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Energy consumption in an ageing population: exploring energy use and behaviour of low-income older Australians

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Abstract

This paper explores energy use and behaviour of older urban Australians by identifying the key factors that shape their energy demand. As Australia is facing an aging population, understanding what structural and behavioural factors can help improve residential energy efficiency is key for developing effective policy initiatives to support the successful management of household energy costs, wellbeing and carbon emissions within this population. This paper reports on survey and electricity meter data collected for an energy efficiency program involving 1,647 older householders (aged 60 and above) living within the Brisbane City Council Local Government Area. The program was funded by the Australian Government Low-Income Energy Efficiency Program (LIEEP) and ran from November 2013 to February 2015. Brisbane is Australia's third largest city and has a subtropical climate, with warm or hot weather for most of the year. The findings show that electricity consumption within the study's sample population was influenced by both structural and demographic factors. These factors include range of energy sources used, number of bedrooms and number of people living in the household, as well as type of appliances used in the home. In terms of appliance use, high-energy consuming appliances such as water heating and space cooling systems, clothes-dryers and refrigerators were important predictors of energy consumption. Over two-thirds of the study participants were relying on cooling systems for thermal comfort, and such systems were typically not being used in an energy efficient way. The use of high-energy demand heating and cooling systems can account for around 40% of energy consumption in Australian households, and has a large impact on electricity peak demand. With the penetration of air-conditioning in seniors' home expected to increase over time, it is important to better understand the range of low and high-energy demand practices that are currently employed by older Australians to achieve thermal comfort at home. Designing strategies that minimise the need for high-energy demand cooling practices will be key for managing household energy costs and wellbeing within this target audience.

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1. Introduction

Like most other developed nations, the Australian population is aging. Between 1994 and 2014, the proportion of Australia's population aged 65 years and over increased from 11.8% to 14.7%, and the proportion of people aged 85 years and over almost doubled from 1% of the total population in 1994 to 1.9% in 2014 [1]. Older person households in Australia tend to have lower household incomes than younger person households and are usually composed of one or two people living in larger than average dwellings, which they own outright [2]. Households with older and low-income individuals are particularly exposed to the rise in energy costs, since they live in older and energy inefficient housing stock and spend proportionately more of their disposable income on energy consumption [3, 4].

Energy efficiency is particularly important to older persons, as during retirement they re-orient themselves from work to more passive activities and are less likely to socialise outside the home [5]. While spending more time inside their homes, there are concerns that older people may make severe economies, being less likely to heat and cool their homes appropriately for their own well-being when experiencing financial constraints. Such saving occurs despite the fact that older residents are more sensitive to ambient temperatures due to more sedentary lives and physiological changes. These in turn negatively affect the body thermoregulation and the musculoskeletal systems impacting older individuals' mobility and capacity to generate heat [6]. Past research has established that a lack of appropriate heating and/or cooling can directly impact on households' health and wellbeing [7], with one previous study reporting reduced hospitalisation for respiratory and coronary conditions following residential energy efficiency investment [8].

The current study contributes to this field of research by exploring energy use and behaviour of older urban Australians and by identifying the key factors that currently shape their energy demand. As Australia is facing an aging population, understanding what structural and behavioural factors can help improve residential energy efficiency is key for developing effective policy initiatives to support successful management of household energy costs, wellbeing and carbon emissions within this target population.

2. Methods

This paper reports on the data collected for an energy efficiency program involving older householders. To be eligible to participate in the program, individuals had to be aged over 60, live in the Brisbane City Council Local Government Area, hold a current Pensioner Concession Card and own their home (mortgaged or outright) which was required to have an electricity meter. Brisbane is Australia's third largest city and has a subtropical climate with warm or hot weather for most of the year. In summer (December - February), average minimum and maximum temperatures are 21^{o}C to 30^{o}C, respectively and in winter (June to August) average minimum and maximum temperatures are 11^{o}C to 22^{o}C, respectively [9].

The program was funded by the Australian Government Low-Income Energy Efficiency Program (LIEEP) and ran from November 2013 to February 2015. In order to optimise recruitment efforts, participants were recruited into the program by program partners with established links with the target population [10]. The program used two recruitment approaches, one led by Brisbane City Council (Council) and the other led by Community Service Providers (CSP). For the Council-led recruitment, a dedicated staff member approached pre-existing community groups and invited their members to participate in the energy efficiency program. For the CSP-led recruitment, CSPs used their client database records to call eligible existing clients and invite them to participate in the program. Of the 3,100 people approached to take part in the program 1,647 (53%) participated.

This paper reports on survey responses collected during the first program interaction with participants (pre-program survey) as well as pre-program household electricity consumption data (12 months prior to pre-program survey completion). With participant consent, electricity meter data was provided by the electricity distributor. Survey and electricity data collection followed the processes specified in the National Statement on Ethical Conduct