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Heat waves and cold spells: an analysis of policy response and perceptions of vulnerable populations in the UK

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Abstract. Heat waves and cold spells pose ongoing seasonal risks to the health and well-being of vulnerable individuals. Current attempts to address these risks in the UK are implemented through fuel-poverty strategies and heat-wave planning. This paper examines evidence from the UK on whether heat waves and cold spells are addressed differently by public policy in the UK given that risks are mediated by similar perceptions that shape behavioural responses by vulnerable individuals. It is based on a review of UK policies and on a qualitative interview study of risk perceptions of elderly people as a primary identified vulnerable group to these weather extremes. The study involved in-depth repeat interviews with fifteen elderly respondents in summer 2007 and winter 2008 in Norwich (UK). Results suggest that neither heat risks nor cold risks are perceived as personal risks and therefore planned preventive measures by individuals are largely elusive. Cold risk policy reduces vulnerability; policy related to heat relies on early warning and public information programmes and does not reduce underlying vulnerability. Both types of policies largely ignore public perceptions of risks and could benefit from a more cohesive approach, supporting similar measures to reduce seasonal vulnerability.

1 Introduction

Weather events that lead to seasonal risks such as flooding, drought, heat waves, and cold spells have negative impacts on the health and well-being of vulnerable populations. The prospect of increased incidences of such events as a result of climate change is a primary concern of policy makers and climate scientists. The relative scale and magnitude of changes in weather due to future climate change are the focus of much climate change research (summarised in Parry et al, 2007) and the probabilities and risks of events are incorporated into insurance, health, and contingency planning. Yet, public perceptions that shape responses to seasonal risks are less well understood, while they affect planning and the climate-change adaptation challenge. Most literature concerned with the effects of extremely hot and cold weather, for example, examines the epidemiology of heat waves (Kilbourne et al, 1982; Kovats and Jendritzky, 2006; Kovats et al, 2004; Semenza et al, 1996), cold spells (Donaldson and Keatinge, 2002; Langford and Bentham, 1995; Wilkinson et al, 2004), and both in comparison (Huynen et al, 2001).

In the context of a changing climate, perceptions of climate, vulnerability, and changing seasonal risks have implications for risk outcomes and impact prevention. Risk perception concerns the subjective judgment of some hazard or activity by lay people (Slovic, 1987). Individuals perceive and respond to risk through combinations

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of rational and affective–experiential assessments, influenced in turn by social and cultural contexts (Slovic et al, 2004). With regards to climate change, most individuals do not perceive this as a direct personal risk but rather a remote issue that affects people elsewhere on the planet (eg Leiserowitz, 2005; Lorenzoni and Pidgeon, 2006). Although studies in Western countries indicate that individuals generally purport high concern about and a sense of personal responsibility towards climate change, public engagement is constrained by a variety of factors which operate at both individual and societal levels (Lorenzoni et al, 2007). These factors have previously been explored in the literature in relation to other risks, including perceived impacts [individuals tend to downplay risks to themselves whilst acknowledging their relevance to others (Sjöberg, 2000),] nature of the risk [imposed risks create more resentment than those taken voluntarily (eg Fischoff et al, 1982)], and its perceived controllability. Diverse perspectives and responses result that bear implications for risk prevention and communication. Said simply, perceptions contribute to shaping behavioural responses.

Analysis of vulnerability in the context of seasonal risk from heat waves and cold spells has focused on characteristics of populations that can explain their health outcomes in response to heat and cold. This largely epidemiological research suggests that the elderly are vulnerable to seasonal risk, including cold temperatures in winter and hot temperatures in summer (Aylin et al, 2001; Sheth et al, 1999; Wilkinson et al, 2001). Older people are more likely to have preexisting medical conditions that exacerbate the effects of extreme temperatures: for example, pulmonary and cardiovascular illnesses in the case of heat (Bouchama et al, 2007).

