Improving the energy efficiency of homes in Moreland

Warm Home Cool Home and Concession Assist social research final report

Victoria Johnson, Damian Sullivan and Jo Totty

2013

Moreland SolarCity

Moreland Energy Foundation

Brotherhood of St Laurence

Working for an Australia free of poverty

The Brotherhood of St Laurence (BSL) is a non-government, community-based organisation concerned with social justice. Based in Melbourne, but with programs and services throughout Australia, the BSL is working for a better deal for disadvantaged people. It undertakes research, service development and delivery, and advocacy, with the objective of addressing unmet needs and translating learning into new policies, programs and practices for implementation by government and others. For more information visit <www.bsl.org.au>.

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Abbreviations

BSL—Brotherhood of St Laurence

CA—Concession Assist

MEFL—Moreland Energy Foundation Limited

WHCH—Warm Home Cool Home

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Summary

In Australia, growing concern about climate change and rising energy prices has renewed interest in residential energy efficiency. Between 2007 and 2012, Australian retail electricity prices have risen by 72 per cent (ABS 2012). Low-income households, which spend a higher proportion of their income on energy than other households, are particularly vulnerable to these price rises. We are also beginning to experience the impacts of climate change—including an increase in the intensity of heatwaves, to which low-income households are highly vulnerable (see ACOSS 2013; Edwards & Wiseman 2009). Homes that are more energy efficient have the potential to reduce householders' vulnerability to rising energy prices, and may also reduce vulnerability to heatwaves. However, many low-income households face financial and other barriers to improving the energy efficiency of their homes.

This report presents the results of social research which investigated the impact of energy efficiency activity for households that participated in the Warm Home Cool Home (WHCH) and Concession Assist (CA) programs. The research described was conducted by the BSL through Moreland Solar City, which is part of the Australian Government's national Solar Cities program. Led by Moreland Energy Foundation Limited (MEFL), Moreland Solar City is a partnership with Moreland City Council, the BSL and Sustainability Victoria. The WHCH and CA programs were delivered by the BSL and MEFL. Like most energy efficiency programs targeted to low-income households, the programs aimed to address cost, information and trust barriers faced by these households in improving the energy efficiency of their homes.

The first phase of research examines impacts of the WHCH energy audit–retrofit program on energy saving, financial hardship, home comfort, health and wellbeing. The research engaged 85 people in 12-month pre-participation interviews, of whom 58 also completed post-participation interviews. A combination of tested, normed, quantitative measures and qualitative data on participants' experience of the program were collected. This interview data was compared to participants' actual energy use and energy audit data.

The WHCH program was significantly altered and the scope of the program and mode of delivery were changed. The new program, Concession Assist, was delivered as a service of Zero Carbon Moreland and—unlike WHCH—did not include insulation as part of the program offer. This redevelopment created an opportunity to undertake a second piece of research that was more forward-looking. In addition to investigating relationships between home energy use, the factors underlying home energy use and barriers to more optimal use of energy, the research also sought participants' views on further action required to improve outcomes in their household in relation to energy efficiency and energy management, and explored participants' plans and capacity to undertake these improvements. The research also explored people's understanding of their energy bills and their preferred methods of receiving information about energy use and energy efficiency.

Findings

This research represents the views and experiences of 199 people who had contact with, or participated in the WHCH or CA programs delivered through the Moreland Solar City program, and an additional 33 Moreland residents recruited to take part in workshops about using energy and saving energy at home.

The programs

- Program participants were all on low incomes and had Commonwealth concession cards. Those in the research group tended to be home owners living in fully detached homes. The WHCH group tended to be older, female and living in one or two-person households. In the CA group, age and household size were fairly evenly distributed.
- The main reasons people joined either program were to save money and save energy. The WHCH group wanted to learn more and to take advantage of the expert advice provided in the program, and the CA group expressed a desire to make their homes warmer or cooler.
- Participants across both WHCH and CA were positive about their experiences on the programs. Suggestions for improving the programs included providing more and larger products and installations, opening the programs up to more people, providing discounts on related products and services, and providing more information. The BSL considers that better communication may improve program retention rates.

Energy use and energy bills

- Participants reported energy savings, and those who received more retrofit items saved more energy than others.
- WHCH participants adopted more energy-saving behaviours following participation in the program.
- Participants reported that the energy advice and information they received was helpful, with most reporting that the program had helped them understand their energy use better.
- Many CA participants took additional action beyond that offered by the program, and 60 per cent of the non-completer group (those who joined the program but later discontinued their participation) also took action to improve the energy efficiency of their homes, as did many workshop participants.
- MEFL calculated a deemed energy saving of around $77 per household per year.
- Although almost half of the WHCH participants felt their participation in the program had helped them save money on their energy bills, measures of financial hardship did not show an improvement after participation in the program.
- During the study period there was a sharp increase in the retail price of electricity in Melbourne.

Thermal comfort, health and wellbeing

- Measures of changes to thermal comfort were assessed in the WHCH group. The majority experienced significant improvements in the thermal comfort of their homes. The proportion of the group reporting draughty homes decreased from over three-quarters to less than one-third after participating in the program.
- Results for changes to health and wellbeing were mixed and tended to vary depending on severity of health issue being experienced.

Barriers to upgrades

- Almost one-third of those who completed the CA program and 40 per cent of the non-completers reported an intention to upgrade an appliance or fixture that would improve the energy efficiency of their home; however almost two-thirds reported barriers to making such upgrades.
- The most commonly reported barrier to further improvements to home energy efficiency was cost, followed by rental tenure.
- While more than half the CA group who did not have Green Energy would like to install solar power or purchase Green Energy, three-quarters of them cannot afford to.

Information

- Over a quarter of the CA participants reported that their energy bills are difficult or very difficult to understand, and a quarter reported that they had experienced energy bill or contract-related problems, including issues with estimated bills, concessions, overcharging and door-to-door sales.
- Almost a third of the CA group used the internet to search for information about household energy usage, energy efficiency and ways to save on bills, with one-quarter of these using Google. Other people looked to mass media channels, government (federal, state and local) or organisations they already had contact with.

Vulnerable groups

The findings of this research further reinforce a difficult Catch-22: some people are unable to afford their energy bills, but cannot afford to take action to bring their energy use (and associated costs) down. This is particularly the case for renters, who experience an additional double-bind of having less disposable income and less capacity to make changes to a home they do not own. Renters also reported being unable or unwilling to approach landlords to request energy efficiency upgrades.

In light of the international evidence, the mixed findings on health and wellbeing in the WHCH research suggest the need to trial deeper energy efficiency interventions in the Australian context in order to assess their impact on health and wellbeing, in particular for people experiencing chronic or severe health issues.

1 Introduction

In recent years, concern about rising energy prices, the need to reduce greenhouse gas emissions, and the impacts of climate change, such as heatwaves, has coalesced in renewed interest in residential energy efficiency programs in Australia. One area of interest has been ensuring that low-income and disadvantaged households are able to benefit from energy efficiency (see KPMG 2008). Most energy efficiency programs targeting low-income households aim to address cost, information and trust barriers faced by these households in improving the efficiency of their homes.

This report presents results of social research which investigated the impact of energy efficiency activity for households that participated in the Warm Home Cool Home (WHCH)[1] and Concession Assist (CA) programs. These programs were delivered as part of Moreland Solar City, which is part of the Australian Government's national Solar Cities program. Moreland Solar City was envisioned as a whole-of-community approach to energy efficiency with four project streams:

- Zero Carbon Moreland: a program to inspire and facilitate residents, community groups and businesses to reduce energy use as part of a community-wide response to climate change;
- Zero Carbon Moreland Concession Assist: a program to help those less able to adapt to the impacts of a changing climate through energy efficiency audits and retrofits for low-income households;
- Moreland Energy Partnerships: a project that seeks to transform the way we generate energy, with a focus on localisation and renewable energy;
- Sustainable urban planning: working with commercial developers and local government to change the way we construct our future through the development of effective tools to embed sustainability into new precincts and demonstrate the business case for action (MEFL 2013b).

