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City scale climate change policies: Do they matter for wellbeing?

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ABSTRACT

Climate change mitigation policies aim to reduce climate change through reducing greenhouse gas (GHG) emissions whereas adaption policies seek to enable humans to live in a world with increasingly variable and more extreme climatic conditions. It is increasingly realised that enacting such policies will have unintended implications for public health, but there has been less focus on their implications for wellbeing. Wellbeing can be defined as a positive mental state which is influenced by living conditions. As part of URGENCHE, an EU funded project to identify health and wellbeing outcomes of city greenhouse gas emission reduction policies, a survey designed to measure these living conditions and levels of wellbeing in Kuopio, Finland was collected in December 2013. Kuopio was the northmost among seven cities in Europe and China studied. Generalised estimating equation modelling was used to determine which living conditions were associated with subjective wellbeing (measured through the WHO-5 Scale). Local greenspace and spending time in nature were associated with higher levels of wellbeing whereas cold housing and poor quality indoor air were associated with lower levels of wellbeing. Thus adaption policies to increase greenspace might, in addition to reducing heat island effects, have the co-benefit of increasing wellbeing and improving housing insulation.

1. Introduction

It has been increasingly accepted that climate change mitigation and adaption policies, in addition to their primary goals, will have implications for human health and wellbeing (Berry et al., 2010; Haines et al., 2009). Mitigating policies aim to reduce greenhouse gas emissions to prevent or at least lessen climate change whereas adaption policies are to aid coping with climate changes as they occur (Pelling, 2011). Implications have begun to be understood regarding physical diseases (Haines et al., 2009; Sabel et al., 2016) but the focus of this paper is on consequences for wellbeing where there has been fewer studies (Hiscock et al., 2014). There are a number of definitions of wellbeing but we have previously defined wellbeing as a positive mental state influenced by living conditions (Hiscock et al., 2014).

The EU funded Urban Reduction in Greenhouse Gas Emissions in China and Europe (URGENCHE) project's incorporation of city policy makers, as well as leading academics, enabled the development of our understanding of how greenhouse gas reduction policies impact living conditions. Via expert opinion and extensive literature review, the following mitigation policies were identified: raising buildings' energy efficiency to reduce need for heating (UNEP, 2009), increased use of wood burning for domestic heating (Sjølie and Solberg, 2011) and promotion of active transport (human powered transportation such as walking or cycling (Public Health Agency of Canada, 2014)) over motorised transport (Hensher, 2008); for adaption the following policies were identified: development of green spaces and vegetation which cool city heat islands (Maimaitiyiming et al., 2014), increased resilience of the population (Keim, 2008) and reduced socioeconomic inequalities (Paavola and Adger, 2006).

These policies, if enacted, will lead to changes in living conditions which have wellbeing implications (Hiscock et al., 2014; Liu et al., 2016; Sabel et al., 2016). Increasing a building's energy efficiency and wood burning for domestic heating have implications for the following living conditions which have generally been found to associated with wellbeing: damp (Blackman et al., 2001; Butler et al., 2003; Evans et al., 2000; Hyndman, 1990; Packer et al., 1994; Shenassa et al., 2007;

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WHO Regional Office for Europe, 2007), thermal comfort (Blackman et al., 2001; Butler et al., 2003; Evans et al., 2000; Hopton and Hunt, 1996; Hyndman, 1990) and indoor air quality (Guite et al., 2006) have been associated with depression and other measures of mental health.

Supporting active transport over motorised transport may also impact wellbeing related living conditions (air pollution is associated with annoyance, mental health, depression and suicide) (Amundsen et al., 2008; Klaeboe et al., 2008; Lim et al., 2012; Menz, 2011; Szyszkowicz, 2007; Szyszkowicz et al., 2009; Szyszkowicz et al., 2010; Welsch, 2006), noise is associated with mental health, depression and sleep problems (Braubach et al., 2015; Dratva et al., 2010; Li et al., 2008; Schreckenberg et al., 2010; Yoshida et al., 1997) and opportunities for building social capital (trust, participation, community building and voting) (Addy et al., 2004; Ball et al., 2010; Hanibuchi et al., 2012; Hopkins and Williamson, 2012; Leyden, 2003; Mason et al., 2011; Nguyen, 2010; Poortinga, 2006; Renalds et al., 2010; Richard et al., 2009; Rogers et al., 2011; Toit et al., 2007; Wilkerson et al., 2012; Wood et al., 2010).

Access to greenspace and nature has been linked to wellbeing in previous studies (Alcock et al., 2014; de Vries et al., 2003; White et al., 2013). Resilience of the population has been discussed as a theoretical issue of importance to cope with change after climate change incidents (Collier et al., 2013; IPCC, 2014; Pelling, 2011). Low socioeconomic status and inequalities in socioeconomic status need to be reduced in order to enhance wellbeing (Hajdu and Hajdu, 2014; Wood et al., 2012).

