK households this winter*. [Online]. Available from: https://www.nea.org.uk/wp-content/uploads/2017/11/Bridging-the-Gap-NEA.pdf [Accessed: 17 February 2018].

NIC (2017) *Congestion, Capacity, Carbon: Priorities for National Infrastructure*. [Online]. Available from: https://www.nic.org.uk/wp-content/uploads/Congestion-Capacity-Carbon_-Priorities-for-national-infrastructure.pdf [Accessed: 17 February 2018].

NISRA (2017) *Excess Winter Mortality in Northern Ireland 2015/16*. [Online]. Available from: https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/EWM_2015_16_WEB.xls [Accessed: 6 February 2018].

NRS (2017) *Winter Mortality in Scotland 2016/17*. [Online]. Available from: https://www.nrscotland.gov.uk/files//statistics/winter-mortality/wm17-18/winter-mortality-16-17-alltabs.xlsx [Accessed: 6 February 2018].

ONS (2017a) *Alcohol-related deaths by sex, age group and individual cause of death*. [Online]. Available from: https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/datasets/alcoholrelateddeathsbysexagegroupandindividualcauseofdeath/current/alcoholrelateddeathsbyindividualcause.xls [Accessed: 6 February 2018].

ONS (2017b) *Death registrations summary tables - England and Wales*. [Online]. Available from: https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables/2016/deathsummarytables2016final.xls [Accessed: 6 February 2018].

ONS (2017c) *Excess Winter Mortality data, England and Wales, 2016 to 2017 (provisional) and 2015 to 2016 (final)*. [Online]. Available from: https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/excesswintermortalityinenglandandwalesreferencetables/2016to2017provisionaland2015to2016final/ewm201617.xls [Accessed: 6 February 2018].

ONS (2017d) *Excess winter mortality in England and Wales*. [Online]. 22 November 2017. Office for National Statistics. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/excesswintermortalityinenglandandwales/2016to2017provisionaland2015to2016final [Accessed: 6 February 2018].

ONS (2017e) *Number of deaths related to drug misuse, local authorities in England and Wales, deaths registered 1993 to 2016*. [Online]. Available from: https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/adhocs/007338numberofdeathsrelatedtodrugmisuselocalauthoritiesinenglandandwalesdeathsregistered1993to2016/drugmisusedeathsbylocalauthority19932016registrations.xls [Accessed: 6 February 2018].

Public Health England & UCL Institute of Health Equity (2014) *Local action on health inequalities: Fuel poverty and cold home-related health problems*. [Online]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/355790/Briefing7_Fuel_poverty_health_inequalities.pdf [Accessed: 7 February 2018].

Sustainable Homes (2016) *Touching the Voids: The impact of energy efficiency on social landlord income and business plans*. [Online]. Available from: https://www.sustainablehomes.co.uk/research-project/rent-arrears/ [Accessed: 17 February 2018].

Thornhill, C. & Deasley, S. (2017) *AFFORDABLE WARMTH, CLEAN GROWTH Action Plan for a comprehensive Buildings Energy Infrastructure Programme*. [Online]. Available from: https://www.frontier-economics.com/documents/2017/09/affordable-warmth-clean-growth.pdf [Accessed: 15 February 2018].

WHO (2011) *Environmental burden of disease associated with inadequate housing: A method guide to the quantification of health effects of selected housing risks in the WHO European Region*. [Online]. Available from: http://www.euro.who.int/__data/assets/pdf_file/0003/142077/e95004.pdf [Accessed: 7 February 2018].

Appendix – Mapping excess winter mortality, cold homes and fuel poverty

The grouping of mapped data by colour across the following three maps has been calculated using Jenks natural breaks optimisation method, designed to determine the best arrangement of values into different classes. It seeks to minimise each class's average deviation from the class mean while maximising each class's deviation from the means of other classes. In other words, it identifies the best clustering of data around the number of classes sought.

Not all parts of the UK have been mapped – owing to resource constraints, the focus has been on readily available spatial datasets.

Excess winter mortality

The map of excess winter mortality shown in Figure 3 is complex. Darker shading indicates higher mortality rates, which occur across England Wales. Cold homes are one factor in excess winter mortality, but so are demographics, temperatures and many other factors.