The WHCH and CA programs delivered home energy audits and energy efficiency upgrades to 1,000 low-income households in the City of Moreland. The programs sought to build upon interventions such as the Victorian Energy and Water Task Force. Similar programs operate internationally, including the Warm Front scheme in the United Kingdom and Weatherization programs in the United States, albeit with a substantially increased suite of upgrade measures available to the household.

The results of the social research are detailed below and include:

- the impact of WHCH on participants' thermal comfort, health and wellbeing;
- the impact of WHCH on participants' financial hardship;
- the extent to which WHCH and CA led participants to undertake pro-environmental behaviours;
- reported changes to energy use;
- feedback on program participation;
- participants' future energy efficiency plans and any perceived barriers to energy efficiency actions;
- participants' preferred methods of receiving information about energy efficiency.

[1] The first phase of the WHCH research is detailed in Johnson & Sullivan (2011).

Energy efficiency, energy affordability and climate change

There is a growing body of evidence of both the impacts of rising energy prices and the potential social impacts of climate change. These include financial impacts, as well as impacts on health and wellbeing, community strength, community connectedness and employment.

Increasing electricity costs, financial impacts and energy-related hardship

The retail price of electricity in Melbourne increased by 84 per cent between June 2007 and June 2012 (ABS 2012). Australian studies of the impact of rising energy costs demonstrate that these contribute to financial hardship, in particular for low-income households (for example Spoehr, Davidson & Wilson 2006). Difficulty in paying electricity bills and increased demand for emergency financial relief services have been identified (Lawrence 2002). In Victoria, the number of Utility Relief Grants[2] increased between 2009–10 and 2011–12 (DHS Vic 2013b). Along with recent price increases, the number and rate of residential energy disconnections increased (see Table 1.1), and the number of customers disconnected and then reconnected at the same address (most likely indicating payment difficulties) also increased. Taken together, these data suggest increasing difficulties in paying for residential electricity for many Victorian households.

Table 1.1 Residential electricity disconnections

Year	2008–09	2009–10	2010–11
Total disconnections	9,568	13,486	17,871
Disconnections per 100 customers	0.43	0.59	0.77
Reconnections in same name and address within 7 days (percentage)	44	44	47

Source: Essential Services Commission 2009, 2010, 2011

In the United Kingdom, financial hardship associated with energy costs, known as ‘fuel poverty’, has been linked to stress, anxiety, poor mental and physical health, and excess winter deaths (Green & Gilbertson 2008).

Health impacts

Health impacts of climate change in Australia identified by Horton and McMichael (2008) include (but are not limited to):

- heat stress and other heat-related cardio-vascular and respiratory illnesses;
- trauma from extreme weather events.

Deterioration in home comfort in particular during heatwaves, will likely have negative flow-on effects with regard to health. For example, the Victoria Department of Human Services estimates that there were 374 excess deaths due to the 2009 heatwave (DHS Vic 2009), in addition to the 173 fatalities in the subsequent bushfires (DSE 2012). Capacity to adapt to increased heat in a changing climate (IPCC 2007) will be dependent, in part, on building modifications (BRANZ Ltd 2007), for example to improve thermal performance.

In New Zealand and the United Kingdom there is evidence of links between damp, cold and crowded housing conditions, and poor health (Howden-Chapman et al. 2005; Green & Gilbertson 2008). While these links have not been researched in Australia, there is also evidence in other

[2] The Utility Relief Grant Scheme provides assistance for domestic customers who are unable to pay their utility bills due to a temporary financial crisis (DHS Vic 2013a).

countries of excess winter deaths (Falagas 2009), to which cold homes are likely to be a contributing factor.

A number of mental health impacts associated with fuel poverty have also been identified; they include stress, anxiety and depression (Spoehr, Davidson & Wilson 2006; Green & Gilbertson 2008). Negative mental health impacts of climate change have also been predicted by Fritze et al. (2008).

Community level impacts

Negative impacts on community strength and resilience caused by climate change have been highlighted by some Australian authors (Fritze et al. 2008; ACOSS 2013); however, this is an area requiring further investigation.

Energy efficiency, health and financial stress

Energy efficiency measures provide an important opportunity to potentially improve household comfort, health and wellbeing, and reduce exposure to extreme weather events and energy price rises. Energy efficiency programs in other countries have been found to improve health (Howden-Chapman et al. 2007) and reduce stress associated with fuel poverty (Green & Gilbertson 2008). Howden-Chapman et al. (2005) also assert that 'good quality housing can act as a protection against other socio-economic stress factors' (p. 2602). In Australia, similar programs have led to a reduction in energy bills (Quantum Market Research 2007; Spoehr, Davidson & Wilson 2006); however, there remains a paucity of detailed, publicly available evaluations of Australian programs.

Research from KPMG (2008) identifies specific household types that will benefit most from energy efficiency upgrades. These include households that:

- consume relatively high levels of energy despite earning very low incomes;
- have inefficient appliances;
- live in substandard houses;
- have health or disability issues;
- consist of very large families (KPMG 2008, p. 18).

2 Warm Home Cool Home

The Moreland Solar City WHCH program was delivered by the BSL in partnership with MEFL and with support from Moreland City Council. It was a free service for Commonwealth concession card holders[3] residing in the City of Moreland, which is located in the northern suburbs of Melbourne.

The aim of the program was to deliver energy efficiency upgrades to 1,000 low-income households in the City of Moreland, with a view to reducing both greenhouse gas emissions and the impact of rising energy prices. The program also sought to establish a viable social enterprise to deliver energy and water efficiency retrofits to low-income and disadvantaged households.

The WHCH program consists of a home energy audit, recommendations of actions that householders can take to reduce their energy use, and assistance in implementing some of these recommendations, such as installing draught stripping on doors and windows, tap aerators and low-energy light globes. Table 2.4 (on page 8) details the items and advice offered in the program.

Households participating in the social research described in this report were involved in the WHCH program between November 2009 and February 2011.

Methodology

The research employs a mixed methods approach. The aim of this approach was to investigate impacts on home comfort, health and wellbeing, financial hardship, and behavioural change in home energy use through a home energy audit and retrofit program delivered in the City of Moreland. The research explores the hypothesis that improved energy efficiency of homes may lead to improvement in home comfort, health and wellbeing, and reductions in financial hardship.

Prior research (which is summarised in Table 2.1) indicates reductions in home energy use as a result of similar programs. Some of this research also indicates non-energy benefits, including those investigated in the WHCH program. WHCH aims to build on this prior research and also to explore the extent to which findings from other countries are applicable in the Australian (Victorian) context.

[3] People receiving income-means-tested government payments, supplements or benefits are eligible for Commonwealth concession cards. Approximately 27 per cent of Australians received these types of payments in 2010 (ABS 2011).