A smaller but growing body of research examines the social, cultural, infrastructural, and institutional dimensions that may contribute to the vulnerability of older people in the context of weather-related risks, adopting a qualitative approach (Abrahamson et al, 2009; Brown and Walker, 2008; Klinenberg, 2002; Wolf et al, 2009). Adaptation to climate change is usually defined as adjustments made when climate changes (in means and incidence of extremes) or when such changes are anticipated (Smit and Pilifosova, 2001). Such actions can be driven by public policy to result in planned adaptation, they can be driven by individuals adjusting autonomously, and they can be reactive or proactive in nature (Smit and Pilifosova, 2001). Specifically, we contrast reactive with proactive and long-term types of adaptations, highlighting the difference between individual responses to changing temperatures on an occasional basis and preparatory adaptation in the long term. Much research on adaptation to climate change highlights the multiple stresses which produce vulnerability to climatic impacts (Adger, 2006; O'Brien and Leichenko, 2000; Smit and Wandel, 2006) and suggests reducing underlying vulnerabilities as a way to adapt (Smit and Pilifosova, 2001).

This paper builds on frameworks for analysing the differing sources and aspects of vulnerability (eg Wilhelmi and Hayden, 2010) and evidence of such vulnerability, by considering the role risk perception plays in shaping responses to weather-related extremes. It is a first attempt to examine seasonal risks of heat and cold together for a vulnerable group. In this case, the elderly are identified through epidemiological studies as particularly vulnerable (eg Kovats and Hajat, 2008; NHS, 2010). We consider the public policy responses to heat and cold events and explore how risk perception of heat and cold among an a priori vulnerable population informs such policy and practice. This paper examines, first, public policy responses to heat and cold risk in the UK and, second, primary data from an at-risk population on perception of these two risks. We consider the perception of heat and cold risks as a factor of vulnerability and suggest ways to adapt by reducing vulnerability. We argue that, while heat waves and cold spells are addressed

differently by public policy in the UK, both risks are mediated by similar individual perceptions that shape behavioural responses by vulnerable populations. The implications of these findings for adaptation to climate change are discussed.

2 Seasonality, risk, and vulnerability in the UK

Cold spells are the more important source of mortality compared with heat waves in the UK. Excess winter mortality lay between 25 000 and 45 000 deaths in England and Wales per year for the winters between 1999/00 and 2008/09 (National Statistics Online, 2009), whereas excess mortality during, for example, the 2003 heat wave amounted to over 2000 deaths (Johnson et al, 2005). With respect to winter cold, however, a systemic adaptation—central heating—is in place in most UK households, and since the widespread use of such heating systems, excess winter mortality from respiratory diseases has fallen significantly (Keatinge et al, 1989). Between 1977 and 1994, for example, declines in winter mortality were not explained by fewer deaths from influenza; instead, nonseasonal factors such as medical care and diet, but also improvements in home heating and increased car ownership, explain the reduction in winter mortality (Donaldson and Keatinge, 1997). Long-term adaptation measures such as home heating modify the exposure to cold and thereby prevent health effects of cold. Rather than being heavily concentrated in socioeconomically disadvantaged groups, evidence suggests that winter excess mortality is distributed quite widely in elderly people (Hajat et al, 2007; Lawlor et al, 2000; Shah and Peacock, 1999; van Rossum et al, 2001; Wilkinson et al, 2004). Poorly heated houses, gender, and a history of respiratory illness, rather than socioeconomic status or age alone, have been suggested as explaining winter mortality (Wilkinson et al, 2004). Modelling changes in mortality in England and Wales during hot and cold periods between 1976 and 2005 indicates that human adaptive actions play an important role, tempering the impact of climatic factors: adaptation has decreased cold-related mortality significantly and reduced the increase in heat-related mortality, although comparatively to a lesser degree (Christidis et al, 2010).