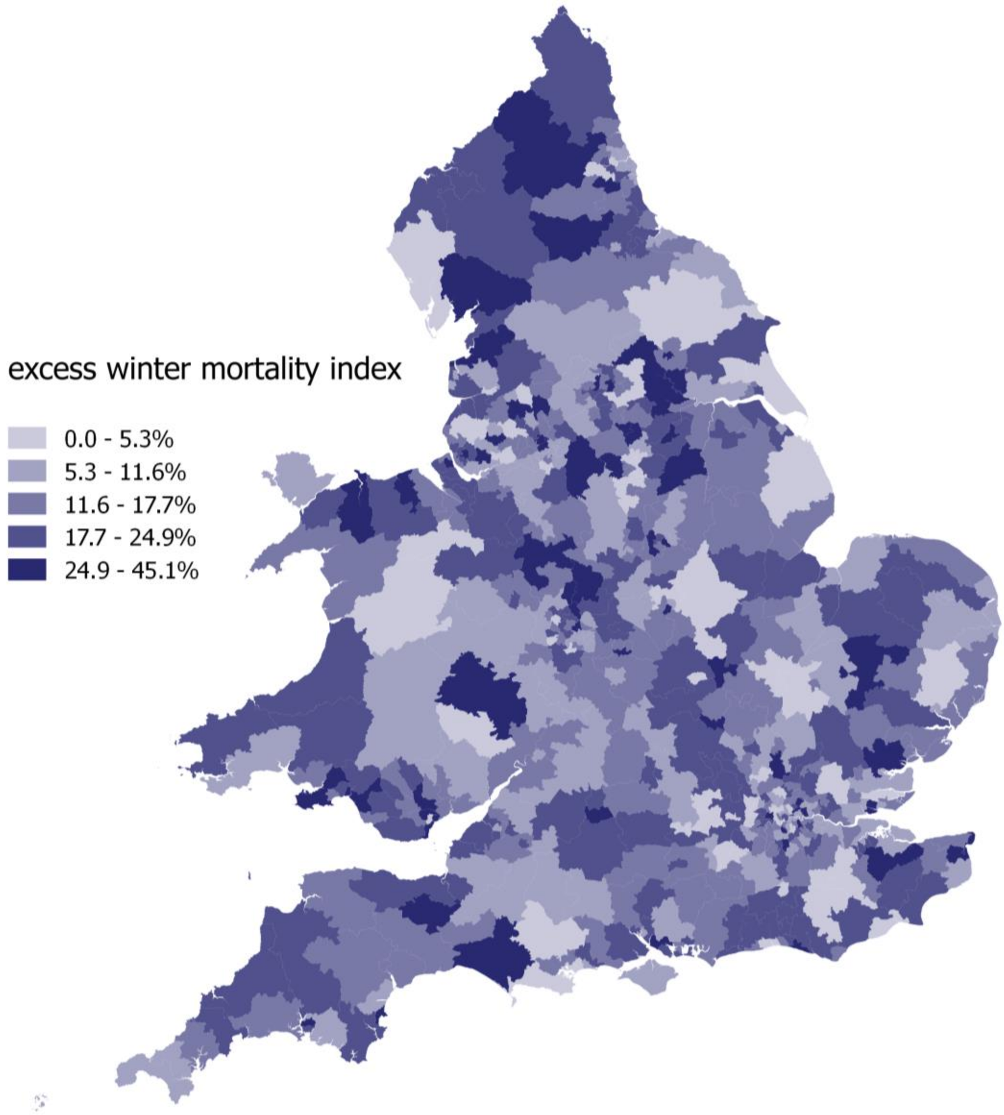

Figure 3: Excess winter mortality index by Westminster Parliamentary Constituency in England and Wales – winter 2016/17 data (ONS, 2017c)

Quartile of homes most likely to be cold

A potential proxy for homes *likely* to be (if not actually) in the coldest quarter of housing is their Energy Performance Certificate (EPC) rating on the A (most energy efficient / lowest predicted cost to keep warm per m^2) to G (least energy efficient / highest cost to keep warm per m^2) scale. Homes in England and Wales rated E, F or G – the lowest three ratings – constitute approximately a quarter of the housing stock. Plotting their prevalence by Westminster Parliamentary Constituency yields the map shown in Figure 4. Wales, the South West and the North of England have relatively high prevalence of lower-rated homes, owing to poor insulation but also the higher cost of heating homes not on the gas grid face.