Table 2.1 Prior research

Research	Program offering	Household-level impacts
Retrofitting houses with insulation to reduce health inequalities: aims and methods of a clustered, randomised community-based trial (Howden-Chapman et al. 2005) (NZ)	Insulation of uninsulated homes	• Lower energy consumption • Small increases in bedroom temperatures in winter • Decreased odds of fair or poor self-rated health
An evaluation of the energy efficiency program for low income households (Spoehr, Davidson et al. 2006) (South Australia)	Fridge buy-backs, interest-free loans for energy-saving products, compact fluorescent lamps, AAA-rated showerheads and draught excluders	• Decrease in bill payment defaults, disconnections and presentations to emergency relief providers • Decreased rate of difficulty in paying energy bills • Reductions in energy use and greenhouse gas emissions • Improvements in home comfort • Decreased energy bills for some
Energy and Water Task Force program: an assessment through market research (Quantum Market Research 2007) (Victoria)	Most common: energy-efficient light globes, door weather strips and draught stoppers, efficient shower roses, blinds, fixing leaking taps Less common: roof insulation, closure of air and exhaust vents	• Changes in energy / water use behaviours • Decreased energy bills • Warmer and more comfortable homes during winter
Warm Front better health: health impact evaluation of the Warm Front scheme (Green & Gilbertson 2008) (UK)	Heating installation / repair, insulation, draught-proof doors and windows, energy-efficient lighting, advice	• Decreased difficulty in paying fuel bills • Increased energy consumption • Improved indoor temperatures • Relief from financial pressure • Decreased anxiety and depression • Improved self-reported health
Non-energy benefits of the US Weatherization Assistance program: a summary of their scope and magnitude (Schweitzer & Tonn 2003) (USA)	Weatherisation retrofits averaging $1,179 per household	Decreased: • Transaction costs of energy efficiency activity • Energy and water bills • Illnesses • Tenancy mobility Increased: • Safety • Property values

The original WHCH program included insulation, which was subsequently withdrawn from the program offer. This has had implications for the research as the program has not delivered the anticipated depth of intervention the research was designed to investigate.

Data collection

There are three data sets used in this research: interview data, audit data and energy billing data.

Interview data was collected in telephone interviews[4] conducted prior to participation in the program and again 12 months after participation.

- In the pre-participation interview, baseline data was collected on home comfort, energy-use and conservation behaviours, health and wellbeing, and financial hardship. Demographic data was collected, and people's reasons for joining the program and how they became aware of the program were also explored.
- In the post-participation interview, some of the demographic data was collected again in order to identify whether there had been any material changes within the household that may have influenced results, for example changes in household size, or entry to / exit from employment. The purchase of new household appliances was also recorded. Repeat measures of home comfort, energy-use and conservation behaviours, health and wellbeing, and financial hardship were taken for comparison to the baseline data. People's experience of participation in the program was also explored; for example, feedback was sought on program processes, what people received, and their satisfaction with the program.

Audit data was collected by the audit–retrofit team at the time of undertaking works in the home. This data has been extracted from a database maintained by MEFL and provided to the Department of Climate Change and Energy Efficiency (DCCEE). The data provides information about the retrofit items installed and the information provided to householders.

Electricity and gas billing data was collected by MEFL from the energy retailers of program participants. Participants signed permission forms, which enabled the retailers to share data with MEFL and the BSL. This data was provided to the BSL as gas mega joules (Mj) and electricity kilowatt hours consumed in calendar-year periods. A combined (energy use) gas and electricity amount was calculated, in which each energy source was converted to a standard energy unit (Mj) and aggregated by simple addition.

The research sample

The research described in this report is based on a final sample of 58 people who participated in a post-participation interview conducted 12 months after their participation in WHCH (Table 2.2). Of these, 23 had the full complement of interview, audit and billing data available for analysis.

Table 2.2 Data sources and sample size

Data source	Pre-participation interview	Post-participation interview	Audit	Billing	Complete data set
Sample size	85	58	69	28	23

[4] A copy of the interview schedules is available from the publisher or by emailing the authors: vjohnson@bsl.org.au

The research group

Table 2.3 presents characteristics of the pre-participation and post-participation samples. The data show slightly higher attrition from the research among men, people aged under 45, people who do not own their home, non-Pensioner Concession card holders, and people speaking English well or very well. Compared to the whole WHCH participant population, the final research sample tends to under-represent renters and people on the lowest incomes ($0 to $20,000 per annum).

Table 2.3 Sample characteristics

	Percentage of pre-participation sample (N=85)	Percentage of post-participation sample (N=58)	Percentage of all WHCH and CA participants
Gender of interviewee			
Female	75.3	77.2	
Male	24.7	22.8	
Age group of interviewee			
Aged 18–24	2.4	1.8	
Aged 25–34	9.4	5.3	
Aged 35–44	14.1	14.0	
Aged 45–54	7.1	8.8	
Aged 55–64	16.5	21.1	
Aged 65–74	18.8	22.8	
Aged 75+	31.8	26.3	
Household size			**N=1,051**
One-person household	38.1	40.4	34.6
Two-person household	28.6	29.8	31.1
Three-person household	15.5	12.3	14.5
Four-to-five-person household	12.0	12.3	9.8
Six-or-more-person household	6.0	5.3	4.7
Housing tenure			**N=129**
Home owner	76.5	80.7	78.7
Renter	18.8	15.8	20.6
Other tenure type	4.7	3.5	0.7
Type of concession card			
Health Care card	20.0	15.8	
Pensioner Concession card	71.8	77.2	
Other concession card	8.2	7.1	
Household income (before tax)			**N=96**
Income $0–20,000	25.3	26.8	36.5
Income $20,001–50,000	51.8	55.4	27
Income $50,001–100,000	7.2	8.9	12.7
Income $100,000+	2.4	0	0
Not known / not stated	13.3	8.9	23.8
English language proficiency			
Speaks English well or very well	94.1	91.3	
Speaks English not well or not at all	5.9	8.8	
Educational attainment			
Did not go to school	1.2	0	
Completed less than Year 10	29.4	28.1	
Completed Year 10–11	12.9	12.3	
Year 12	11.8	10.5	
Certificate	9.4	10.5	
Diploma	8.2	12.3	
Degree	15.3	14.0	
Postgraduate	11.8	12.3	

Changes made in homes

WHCH actions comprised:

- undertaking an audit of home energy use and energy efficiency;
- installing energy efficiency upgrades by the BSL retrofit team;
- providing advice to householders on home energy-saving measures; these included day-to-day behaviour change such as switching off lights or shorter showers, and possible future energy efficiency upgrades; the advice provided to households varied from home to home.

Table 2.4 lists the different measures installed by the BSL retrofit team and the proportion of homes receiving the measures, as indicated in the audit data from the MEFL database. This is the 'audit data' referred to in this research.

Table 2.4 Hardware measures installed as part of retrofit (from audit data)

Measure	Number of homes receiving the measure	Percentage of homes receiving the measure (N=69)
Install draught stripping	63	91.3
Replace standard globes with low-energy globes	49	71.0
Install 3-star showerheads	17	24.6
Increase fan numbers	7	10.1
Install flow adjuster	6	8.7
Install ceiling insulation	3	4.3
Install external shading	1	1.4

In the post-participation survey, just over 70 per cent of participants reported they were making some or all of the changes recommended by the auditors. Some of the reported changes included items not listed in the audit data. Commonly reported changes were:

- use of items provided by installers: low-energy lights, draught stoppers, draught seals, door snakes, insulation, clothes horses, power-saving board and standby power switches;
- additional actions recommended by the WHCH team: cessation of or decreased use of clothes dryers, turning off lights and other appliances when not in use, taking shorter showers, decreased use of heating and cooling, and closing doors, curtains and blinds;
- other additional actions: changing windows to a different style and glass, or applying insulating film to windows.

Some participants reported they were already doing the actions recommended by the WHCH team, and so no changes were made. Others reported they were unable to make the recommended changes.

Barriers to making changes

One-third of the sample reported facing barriers to implementing the changes recommended in the program.

Financial

The most commonly reported barrier was financial: that the recommended measure was unaffordable or too expensive. Unaffordable measures included installation of solar hot water, solar power, cowlings[5] for ceiling fans, external blinds, and replacement of windows.