How the elderly actually perceive and respond to seasonal risks such as heat waves and cold spells is less well understood. Some evidence suggests that the elderly do not consider themselves as vulnerable to the effects of extreme heat, even if they identify older people in general as at risk (Abrahamson et al, 2009). The actions undertaken by the elderly to cope with heat are almost exclusively reactive and do not prepare for current or future events (Wolf et al, 2009). These results are not surprising and could be explained in part by considering that for this generation extremely hot summers in the UK have been and still currently are exceptions; therefore, future heat events are thought of as exceedingly unlikely. Regarding cold temperatures, a study of fuel poverty among sixty-four older households (aged 60 – 90, half of the sample were about 75 years of age) in England, Scotland, and Wales highlights a culture of frugality when it comes to heating expenses among this age group (Wright, 2004) stemming from their upbringing and present economic circumstances. The study finds that participants turned heating off during the day, slept in unheated bedrooms (cf Dale and Smith, 1985), and kept their homes overall cooler than the temperature in their children's and grandchildren's homes (Wright, 2004). The study suggests that the older generation's childhood memories of cold winters in homes without central heating affects their use of more recent technology; the elderly felt better off by having central heating, even if it was not used (Wright, 2004). Little is known, however, about how the elderly might gradually acclimatize to the heat (Hajat et al, 2010). As shown below, these results resonate with some of the findings of this study. This limited evidence underscores that subjective perceptions shape responses to seasonal weather-related risk.

Perceived risk is important in shaping behavioural responses to other seasonal risks: for example, falling in winter and subsequent injury and disability. Some studies examining the perceived risk from falls among the elderly suggest that, while participants appear to appreciate the risk of falling, they do not consider themselves susceptible to this risk (Braun, 1998). Similarly, the elderly accept fall-prevention messages, but most of them do not view these messages, as personally relevant (Hughes et al, 2008). These results, as with those pertaining to perceived risk from heat waves among the elderly, suggest that, while those vulnerable to an impact may know about the associated risks, they may not consider themselves susceptible to them. This raises profound questions about the potential effectiveness of outreach and awareness campaigns, and about long-term prevention and adaptation in the face of a changing climate.

3 UK public policy responses to heat and cold risk in the UK

Policy responses to public risks from cold weather are longstanding. On the other hand, responses to extreme heat are relatively recent. This section explores the similarities and differences between the two, in relation to the management of public risk.

3.1 Addressing risks from cold weather

Public policy in the UK has explicitly dealt with risks from very cold weather at least for the past three decades, and is tied closely to poverty reduction and health promotion. Cold weather payments were made as early as the 1970s to provide additional income assistance during very cold weather [subzero temperatures for seven or more consecutive days (Directgov, 2009a)] for low-income households. These payments were introduced as a statutory instrument of the Social Fund[(1)] in 1988. Since 2000, a public grants scheme for installing central heating, Warm Front, has supported homeowners who have dependent children, are elderly, long-term ill or disabled, or are in receipt of certain income benefits. More recently, energy considerations at national and household levels made explicit by policy include the 2001 UK Fuel Poverty Strategy (DTI, 2001) which aims to "improve energy efficiency and reduce the costs of fuel for fuel poor households" (page 3). Fuel-poor households are those that are unable to adequately heat their homes,[(2)], either because of rising fuel costs or heating preferences. As part of the Fuel Poverty Strategy, winter fuel payments are made to all UK residents aged 60 and above (The Pension Service, 2008); the strategy also includes financial investment via the government Warm Front scheme and in collaboration with energy suppliers (interested in reducing carbon emissions from target groups) for improvements in energy efficiency (eg better insulation) and heating systems for elderly and low-income households (DECC, 2009; DEFRA, 2008). Recently, discourses have publicly linked cold risk and fuel poverty [due to the rising trend of fuel poverty in the UK (eg *BBC News* 2008; 2009; Webb, 2008)] with national climate-change mitigation targets.