Although some evidence for links between policy related living conditions and wellbeing has been found, much is weak or only considers one living condition whereas the aim of URGENCHE was to compare policies (Hiscock et al., 2014). Thus as part of URGENCHE a survey was commissioned in Kuopio, Finland, to increase understanding of whether a number of living conditions might be associated with wellbeing. Kuopio (population 100,000 (Statistics Finland, 2016)) was chosen because of a lack of data on wellbeing despite Kuopio's leading comprehensive climate change policy (City of Kuopio, 2009). Kuopio's climate change policy goals include (a) identify and prepare for effects and (b) all citizens to participate (City of Kuopio, 2009). Consequently understanding more about wellbeing implications is paramount in order that the population will accept and aid climate change mitigation and adaption actions (Fritze et al., 2008).

2. Methodology

A postal survey was sent to a random sample of adults, stratified by age, from the population registry living in 2500 households in Kuopio, Finland on 5th and 6th December 2013 (n = 680, a 27% response rate). From the 6th to 20th December an online version was available (n = 102). The online version was publicised via the internet, newspapers and radio in the week following 6th December. We do not know the number of people who saw the link to the online survey so we cannot calculate a response rate. Power calculations (SurveyMonkey, n.d.) suggest this was a sufficient sample size for analysis.

2.1. Dependent variable (wellbeing)

The WHO_5 Wellbeing scale (Psychiatric Research Unit at the Medical Health Centre North Zealand, 2013) was chosen to measure wellbeing. This scale has been translated into many languages and successfully statistically validated in a variety of populations (Liu et al., 2016) and used in the European Quality of Life Survey (EQLS) (Eurofound, 2012), which made it possible to compare this study with international studies in the future. A score was derived in the standard manner (Psychiatric Research Unit at the Medical Health Centre North Zealand, 2013) with a higher score indicating higher wellbeing. A square transformation was used to reduce skew for multivariable analyses.

2.2. Independent variables (living conditions and individual characteristics)

The independent variables were chosen after extensive literature review, consultation with WHO Regional office for Europe and Kuopio City Council Departments of Environmental Protection Services and Environmental Health Care. Relevant questions from the European Quality of Life Surveys (EQLS) (Eurofound, 2012), WHO LARES study on European housing and health (WHO Regional Office for Europe, 2007) and an earlier URGENCHE wellbeing survey carried out in Suzhou, China (Liu et al., 2016) were collated and in some instances modified. In addition there were some additional questions designed especially for this survey. Questions were asked about the home, the outdoor environment, resilience and sociodemographic characteristics.

The home variables were as follows. To measure home satisfaction, respondents were asked to respond on a five point Likert scale how they would rate their home on each of the following: heating, insulation, air quality, ventilation, parking, neighbourhood, distance to green space, distance to sporting facilities, distance to a bus stop and distance to a beach. In order to explore housing conditions respondents were asked about thermal comfort and damp. To measure indoor air quality respondents were asked how often they had the following air problems in their home: too moist, dry air, dust and particles, odour, smoke (not tobacco), still air, stuffiness, draught, tobacco smoke from balcony/terrace, pollution from traffic/industry. Respondents were also asked whether anyone smoked tobacco cigarettes or a pipe in their home.

Outdoor transport, air pollution and greenspace were explored. Main transport mode was established by asking whether respondents made most of their journeys by car/motorbike/moped, public transport, bike, walk or other in winter and in summer. Opinion on air quality was established by asking whether respondents agreed or disagreed with the following statements: 'some air quality should be sacrificed for faster economic development', 'GHG should be reduced in Kuopio', 'Kuopio should promote renewable energy for heating of buildings', 'district heating is the greenest domestic heating', 'increase biofuels for district heating for environmental reasons, even though it is more expensive', 'increase wood domestic heating to reduce GHG ', 'wood burning causes air pollution so don't increase', 'biofuels for cars reduce greenhouse gas emissions', 'biofuels cause problems in the countries where they are grown', 'Kuopio should encourage use of biofuels in traffic' and 'air pollution has not been noticeable in the past 2 weeks'. Respondents were asked how often on average they spent their free time in nature.

We approached resilience chiefly through the concept of ontological security: a long term sense of feeling secure in oneself which allows oneself to deal with life's challenges (Giddens, 1991; Kearns et al., 2000; Liu et al., 2016) given that climate change is likely to present significant challenges. Ontological security was measured through a modified form of the validated psychosocial benefits from home scale (Kearns et al., 2000) to apply to wider aspects of people's lives which has been used in the sister survey in Suzhou (China) (Liu et al., 2016) and a study of smokers attempting to cope with the challenge of quitting smoking (Dobbie et al., 2015). The ten items are intended to measure psychosocial feelings which may connect wellbeing to external factors through feelings of protection, control and prestige (Hiscock et al., 2001). All items are answered on a 5 part Likert scale. The items linked to protection are 'I can deal with stress' and 'I feel safe'; the items linked to control are 'I feel in control' and 'I can do what I want, when I want'; the items linked to being valued are 'most people would like a life like mine' and 'I feel I'm doing well in life' and items linked to response to change are 'my life has a sense of routine', 'I worry about things going wrong' (reversed), 'I enjoy a challenge' and 'I'm frightened of change' (reversed).

Unsatisfactory conditions in various life domains create stress and undermine resilience (Baum et al., 1999) thus we measured satisfaction with respondents' current job, current standard of living, housing, family life, health, social life and the economic situation in Finland. A