Rental properties

The second most commonly reported barrier was due to participants being tenants of rental properties (both public and private), including being unable or unwilling to obtain permission to make changes; for example:

> We didn't want to ask the landlord. We have very affordable rent because we don't hassle the landlord and he doesn't hassle us—we pay 30 per cent less than our neighbours.

The experience of renters is discussed in more detail in the discussion of results (see Section 4).

Trust

Distrust of WHCH and of other energy efficiency programs—such as the Commonwealth's insulation program—was also a barrier; for example:

> I wasn't sure about them doing anything to the house, wasn't sure if they were qualified.

> I chose not to have insulation added because I had some already and in retrospect I'm glad I didn't ... [prompt: why are you glad you didn't?] ... because of all the problems they had with it[6], but I guess this is a different thing.

Some participants reported a mismatch between their home's design and the recommended energy efficiency upgrades, for example: 'ceiling too low for insulation', 'globes don't fit existing lights' and 'how the house is laid out makes electrical changes difficult'.

Some participants also mentioned specific failings of the WHCH program, for example that they did not receive an audit, or an audit report; or that the draught stripping on a door had fallen off, or was making the door difficult to close.

Changing views on energy efficiency

While 70 per cent of participants said they were making at least some of the recommended changes, less than half considered that their views on energy efficiency had changed. This is because many felt they were already very conscious of energy efficiency and were doing what they could.

For some people, the program helped them to take action on energy efficiency measures that they knew about and had wanted to implement, for example:

> I've always been conscious but having those things done has made it easier to maintain and for example when I bang on the door to tell the kids to turn off the shower after 5 minutes, at least I know it's still using less [hot water because of the low-flow showerhead installed].

[5] A cowling is a removable covering or hood.
[6] The Commonwealth Home Insulation Scheme

Those whose views had changed reported that they had developed more awareness of energy efficiency as a result of their participation in the program, for example:

> Everyone in the house is more conscious of how to reduce energy use. It helps me save money. I turn off lights and appliances when not using them, I think more before I do things around the house. I don't need to heat the house as much. I had no idea such small things would make such a difference.

This participant has touched on two themes that were evident in the responses of many respondents: first, that they now think more about their actions in relation to energy efficiency (11 people), and second, their surprise that small actions make such a difference (9 people).

Some participants reported that the awareness they already had was prompted or reinforced, for example:

> The general ecological footprint thing is important. We do try very hard to do the right thing. We've always been green, but I think the community thing sort of bolts it home. Like the campaigns on TV.

Others whose views had been changed reported specific behaviours, such as turning off lights or waiting longer before turning heating or cooling on, for example:

> I'm more frugal with my electricity and gas use, but I don't go cold. I'm more conscious of saving electricity and gas; like I turn off the lights, TV, when I'm not using it, but I don't go without.

Changes in the use of energy

Changes in energy consumption were investigated to try to identify whether the program had any material impact on energy use. These changes were assessed in three ways:

- pre and post-participation measures of change in common energy-using and energy-conserving behaviours;
- self-reported changes in the amount of energy used;
- assessment of 12-month pre-participation and post-participation billing data.

Energy-use behavioural changes

Measurement of energy-use behaviours in the home is difficult, contentious and heavily influenced by positive response bias (Shipworth 2000). In this research, we have attempted to address the tendency to provide socially desirable answers by asking the same question both before and after participation in WHCH.

Changes in home energy-use behaviours were assessed by asking participants whether people in their household practised 11 energy-using or energy-conserving behaviours *always*, *sometimes* or *never*. These behaviours (see Figure 2.1) were scored and compared.

Overall, 69 per cent of the sample (N=58) reported being more pro-environmental than before.

A dependent samples t-test was conducted to evaluate the impact of the program on participants' energy-use behaviour in relation to the 11 behaviours mentioned above. On average, participants' scores were higher before participation (M=1.69, SD=.307) than after (M=1.54, SD=.313), t(57) = 3.731, <.001, r=0.44; that is, the participants were more energy-wise—undertaking more energy-

conserving behaviours and fewer energy-using behaviours—following their involvement in the program.

This result is significant and represents a medium to large effect (Cohen 1988; Cohen 1992; cited in Field 2009).

A breakdown of results by behaviour (Figure 2.1) indicates the most commonly reported change was 'turning appliances off at the wall power point', which included the use of an energy-saving switch. Other gains related to hot water use: more people reported keeping showers to 4 minutes or less and washing clothes in cold water (instead of hot); and fewer reported rinsing dishes under running hot water.

The increase in participants heating their house to above 20 degrees Celsius may represent increased understanding of home temperatures following participation in the program, or may reflect changing attitudes to warmth in the home.

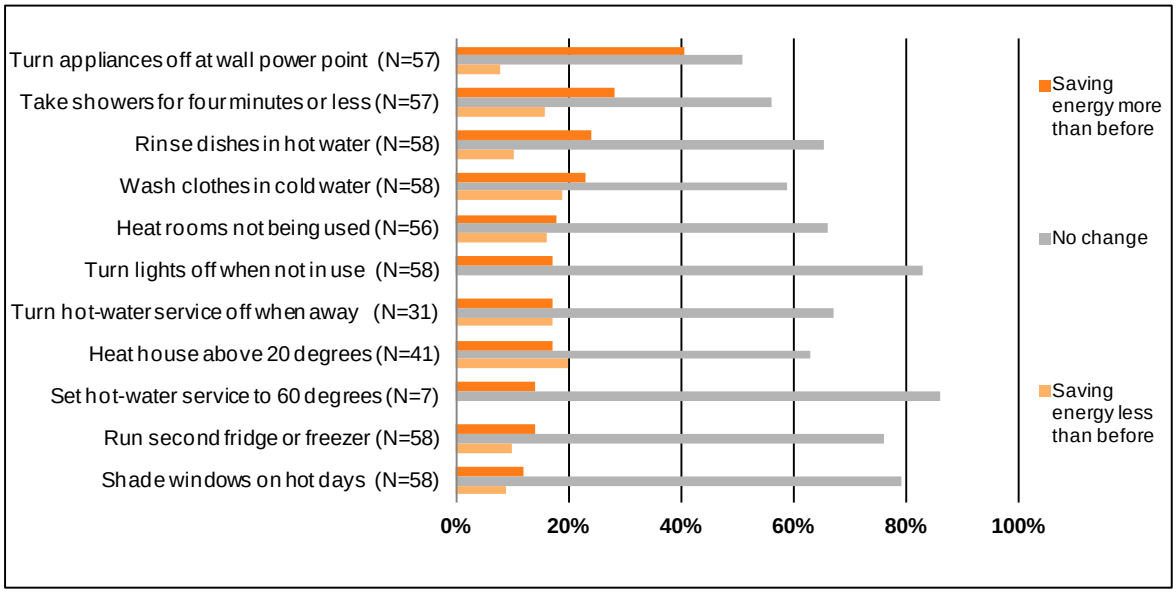

Figure 2.1 Change in energy-use behaviour score: energy-saving behaviours

In addition to reporting on specific behaviours, people were asked to reflect on whether participation in the program had changed the way they thought about energy efficiency or the way they did things around the house overall. Responses indicate almost half (42 per cent, N=57) reported they were now more aware of their energy use in the home; the remainder reported they had always been aware of energy efficiency.

Comparison of 'awareness change' data to the data on changes to specific behaviours reveals interesting results. More than half of the people whose awareness improved were already implementing the energy-saving behaviours examined in this research prior to participation. Conversely, some of those people who did not report improved awareness had in fact implemented more of the energy-saving behaviours than they were undertaking prior to participation in WHCH. This finding indicates a need to further explore and understand the knowledge–action gap identified in other research (McKenzie-Mohr 1999; Kollmuss & Agyeman 2002).