In addition to policies that address housing-related cold issues, the Department of Health, in collaboration with government and nongovernmental partners such as Help The Aged, distributes health-promotion advice through its "Keep warm, keep well" campaign (Directgov, 2009b). The aim of the campaign is to reduce cold-related illness and deaths during winter. Its information leaflets target people aged over 60 years (DoH, 2008a), people with disability or chronic illness (DoH, 2008b), and families (DoH, 2008c).

[(1)] The Social Fund (S.I. 1988/1724) draws on sections 32(2A) and 84(1) of the Social Security Act 1986, and section 166(1) to (3A) of the Social Security Pensions Act 1975.

[(2)] In the UK, "a fuel poor household is one which needs to spend more than 10% of its income on all fuel use and to heat its home to an adequate standard of warmth" (DTI, 2001, page 30).

They explain how to stay healthy during cold weather, how to keep living spaces adequately warm, and how to obtain support for both daily living and home heating renovations and upgrades.

While the effectiveness of the Fuel Poverty Strategy and related measures is debated (Milne and Boardman, 2000; Sefton, 2002), the efforts are direct interventions that target specific vulnerable populations. The initiatives of the UK government to address cold risks are a combination of public policy to support vulnerable populations through governmental provisions directly, and partnerships with community organisations to assist specific groups (DECC, 2009). The strategies aim to reduce cold risk by not only targeting specific aspects of cold effects (the ability and affordability of heating homes), but also specific vulnerable groups (including the elderly and deprived households). This approach is in stark contrast to how the risks from very hot weather are addressed.

3.2 Responding to risks from hot weather

The European heat wave in 2003 alerted policy makers in the UK—and in Europe more widely—to the significant health risks posed by heat waves. Until then, there was no formal policy on heat waves in the UK. The 2003 heat wave occurred in England between 4 and 13 August and brought temperatures above 30°C for ten days in a row, topping 35°C in many places on three days within the period. During this heat wave, the warmest temperature ever was recorded in England at 38.5°C, with elevated concentrations of ozone and particulate matter. In total, the event caused 2091 excess deaths in England and Wales (Kovats et al, 2006). Excess mortality among those aged 75 and above was 33%; excess mortalities among this group were similar at home, in hospital, and in care homes (Kovats et al, 2006) Among those under 75 years of age excess mortality was 13.5% (compared with a *total* excess death rate of 17% in England and Wales during that period), underscoring the higher risk of death among the elderly during heat waves. This event highlighted the risks of recurring heat waves in the context of climate change and vulnerable groups, and led to the development of the Heat Wave Plan. In the same year, the European section of the World Health Organization suggested that heat waves be included in emergency planning procedures (WHO Europe, 2003) and the UK, as other European countries, has in place a heat wave warning system as part of its Heat Wave Plan (DoH, 2009a). As heat waves are projected to increase in frequency, intensity, and duration (Christensen et al, 2007; Confalonieri et al, 2007), heat risk is considered a public health issue likely to recur more frequently in the future under the changing climate.

The Heat Wave Plan lays out best-practice guidance for care and health professionals during a heat wave for England and Wales and was implemented for the first time in 2004. The plan contains four alert levels and is triggered into action by region-specific temperature thresholds. It aims to address the risk from the effects of extreme heat and advises agencies and individuals how they might cope during a heat wave (DoH, 2009a). The communication of the plan targets health and social care professions (DoH, 2009b), care home managers and staff (DoH, 2009c), and the general public (DoH, 2009d). The pamphlet for the general public, available at medical practices, outlines who is vulnerable to the effects of heat, the symptoms of heat illness, and steps to take during a heat wave (DoH, 2009d). Aside from asking people to plan ahead when leaving the house during a heat wave, it neither contains advice on how to prepare for heat before it occurs nor provides any assistance with such preparation. How to prepare for heat waves is covered in detail only in the two publications that target professionals (DoH, 2009b; 2009c). Here, measures taken in advance are recommended, including increasing shade from outside the building (by planting trees,

installing shutters, etc), checking the home can be properly ventilated, ensuring that fridges, freezers, and fans work properly (DoH, 2009b). While included in the Heat Wave Plan itself, improving insulation in homes is mentioned only in the guide for care home managers (DoH, 2009c). This means that the general public is not informed through these avenues of communication about the benefits of loft and cavity-wall insulation, planting shading trees, and having fans at home *before* it gets hot.