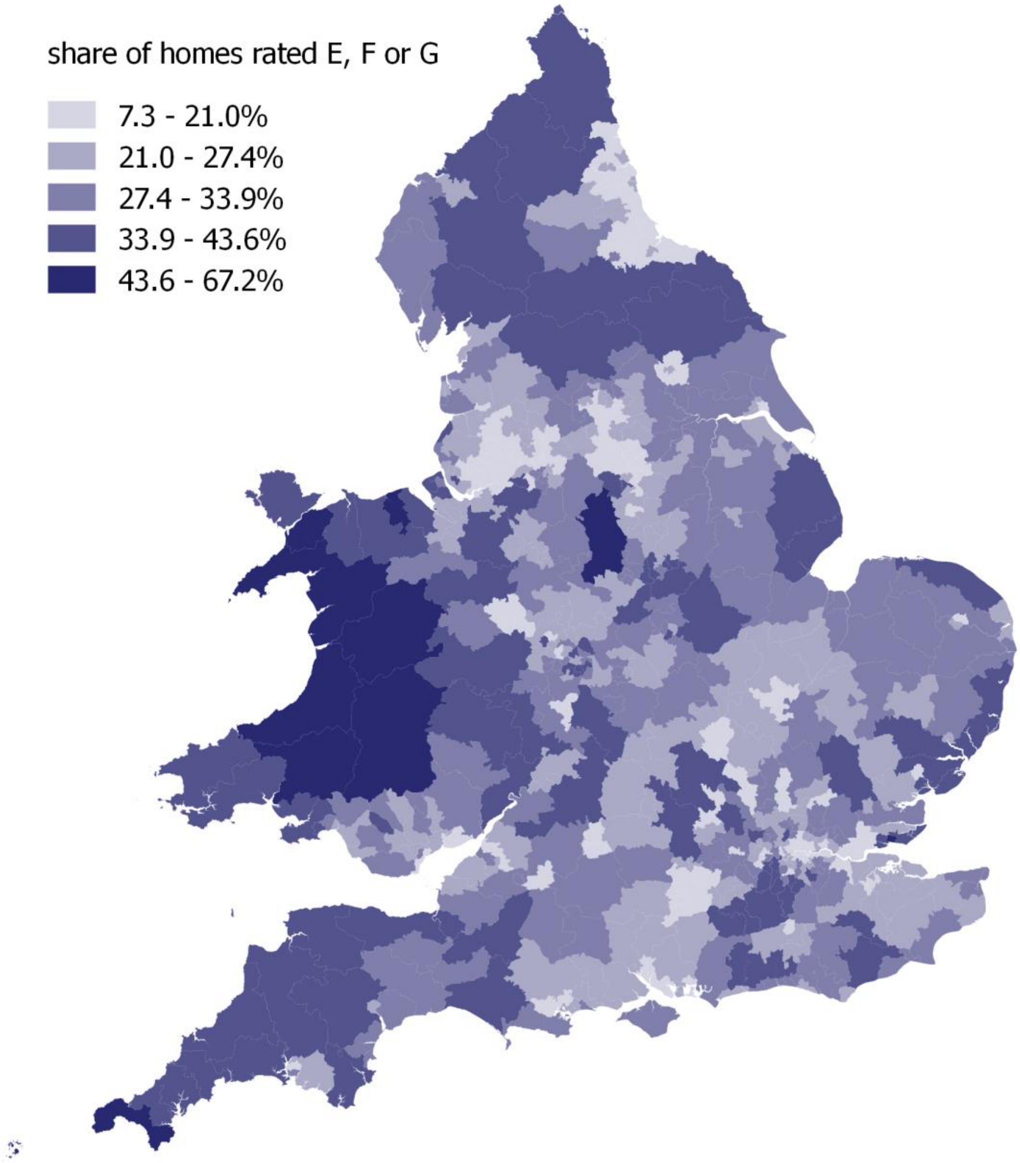

Figure 4: Share of homes rated E, F or G by Westminster Parliamentary Constituency in England and Wales – 2012 data (CSE, 2015)

Fuel poverty

Comparing Figure 5 below with Figure 4, the distribution of areas with higher fuel poverty incidence in England bears some resemblance to the prevalence of the least efficient homes. Alongside home energy performance and energy costs, incomes are a key determinant of fuel poverty – visible through some inner-city Constituencies showing higher fuel poverty rates.