Changes in self-reported energy use

Calculations by MEFL, based on the first 200 homes involved in the WHCH program, indicate that the installation of hardware items was deemed to generate average household energy savings of $77 per annum. Some households would have achieved additional savings by everyday behavioural changes and additional actions undertaken on the recommendation of the audit–retrofit team. When asked to report whether their household had reduced its energy usage since participating in WHCH:

- half the sample did not believe their energy use had reduced;
- just under 40 per cent felt their energy use had decreased;
- just over 10 per cent were not sure.

Changes in the amount of energy consumed

Mean consumption in the year prior to participation in WHCH was 41,581 Mj per annum per household. This is very low, and lower than the medium and low annual consumption calculated by Johnston (2013) for Victorian households (see Table 2.5).

Table 2.5 Comparison of medium and low consumption to WHCH group

Fuel type	Medium consumption (as calculated by Johnston 2013)	Low consumption (as calculated by Johnston 2013)	WHCH mean pre-participation consumption (N=28) *(standard deviation)*	WHCH mean post-participation consumption (N=28) *(standard deviation)*
Dual fuel	63,000 Mj	50,400 Mj	43,674 Mj *(21,289)*	44,745 Mj *(23,286)*
All-electric[1]	7,000 kWh	5,600 kWh	24,136 Mj[2] *(21,131)*	22,157 Mj[2] *(17,995)*

[1]All-electric data presented in kWh by Johnston, but Mj for WHCH data.
[2]These figures are calculated from only three records and should be treated with caution.

Post-participation data indicates a small increase in usage (744.15 Mj) between the pre-participation year and post-participation year overall.

A grouping of changes in mean energy use by self-reported energy use reductions (Table 2.6) indicates variability between perceived and actual savings. Those participants reporting that the program had helped them save energy ‘somewhat’ had in fact increased their energy use in the year following the WHCH retrofit.

Table 2.6 Self-reported and actual energy use savings (N=22)

Extent program helped person save energy	Mean change on pre-participation year usage (Mj)
Did not help me save energy	5,125
Helped me save energy a little	–3,898
Helped me save energy somewhat	3,007

What factors influence change?

Given the large variability in energy-use change within the group, we have investigated factors that may have influenced the changes reported by participants and recorded in billing data.

Retrofit items

The relationship between changed energy use and the number of retrofit items installed was tested using Pearson's correlation.[7] Results indicated that energy savings were positively related to the number of retrofit items installed in the home—the higher the number of retrofit items installed, the greater the energy-use saving: r=.37, p (one-tailed) <.05.

The household that received external shading had the largest energy saving of the group (27,550 kWh); however, both the households that received insulation increased their energy use in the post-participation period.

Behaviour change

The way energy is used and conserved in homes influences consumption levels (DEWHA 2008). It was anticipated that changed energy-use behaviours would influence the amount of energy used in the home; however, analysis of the relationship between energy-use behaviour change and energy consumption change recorded in energy billing data showed that of those whose total Mj energy consumption decreased in the post-participation year (N=13), six were implementing more energy-saving behaviours than before, six were implementing fewer energy-saving behaviours than before, and one person's behaviour had not changed since participating in the program.

Household characteristics

Household characteristics—including household size, housing tenure, income and the presence of a household member with a chronic illness or disability—are all known to influence energy use in homes. Unfortunately, due to the limited number of matched interview and billing data records, there was insufficient data to undertake meaningful analysis of the influence of these factors.

Thermal comfort of homes

Heating and cooling account for just under 40 per cent of the energy used in Australian homes (Reardon et al. 2008, p. 13), indicating a strong link between energy efficiency and the thermal comfort of homes. Changes in the thermal comfort of homes is an important aspect of this research because of the known links between poor thermal comfort and poor health (Green & Gilbertson 2008).

In this study, thermal comfort has been measured using the Bedford thermal comfort scale (see Griffiths & Boyce 1971; Green & Gilbertson 2008; Wong & Khoo 2003). This scale has been used because participants not only rated their thermal sensation (for example: cool, warm), but also identified whether they were comfortable or experiencing too much of the sensation (for example: too warm, much too warm). Gilbertson et al. (2012) found that lower stress levels were associated with improved thermal comfort, but that stress was not significantly associated with cold homes. This suggests the importance of understanding subjective comfort measures.

A dependent samples t-test was conducted to evaluate the impact of WHCH on participants' self-reported levels of home comfort using the Bedford scale. There was a significant difference in

[7] A standardised measure of the strength of relationship between two variables (Field 2009, p. 791).

scores before and 12 months after participation; on average, participants scored less discomfort (Mean=0.77 SE=0.146) post-WHCH than pre-WHCH (Mean=1.57, SE=0.161), t(55)=4.679, p<.05, r=0.53.[8]

It appears that the annual score change mostly reflects improvements in summer comfort, with 54 per cent of participants reporting their home as too warm or much too warm prior to participation in WHCH, dropping to 27 per cent 12 months after participation.

Draughts

One of the most prominent factors reportedly influencing participants' experience of changes to their home's thermal comfort was draughts. Some 21 per cent of participants said they joined the program to stop draughts and/or fix gaps. Comparison of pre and post-participation data (see Figure 2.2) indicates important improvements in the draughtiness in homes, with the proportion of homes reporting draughts decreasing from over three-quarters to less than one-third.

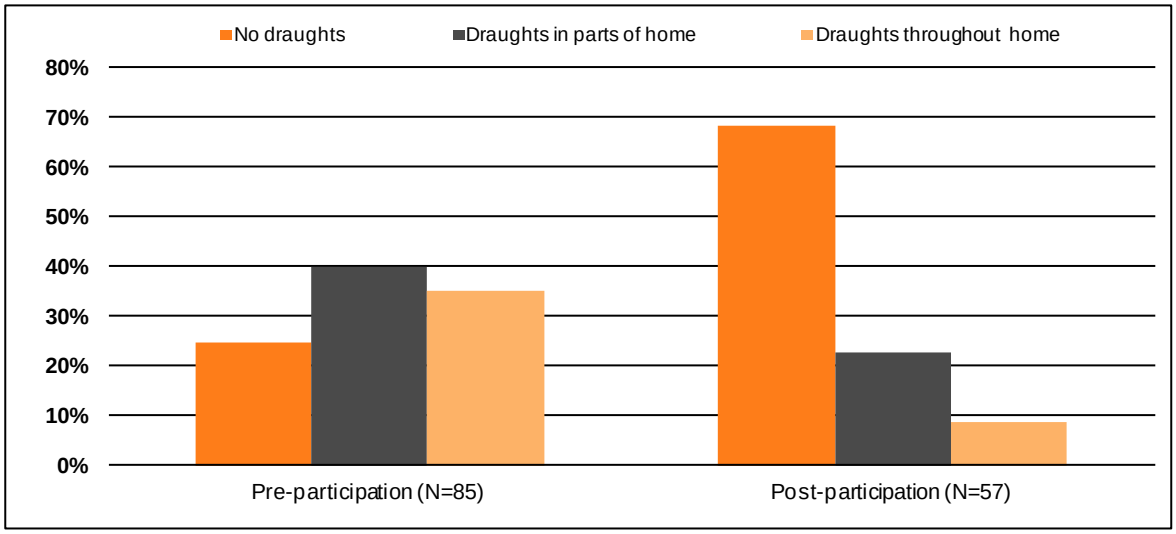

Figure 2.2 Presence of draughts in the home

Importantly, almost one-quarter (23 per cent) of the group completing the post-participation interview (N=57) moved from having draughts throughout their home to having none. Eight participants said that stopping or fixing draughts was the best thing about the program, for example:

> It's good they put the draught things [in] for me because I didn't have the money to pay someone else to do it for me.