Thus, the key difference between heat-related and cold-related policies is that heat-related initiatives do not offer direct financial intervention. Cold-related policies by contrast involve monthly financial support offered to the elderly in winter, and structural improvements to homes through the Fuel Poverty Strategy that could prevent future exposure to heat and cold indoors. The policy effort on managing the risks from heat waves is currently less targeted towards alleviating vulnerability than cold-related efforts, and this has implications for adaptation. There have been suggestions for a stronger focus on *prevention* of morbidity from heat waves in addition to early-warning systems and emergency response management. Given this priority, the lack of focus in the Heat Wave Plan on preventing exposure *before* heat sets in seems inappropriate. The following section further supports an increased focus on prevention in light of elderly people's perception of heat and cold risk.

4 Elderly people's perceptions of heat and cold risk

As a result of interviews conducted as part of a project examining elderly perceptions of and responses to heat waves (Abrahamson et al, 2009; Wolf et al, 2010), some interviewees felt strongly that cold rather than heat risk poses a threat to the elderly. A follow-up in the winter therefore examined whether the perceptions of cold risk differ from the perception of heat risk. For this paper we analyse a total of thirty semistructured interviews, two each with fifteen elderly people aged 75 and above in Norwich, UK. The first interviews took place between July and September 2007; the second in January 2008. The fifteen elderly people referred to here are part of a larger sample of thirty elderly people interviewed in summer 2007 in Norwich [ie a subset of the participants reported in the study by Abrahamson et al (2009) and in Wolf et al (2010)] who after their summer interview indicated interest in being interviewed again in the winter. The interviews lasted on average 45 minutes, and ranged between 20 and 75 minutes.

The recruitment of elderly participants took place through their general practitioners and the overall sample was then stratified by level of deprivation. Using the 2004 data from the Index of Multiple Deprivation (IMD), households whose postcodes were located in either the most or the least deprived quintile of the aggregate IMD indicator were selected to participate. The sample includes households located in IMD1, 2, 4, and 5, where IMD1 is the most deprived quintile and IMD5 the least deprived. Participants were aged 75 – 83 years and six, two, three, and four households were ranked in IMD 1, 2, 4, and 5, respectively.

The participants of this research all lived independently, either in socially rented housing or in owner-occupied houses or flats. All participating households had central heating, thirteen of them had natural gas fired with radiators, and two had electric storage heaters. Three of those households fuelled with natural gas had an additional gas fireplace in the main living room.

In order to make responses comparable between the two seasons, the same open-ended questions were used in both the summer and the winter interviews. The questions referring to heat during the summer referred to cold in the winter interviews. The interviews were audio taped, transcribed, and analysed using NVivo

qualitative coding software (QSR International). The analysis relied on grounded theory techniques (Glaser and Strauss, 1967; Strauss and Corbin, 1990) by first open and then axial coding of text passages, followed by iterations of merging and augmenting categories where necessary (Ezzy, 2002). The analysis concentrated on themes and categories that related to perceptions of heat and cold risk, behavioural responses, barriers to adjusting to the risks, and any assistance perceived helpful in addressing the risks.

The interviews suggest that there are some strong and important similarities between perception of heat and cold risk among the sample. This section examines these findings, comparing perception of heat and cold risk among participants.