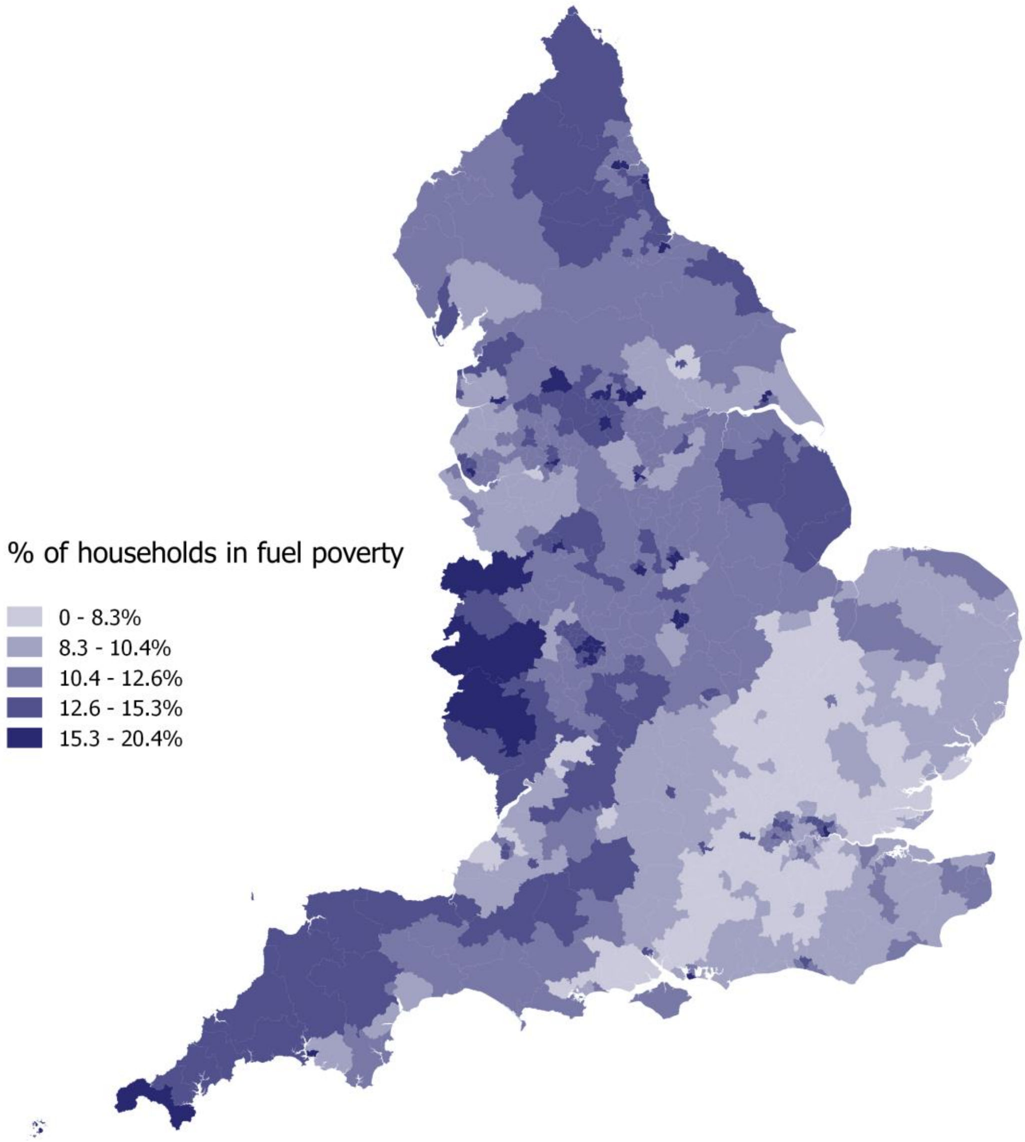

Figure 5: Fuel poverty in England - 2015 data (BEIS, 2017)

Acknowledgement

The new analysis in this paper builds on the work of the Association for the Conservation of Energy for the Energy Bill Revolution. A huge credit goes to ACE and Dr Sarah Royston whose original report this work attempts to build on.

About E3G

E3G is an independent climate change think tank operating to accelerate the global transition to a low carbon economy. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere. In 2016, E3G was ranked the number one environmental think tank in the UK.

More information is available at **www.e3g.org**

About NEA

National Energy Action works across England, Wales and Northern Ireland, and with its sister charity Energy Action Scotland, to ensure that everyone can afford to live in a warm, dry home. In partnership with central and local government, fuel utilities, housing providers, consumer groups and voluntary organisations, NEA undertakes a range of activities to address the causes and treat the symptoms of fuel poverty.

More information is available at **www.nea.org.uk**