Two-thirds of the people who received draught stripping reported fewer draughts after the program (Table 2.7), compared to one-quarter of those that did not receive it. One household that benefitted from fewer draughts is presented in the case study of 'Dimitra' (not her real name) on page 16.

Table 2.7 Draught stripping and reports of draughts (N=57)

	Draught stripping	No draught stripping
Fewer draughts	33	1
No fewer draughts	17	3
Total	50	4

8 p<.05 represents a statistically significant difference; r>0.5 is a large effect.

Condensation, damp or mould

Respondents were also asked to report problems with condensation, damp or mould in their homes on a three-point scale: 'no', 'yes in parts' or 'yes throughout'. As indicated in Figure 2.3, some 24 per cent of the sample reported condensation, damp or mould prior to participation, of which 6 per cent reported 'yes throughout'. Post-participation results indicated a decrease in the prevalence of condensation, damp or mould in homes, with only 14 per cent reporting 'yes in parts' and none reporting 'yes throughout'.

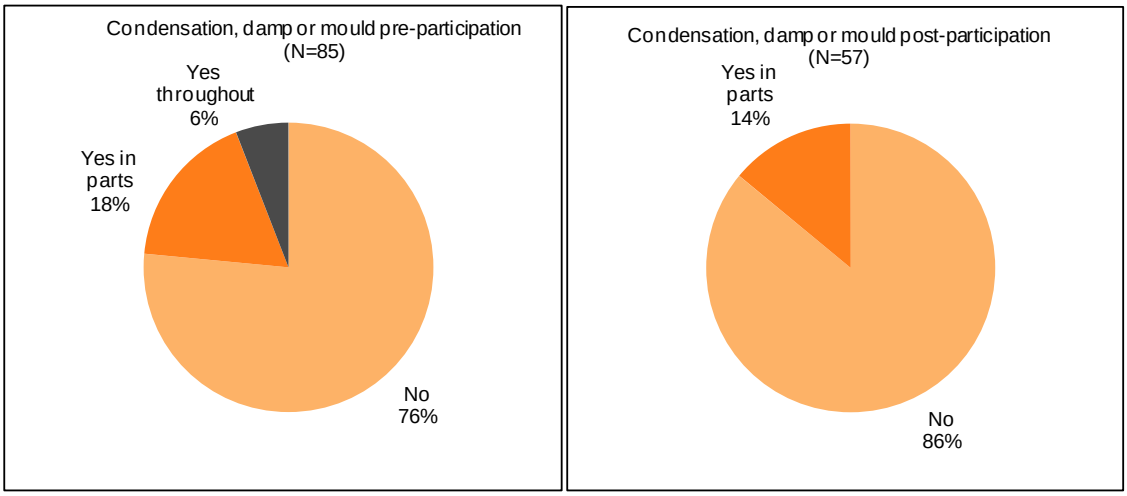

Figure 2.3 Presence of condensation, damp or mould in the home

What factors influence changes to the thermal comfort of homes?

Numerous factors are likely to influence the thermal comfort of homes and a study of this size will not be able to assess them all.

Analysis of the relationship between Mj saved and improvement in annual thermal comfort score did not show a correlation using the available data (N=23, r=.244, p=.131).

Analysis of the relationship between improvement in thermal comfort score and retrofit items installed found a negative correlation between total items installed and improved thermal comfort; that is, fewer items installed correlated to improved thermal comfort (r=-.309, p=.012). There was no significant correlation found between the number of thermal-related items installed (draught stripping, fans, insulation and external shading) and improved thermal comfort (r=-.154, p=.136).

Thermal comfort score changes were assessed in relation to mean monthly maximum and minimum temperatures (BOM 2012), and a significant correlation (Spearman's Rho, one-tailed) was found for both summer (N=56, r=.380, p=.002) and winter (N=58, r=.273, p=.019). The influence of changes in the weather needs to be considered when assessing these thermal comfort results.

Dimitra

Dimitra (not her real name) joined the WHCH program because she wanted to help the environment, and also hoped she could receive assistance in replacing her showerhead because she is concerned about the amount of water it uses, especially as her two teenagers do not always keep their showers under 4 minutes in length.

Dimitra is trying to make ends meet on a disability pension and $20 per fortnight child support for her second child, who is at high school. She says she gets 'frantic' about bills, which include $175 per week in mortgage payments. She says that she organises things as best she can, that she prioritises bills, and that her elder daughter (who is working) contributes $200 per fortnight to household expenses. Nonetheless, as she says, 'I do things for myself, basically', which means she cooks all her family's meals at home, cuts her own hair and has not been on a holiday for a number of years.

When we first met Dimitra, her whole house was draughty. She explained that she is very careful with heating and said that if she is home alone in the evening, she turns the heater off and goes to bed to economise. One of the things she hoped WHCH would do was help her with the draughty areas in her house.

Dimitra also said: 'I can't afford it, to do it myself. For a long time on my water bill it used to say "You can save water by getting a plumber to do this, or that". But how much does a plumber, or electrician cost? Sometimes people want to do the right thing but can't afford it. In the end, it comes down to the crunch. It's the bloody dollar.'

As part of the retrofit, Dimitra received draught stripping. In the post-participation interview, she reported no draughts, but because her house is on a slant, there is a gap at the top of the door that could not be fixed, so she now puts cardboard there to stop that draught. Dimitra reported that her thermal comfort had improved from 'much too warm' to 'comfortably warm' in summer.

When asked whether the program had influenced her thinking about energy efficiency, Dimitra said: 'I've always been conscious but having those things done has made it easier to maintain and for example when I bang on the door to tell the kids to turn off the shower after 5 minutes, at least I know it's still using less.'

When asked what had been the best thing about the program, Dimitra said: 'Cutting down costs. It's good to know I've got everything under control, so now I don't have to worry so much and keep an eye on everything.'

Health

A series of self-reported measures was used to elicit feedback from participants about their health and changes to their health after participation in WHCH. These included measures of overall health, respiratory conditions, pain, chronic illness or disability, and summer heat-related illness.

Overall health

As indicated in Figure 2.4, at the start of the study, around one-third of the sample (N=84) reported being in 'good' overall health, with almost 40 per cent rating their health below this, as 'poor' or 'fair', and 29 per cent rating their health higher, as 'very good' or 'excellent'. In comparison, the

2007–08 National Health Survey (ABS 2010) indicated a similar proportion of the population reporting their health as 'good' (29 per cent), but a much higher proportion of the sample reporting 'very good' or 'excellent' health (56 per cent) and only 15 per cent rating their health as 'fair' or 'poor'. This suggests a higher burden of health in the WHCH sample than in the general population.

Also as indicated in Figure 2.4, after participation in WHCH, 20 per cent rated their overall health as 'good', with 49 rating their health below this, as 'poor' or 'fair', and 31 per cent rating their health higher, as 'very good' or 'excellent'.

On average, participants reported poorer overall health post-WHCH than prior to participation.