Participants did not generally perceive themselves as vulnerable to either heat or cold and pointed to other people as 'older people' who may be affected, but they did not include themselves in this category. Everyone interviewed felt able to look after themselves in both hot and cold weather. Responses to heat and cold were essentially regarded as 'commonsense' actions. This involved wearing more or less clothing, having hot or cool drinks, and eating more hot or cold food, or more or fewer salads. Although some of these strategies require a little advance preparation (eg buying the appropriate food), they were considered as an immediate and therefore mainly reactive response to changing circumstances by the respondents. While these adjustments are efficient, they are effective only in the short term and involve some exposure to heat or cold because they are initiated once it is already hot or cold. Most importantly, eight of the participants felt that they simply needed to 'put up with' heat and cold and 'get on with things' because little could be done about the weather. Their explanations show that this means participants bear the cold and heat and go about their business as usual as much as possible. These results, summarised in table 1, convey that the elderly interviewees did not generally apply the risks of heat and cold to themselves and that they did not usually prepare for such events. Considering, first, that at the time of the interviews, the most recent heat waves in the UK were in 2003 and 2006, and, second, that very hot weather is somewhat exceptional in the UK, these results are not entirely surprising.

Participants perceived the same groups of people to be at risk from heat and cold: older people living alone, young children and babies, people with illnesses, and those who are mobility impaired. These groups were identified due to perceived changes in blood circulation with age, being unable to dress themselves appropriately, and being unable to move around to warm up or get out of the heat. This suggests that the perception of risk is heightened when there is a known underlying condition that is thought to impede the independence and well-being of a person. In identifying a set of characteristics, rather than focusing on age alone, participants demonstrated that they differentiate risk groups and negotiate some differences between aggregate risk and specific risk conditions. Despite this ability, they do not feel personally at risk.

The types of barriers to effective action to prevent morbidity were similar for both heat and cold. Even those participants who reported having experienced health effects of cold or heat did not believe preventive action necessary. Further, participants believed very little could be done to help them adjust or prepare. In winter the majority of participants said nothing could be done for them to be better prepared for cold weather. In summer the responses to the question were almost entirely in unison, stating that nothing could be done for participants to be better prepared for heat events in the future, and indeed that such preparation was unnecessary. In winter four participants suggested that cheaper natural gas or an increased winter fuel allowance would be helpful. Finally, there is some limited evidence of people objecting to known preventive strategies. One participant in the summer refused to have air conditioning installed in her home after a relative offered the installation.

Table 1. Summary of participants' perceptions of heat and cold risk.

Perceptions	Heat: exemplary quotes	Cold: exemplary quotes
Heat and cold are not a problem. One just has to put up with heat and cold.	"I don't think there's anything you can do about the heat. You can just keep out" (female, age 78). "You just put up with it!" (male, age 77).	"I think I just accept it. That's winter and that's cold and hopefully that'll be better tomorrow. That don't worry me" (female, age 76). "I sort of take it in me stride I think, when that's cold you just put up with it" (female, age 75). "I just get on with things!" (female, age 83).
Reactive, ad hoc adjustments dominate elderly people's responses.	"I open the windows and use the fan ... have iced drinks or cold drinks, not hot ones. I don't have hot meals, I tend to go with cool salads ... and wear as little as possible in the heat" (female, age 78).	"You just wrap up and do what has to be done" (female, age 80).
The elderly feel little can be done for them to help cope with heat. Income support is seen as helpful to cope with cold in winter.	"I don't think there is anything that can be done for you, people don't have control over the weather, it's up to you as an individual to work out what you're going to do" (female, age 77).	[I: "Do you receive any government benefits in the winter time?"] "Yes, just the £200." [I: "Do you feel that it's sufficient?"] "Well it could be a little bit more sometimes because the cost is going up" (female, age 77).

The results presented in this section suggest that there are important similarities between perceived risk from heat and cold. The elderly do not generally perceive themselves as at risk; they respond reactively mainly by employing avoidance strategies once a risk is perceived. They feel that little aside from financial help can be done to assist them; think that preparation is unnecessary; and rely on social contacts who in turn rely on the elderly to voice a need for support. These findings can help question and reevaluate policies that currently manage heat and cold risk in distinct ways.

