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Retrofit or behaviour change? Which has the greater impact on energy consumption in low income households?

Melissa James^{a,*}, Michael Ambrose^a

^a CSIRO, Bayview Ave, Clayton VIC 3168, Australia

Abstract

What is the most effective way to help low income households use less energy? Is it best to target the building in which they live by upgrading its thermal envelope, its lighting, its heating and cooling system, or its hot water system? Or is it more effective to focus on educating the householder and facilitating energy efficiency through behaviour change? Or is a combination of the two required? This paper presents the results of a randomised control trial that compares changes in energy consumption in 320 low income Victorian households which underwent different combinations of retrofit and behaviour change interventions. The results show that households which underwent retrofit only interventions reduced total energy consumption by 7.1% and were 1°C warmer in winter; households which underwent a combination of retrofit and behaviour change interventions reduced gas consumption by 18.6% and total energy consumption by 11.4%; households which underwent behaviour change only interventions did not show a noticeable improvement.

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1. Introduction

Low income households spend a larger proportion of their income on gas and electricity than any other household. A recent report into Australian household energy consumption found that the lowest income quintile spent 5.6% of their income on gas and electricity in 2012, up from 5.1% expenditure in 1994. This is more than

* Corresponding author.

E-mail Address: melissa.james@csiro.au

double the average household expenditure of 2.7% of income [1]. The later part of this period also saw large increases in electricity prices. Government data shows that household electricity prices rose by around 50% from 2010 to 2013 [2]. Over the past ten years, the retail price of gas for households has increased by 8 per cent a year. This is significantly faster than the rate of inflation [2].

The Council of Australian Governments (COAG) developed a 10 year national strategy on energy efficiency in 2010 which included proposals for new energy efficiency provisions for new residential buildings and increasing the stringency of minimum energy performance standards (MEPS) for appliances and equipment [3]. Improvements in energy efficiency provisions for new buildings and increased MEPS have resulted in more energy efficient new houses. Average energy consumption in Australian households has remained relatively constant for the last couple of decades [4], but is projected to decline by about 6% by 2020 compared to 1990 levels. This expected decline is primarily being driven by the energy efficiency programmes that have been introduced to increase the efficiency of the building shell and appliances.

Whilst changed regulations have led to new houses and household appliances and equipment becoming more energy efficient, low income households are less likely to benefit from this. Low income households have greater exposure to poor quality housing stock and have limited access to more efficient appliances. This, combined with rising electricity and gas prices over the last decade, has put pressure on Australian low income households.

The Australian Government's commitment to a target of improving Australia's energy productivity by 40 per cent by 2030 includes a focus on reducing energy costs and carbon emissions for households [5]. It aims towards "energy consumers that are able to effectively manage their energy costs and are engaged in improving the productivity of their energy use" [5, p13], and includes working with stakeholders to support vulnerable consumers.

The Australian Government established the Low Income Energy Efficiency Program (LIEEP) in 2011, providing \$55.3M in grants to twenty different consortia, to trial approaches to improve the energy efficiency of low income households and enable them to better manage their energy use [6]. One of the grant recipients was the South East Councils Climate Change Alliance (SECCCA) who coordinated a consortium of local government, researchers, and businesses to implement the Energy Saver Study (ESS). This three-year project involved the recruitment of 320 households to participate in the implementation and evaluation of three pilot household energy efficiency programmes, designed to help low income households become more energy efficient. The programmes involved different combinations of retrofit and behaviour change interventions. This paper describes the project and the three programmes trialed, outlines the method used to evaluate them, and gives the results of the evaluation.

2. Methodology

2.1. Recruitment of households

Volunteer households were recruited from a pool of low income clients that receive direct care services through Home and Community Care (HACC), a Victorian state government service deployed by local councils. The 320 households that participated in the study were recruited using an online random number selection tool. Each of the randomly selected clients was assessed for eligibility to participate in the study. Those invited to participate needed to have the physical and cognitive capacity to enable them to participate in the three-year study. They needed to be able to receive numerous visits from a wide range of staff and contractors and to answer a series of survey questions.

2.2. Allocation of households to study groups

The 320 recruited households were allocated to one of four study groups involving different combinations of retrofit and behaviour change interventions:

- Retrofit – households received energy efficiency upgrades to the house itself, such as insulation, weather sealing, appliance repair and replacement, and lighting upgrades
- Behaviour change – householders were provided with information and house operation strategies to encourage behaviour change in order to reduce energy consumption
- Retrofit and behaviour change – occupants received both the behaviour change programme and retrofits

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