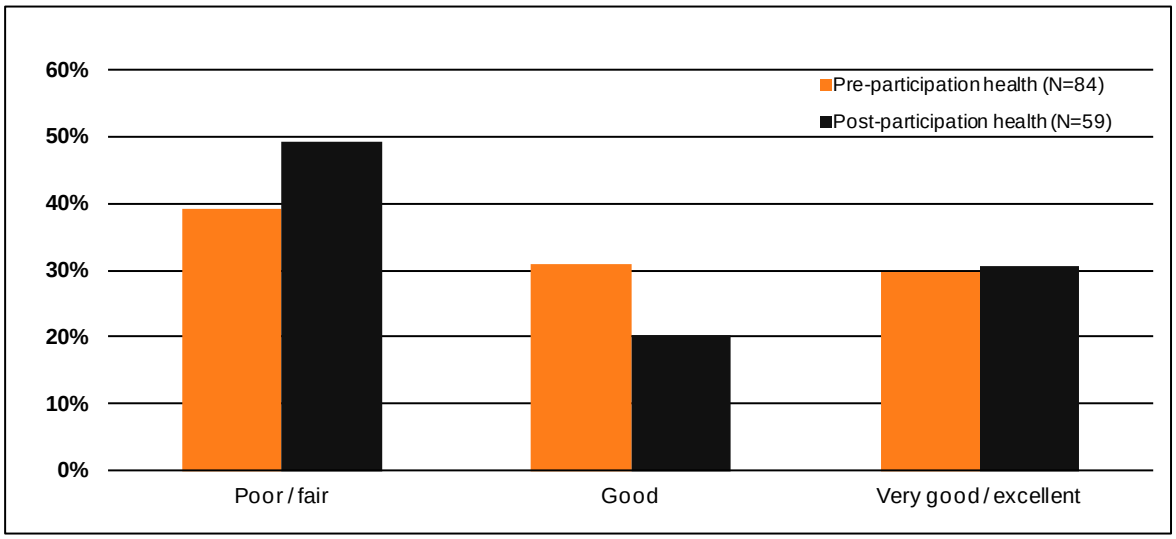

Figure 2.4 Pre and post-participation health status

There are a number of likely reasons for this, including:

- the age of the sample: just under half (49 per cent) of the final sample was aged over 65 years; a cohort of this age is likely to be experiencing declining health;
- specific health conditions experienced by the sample: these are discussed below.

Specific health conditions

Further investigation was conducted into specific health conditions known to be influenced by changes to the thermal comfort of homes, which can influence overall health.

Respiratory difficulties

In the pre-participation group, 39 per cent reported that they or someone in their home had a respiratory difficulty such as coughing, wheezing or asthma (Figure 2.5). Of these, 33 per cent had experienced symptoms in the previous four weeks: 13 per cent had mild symptoms, 15 per cent had moderate symptoms and 5 per cent had severe symptoms (requiring medical advice or attention). In the post-participation group, 43 per cent reported difficulties and 68 per cent of these had symptoms in the previous four weeks. In this group, the severity of symptoms was greater than in the pre-participation group, with 23 per cent having mild symptoms, 26 per cent having moderate symptoms and 19 per cent having severe symptoms.

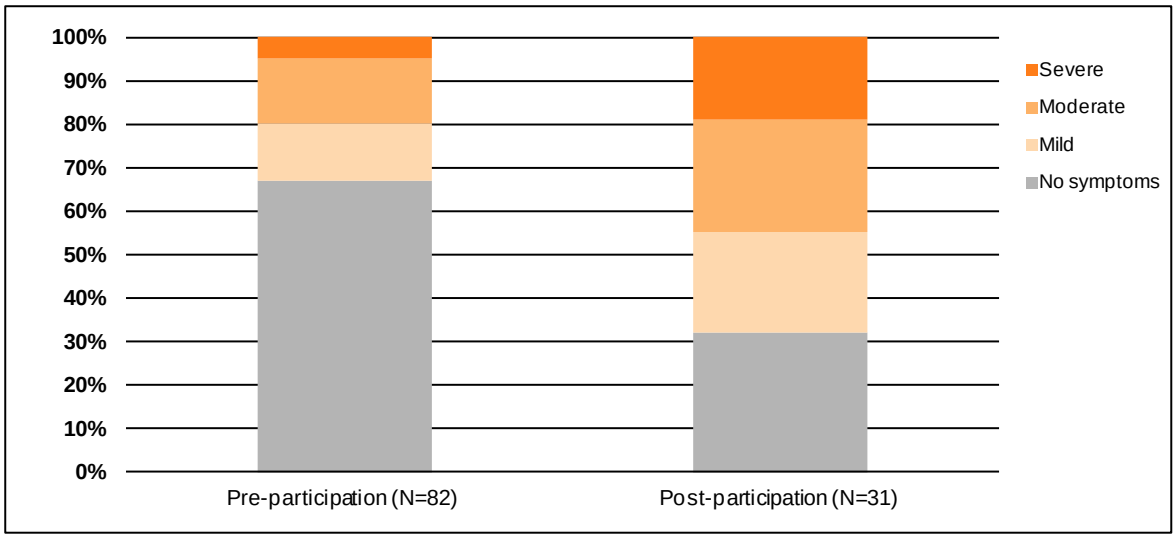

Figure 2.5 Symptoms of respiratory illness / condition in past four weeks

Summer heat-related illness

Of the 21 people reporting a heat-related illness during the previous summer, nine did not report such an illness in the follow-up interview. Of these nine people, seven had reported transitory health issues such as headaches, swelling feet, stress, heat rash and vomiting prior to joining WHCH.

Those with complex and chronic illnesses (such as migraine, arthritis, lymphoedema, complex regional pain syndrome or multiple sclerosis) still experienced heat-related problems after having participated in WHCH. An example of this is provided in the case study of 'Nicole' (not her real name) on page 21.

Participants' views on changes in health

Participants were asked to report on whether they thought the WHCH program had improved the health and wellbeing of themself or other members of their household.

Almost 60 per cent of respondents felt the program had improved the health and wellbeing of either themself or a household member.

Table 2.8 WHCH has improved the health and wellbeing of self or household members

Scale option	Number	Percentage
No, not at all	23	41.8
Yes, a little	17	30.9
Yes, somewhat	8	14.5
Yes, a lot	7	12.7
TOTAL	55	100.0

Participants who reported that the program had improved the health and wellbeing of themselves or a household member attributed this to the house being 'warmer in winter' and / or 'cooler in summer'. For some, this had the flow-on effect of using heating or cooling less than before. Others reported that their home was generally 'more comfortable'. For example, one participant who reported that WHCH had improved their health and wellbeing 'a lot' said:

> Because it keeps me warm, makes me not get cold, and the cold affects my asthma. Now I sleep beautifully in the night.

Another participant, who reported that their health had improved 'a little', said:

> It helps me keep cool and feel better because I can't handle the heat.

A participant who is the full-time carer of her elderly parents said that because her father is now immobile, it is harder to keep him cool and warm. She felt that WHCH had improved her parents' health and wellbeing 'somewhat', and explained that in particular:

> Not having to use the air-conditioning as much helps my parents' health.

Six participants specifically mentioned stopping draughts as the reason they felt the program had improved their health or wellbeing; while others talked of improved wellbeing from 'peace of mind'. For example, one participant reported that she 'felt good' knowing she had taken action on the things she could, and another said:

> Cutting down costs. It's good to know I've got everything under control, so now I don't have to worry so much and keep an eye on everything.

Another woman, whose son has Down syndrome and can easily develop pneumonia, said that the program had helped improve her household's health and wellbeing 'a little'. As she explained:

> It helps your wellbeing to know there is a good community thing—to know there is advice available.

One participant talked about what he had learned in the program:

> We manage the house a bit better, being more aware of controlling the temperature, so there's a greater sense of cosiness which is really good when you've got a little one.

Two participants reported improvements based on more tangential things. One said that although she had already made significant energy efficiency upgrades prior to joining WHCH, she now uses what she learned in the program when in discussion with the Office of Housing about further potential improvements:

> It allowed me to justify pushing the Office of Housing for energy efficiency.

The second said:

> [WHCH] improved our wellbeing because of the door [draught excluder] and fan. That improves our comfortability. It improved being warmer in winter. Even though they might not have said anything specifically on those things [health and wellbeing], it made us think a bit about it and take action.