5 Perceptions, policy, and adaptation to heat and cold risk

The elderly are at risk from both heat waves and cold spells as one of the groups most vulnerable to such effects (see section 2). The similarities in perceptions of heat and cold risk among the elderly raise questions about how best to address these risks. Recent research by Abrahamson et al (2009) suggests that people of this age group perceive the risks to themselves personally as minor, despite identifying older people in general as vulnerable. Whilst we acknowledge that our sample is small, and therefore that our findings are regarded as suggestive, they do reflect the wider risk literature on individual perceptions of risk. Although based on a limited number of interviews, the consistent finding among elderly participants was their concern with risk to others. In the case of heat risk this separation between risk to self and risk to others was compounded by an underlying belief that heat itself is not a problem in the UK. Central heating was the only planned preventive measure evidenced for extreme cold, and there

were none for heat among those interviewed. As this study did not aim to consider behavioural components of heating, no data on actual use of central heating were collected. Based on age group alone, it is, however, likely that evidence on heating use among elderly people in England, Wales, and Scotland (Dale and Smith, 1985; Wright, 2004) applies here. The elderly interviewees here did not perceive a need for preparation and planned action. As a result, the long-term adaptations from which elderly benefitted were those provided by the physical infrastructure around them, and whatever had been put in place by them or others in their homes by the time they retired. Therefore, the fact that the elderly may not currently perceive themselves at risk of long-term climatic changes may not affect their immediate responses but will have longer term repercussions in being able to adapt.

The premise of efforts such as the Heat Wave Plan seems to be an information gap, which, if filled, is thought to lead individuals to behave differently. While the results of this study do suggest there are gaps in the elderly's understanding, we suggest that addressing these gaps through information provision would accomplish little improvement in responses to heat waves, partly because elderly people do not generally perceive themselves as at risk from heat. A possible remedy may be either to tailor the information by some characteristics of vulnerability (for example, meeting multiple criteria of age, underlying illnesses, and living alone), or to aim information at the wider public to explain the specific vulnerability characteristics more broadly and encourage individuals to relate to this explanation.

An important difference between heat and cold risk policy response in the UK is that there is no evidence of adaptation measures to heat comparable with the long-term adaptation measures to cold. While double-glazed windows and insulation act to maintain both a warm or cool indoor climate, central heating can be considered a specific adaptation to a cold climate. The equivalent measure for heat, which maintains a cool indoor climate—air conditioning—is not commonly used in the UK. In the context of energy and greenhouse gas reduction, it is also undesirable because it is energy-intensive and therefore emissions-intensive adding significant (and partly externalised) costs. Policies that aim to help older and other vulnerable populations to add insulation and double glazing are included in the fuel poverty strategy but are not recommended with regard to heat (DoH, 2009d). Yet such efforts could be effective in preventing exposure to heat and have additional energy-efficiency benefits. Given the greater incidence of winter mortality in absolute numbers in the UK, a greater budget for winter/fuel-poverty policies than for heat policy seems justified. Currently, the Heat Wave Plan (DoH, 2009a) has no provision for actively supporting home improvements to help the elderly maintain a cool indoor environment. It does ask the Department of Health to "encourage the uptake of insulating homes for populations vulnerable to the effect of heatwaves" (DoH, 2009a, page 20), to "encourage regional planning to increase urban green spaces to reduce the impact of urban heat islands" and "establish links of heatwave planning with other adaptation and mitigation measures for climate change, for example, promote carbon emission reduction from housing insulation" (page 21). It leaves open, however, how these could be achieved. Proactive adaptations include adding loft and cavity-wall insulation and double glazing in existing housing, but also providing financial support to offset costs accrued through the increased use of fans and potentially of air conditioning. With climate change and consequently warmer winters, the uptake of measures supported by cold policies may indeed decrease. This could free up more funds for heat-related policies with similar benefits.

This analysis begs the question of how these policy suggestions aimed at reducing vulnerability could be related to elderly people's risk perceptions. Developing such

policies is acknowledged to be difficult; reviews of evidence in this area conclude that "investigating heat-health risk perception is one way to develop more targeted and effective communication strategies for these groups" (Bassil and Cole, 2010, page 999). We suggest that policy can encourage adaptation by enabling vulnerable people, including the elderly, to take action in forms that would not reflect their 'instinctive' or immediate responses to current ambient changes. As cold-related policies have demonstrated over time, adaptive responses among the elderly have mainly been instigated by external factors including infrastructural upgrades and cultural changes. We propose that the elderly could be encouraged to adapt by circumventing their distancing from personal risk via a simplified grant system promoting financial support for infrastructural retrofitting to reduce overall vulnerability (to heat *and* cold as proposed above). We acknowledge, however, that disregarding people's perceptions may hamper success in terms of proactive behavioural adaptation, due to the complex relationship between individual characteristics and appropriate use of technology [eg Wright (2004) on use of heating, mentioned earlier]. Thus we propose that a more cohesive set of policies for heat-related events, learning from cold-related work, and based on a sophisticated in-depth understanding of the psychological and sociological underpinnings of elderly perceptions of themselves in relation to extreme weather events may be more successful at encouraging long-term adaptation in this group.

6 Conclusions

This study examines the implications of the similarities in perceptions of the vulnerable to different weather risks for policy design. It finds that there are indeed fundamental similarities in perception that shape responses to both heat and cold risks among participants of this research. Participants did not feel personally at risk from either heat or cold, perceived responding to heat and cold as matters of mere common sense and, as a result, did not see preventive action as necessary. Aside from additional financial assistance to combat increasing fuel costs, which was mentioned only in winter, participants did not feel anything could be done to assist them with future heat or cold events. These similarities, we argue, are substantive and have implications for policy responses not only to heat and cold risks but also to climate change and extreme events in the UK.

We also suggest that the importance of public perception of heat and cold risks is currently poorly reflected in both heat and cold risk policy in the UK. Neither the Heat Wave Plan nor the Fuel Poverty Strategy consider the implications of heat and cold risk perception explicitly. In order to strengthen both types of policies and ground them in an understanding of people's perceptions of the risks, the policies could disseminate a key message about measures that effectively reduce vulnerability to both risks. This could be done in the first instance by providing infrastructural support, as detailed below. Secondly, policies could be grounded more consistently in a fuller understanding of the individual and societal characteristics that influence the perceptions of the elderly about risks and vulnerability. Consequently, the broader context in which adaptive responses are limited and implemented deserves more attention. Perceptions cannot be altered overnight, and they will continue to affect the effectiveness of structural improvements, as responses to cold-related policies has indicated. Yet there is scope for devising policies and communication initiatives appropriate to the contextual circumstances of the populations targeted.

In light of the findings presented here, heat-adaptation policy initiatives, such as the Heat Wave Plan, should consider including direct support for structural improvements, including adding loft and cavity-wall insulation, to the homes of the elderly. Such support would reduce both heat and cold vulnerability and therefore help the UK adapt

to the effects of climate change effectively and efficiently. This would not necessarily lead to duplicating the efforts of cold policy, as there would be ways in which double applications or receipt of payments for the same measures could be avoided. In addition, providing similar support through both types of policies could enable a key message about the effectiveness of the same measures against two types of environmental stress to be disseminated. By promoting similar measures through both policies, different target audiences could potentially be reached (those vulnerable in the summer months might include children or other groups). These measures could also lead to an overall improved coherence on adaptation policy for ongoing seasonal risks in the face of climate change.

Policy interventions to help weather the heat are uninformed by and unrelated to cold policy. This disconnect is at least a lost opportunity and at worst potentially problematic as responses to a changing climate in the future would benefit from an integrated policy approach that takes account of changes not simply to one season but of the suite of pressures on vulnerable populations, especially considering there are effective measures that reduce vulnerability to both heat and cold risks.

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