Comments from the 42 per cent who felt the program had not contributed to any improvement centred on three main themes.

First, some participants felt that very little had changed in their home as a result of the program and as such, they did not believe there had been an impact on their health, for example stating,

> Because nothing much changed.

Second, some said that they had already undertaken significant energy efficiency upgrades, such as this participant, who explained:

> We're previously aware and doing everything possible.

Third, there was a group—exemplified by the following quotes—who said that the issues needing to be addressed in order to improve the efficiency of their homes were too great for WHCH to make an impact:

> Nothing is different, unless they give me money to fix my house. Then I would change the doors and the floors, they're moving; and change the tin roof in the bedrooms and move the laundry.

> I wouldn't say that [the program has improved our health and wellbeing] because we are getting old and we have issues and they'll never stop.

Nicole

Nicole is very energy conscious and rated highly on the energy-saving behaviours checklist used in the WHCH research, both before and after her participation in the program. Nicole joined WHCH to save money, and said she knew about energy-efficiency retrofitting works as she had done a few things herself already, such as installing radiant heat barrier shading on her windows.

Nicole has glass-wool ceiling insulation (unknown thermal resistance (R) value) and curtains, 10-year-old gas central heating, gas storage hot water, a gas cook-top, an electric oven, a refrigerator (age and condition not known), a toilet WELS rating of 3_0 and shower of 2_5.

Nicole has significant heat intolerance caused by multiple sclerosis (MS). At 20 degrees Celsius and above, her physical mobility, breathing and cognitive function all deteriorate. She has a medical need for refrigerative cooling, and although the Office of Housing installed air-conditioning in her home, it is not serviced regularly and the running costs are high. When she uses the air-conditioning freely, her electricity bills triple during the summer months. This creates a terrible double-bind for Nicole. Worrying about the costs of air-conditioning can impact in a negative way, causing MS relapses; but the risks of not using it are obviously greater.

Her brother helped her block some of the air vents in her home, to try to stop the cool air escaping, but she hoped that her participation in WHCH would assist her in further improving the thermal performance of her home.

She received the energy audit, two replacement low-energy light globes, two appliance standby power controllers and two lots of draught stripping.

Nicole reported that participation in the program improved her health and wellbeing, but she did not report improvement on any of the tested health measures.

The main benefit of the program from Nicole's point of view was that it provided her with the assurance that she was 'doing the right things' in making changes to her home, and it also 'allowed [her] to justify pushing the Office of Housing for energy efficiency'. Nicole said she would have liked to have received a written audit report and checklist that she could use when advocating with the Office of Housing.

Financial hardship

As discussed in the introduction, rising energy costs and the impact of these on household expenditure are important aspects of this research, as they relate to financial hardship. Two measures were used. These assessed financial hardship and billing hardship, and changes in these measures after participation in WHCH.

The hardship measure[9]—based on Butterworth & Crosier (2006) and using Household Income and Labour Dynamics Australia (HILDA) data (Melbourne Institute 2011)—asks participants to indicate whether they experienced any of a group of hardship-related situations in the preceding six months. The measure is a count of how many of these 'hardships' the households experienced and ranges from zero to seven.

[9] Variables in the measure are listed on page 14 of Johnson & Sullivan (2011).

The data in Figure 2.6 shows an increase in financial hardship overall; the proportion of people reporting no hardships decreased from 61 per cent to 57 per cent.

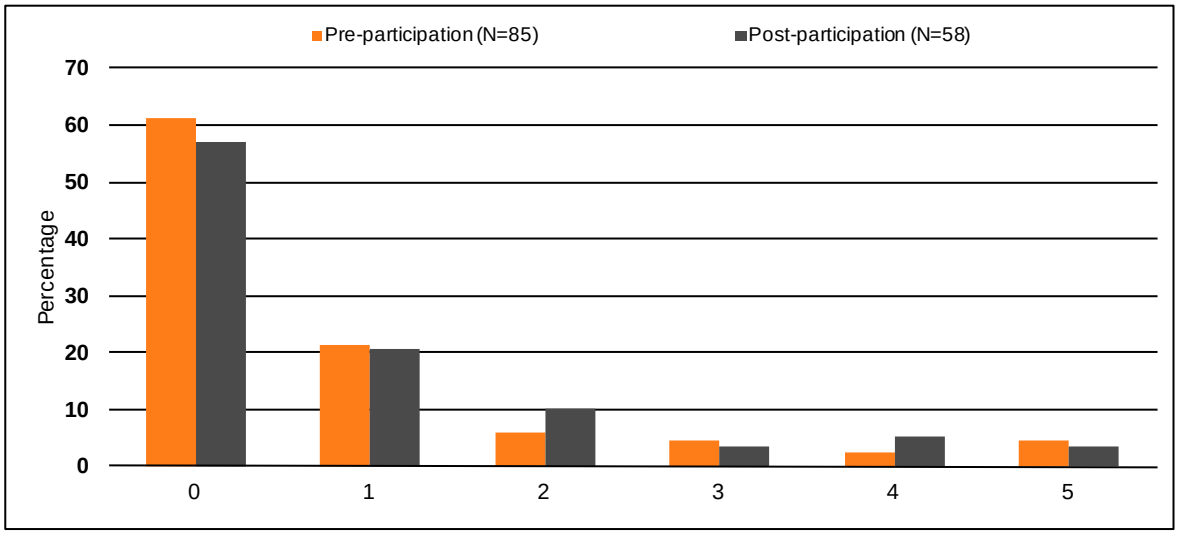

Figure 2.6 Number of financial hardships reported

An assessment of individuals' pre-participation and post-participation scores indicates that the financial hardship score deteriorated for 17 per cent of the group and improved for 14 per cent, while most people's (69 per cent) did not change.

Associated with financial hardship (in the context of this research) is ease or difficulty in paying energy bills. The data in Table 2.9 demonstrates an increase in people's self-reported difficulty in paying bills. It is likely that the main reason for this relates to the 9.2–13.6 per cent increase in Victorian energy (electricity and gas) standing offer prices between 2009 and 2011 (calculated from AER 2011, p. 114). Assessment of individuals' pre-participation and post-participation scores indicates that ease or difficulty of bill paying deteriorated for 32 per cent of the group, improved for 21 per cent, and did not change for almost half of the group (47 per cent).

Table 2.9 Extent to which WHCH made it easier to pay energy bills

Rating	Percentage (N=53)
No, not at all	71.7
Yes, a little	17.0
Yes, somewhat	7.6
Yes, a lot	3.8
TOTAL	100.0

Most people (72 per cent) felt that the program had made no difference to their ability to find the money to pay for electricity, gas and other fuel bills. For most, this was because they felt there had been no change to the amount of energy used in their home as a result of the program.

Others saw budgeting for bills as a separate issue to energy use. This group made comments such as:

> It doesn't make any difference because of EasyPay.

> Because I've just got a budget every fortnight and that's just what I do. It had nothing to do with them coming here really.

Another group felt that paying bills was not easier because prices were going up. Their comments ranged from those who felt that the program had not made an impact and rising prices worsened their situation, to those who felt that any potential improvements from the program were masked by rising prices, for example:

> The only thing is the bills are still coming in high.

Feedback on participation in the program

The interviews elicited feedback from participants on why they joined the WHCH program and whether or not it had met their needs.

Reasons for participating

People provided multiple reasons for joining the program (Figure 2.7). These included saving money and energy, helping the environment, and learning more / obtaining expert advice:

> I use resources carefully, I want to do what I can environmentally, within my finances.

Some people joined WHCH because they wanted to make their homes more comfortable—warmer or cooler. Some joined to access specific items (most of which related to fixing or stopping draughts), and some people sought assistance with the installation of energy-saving products.

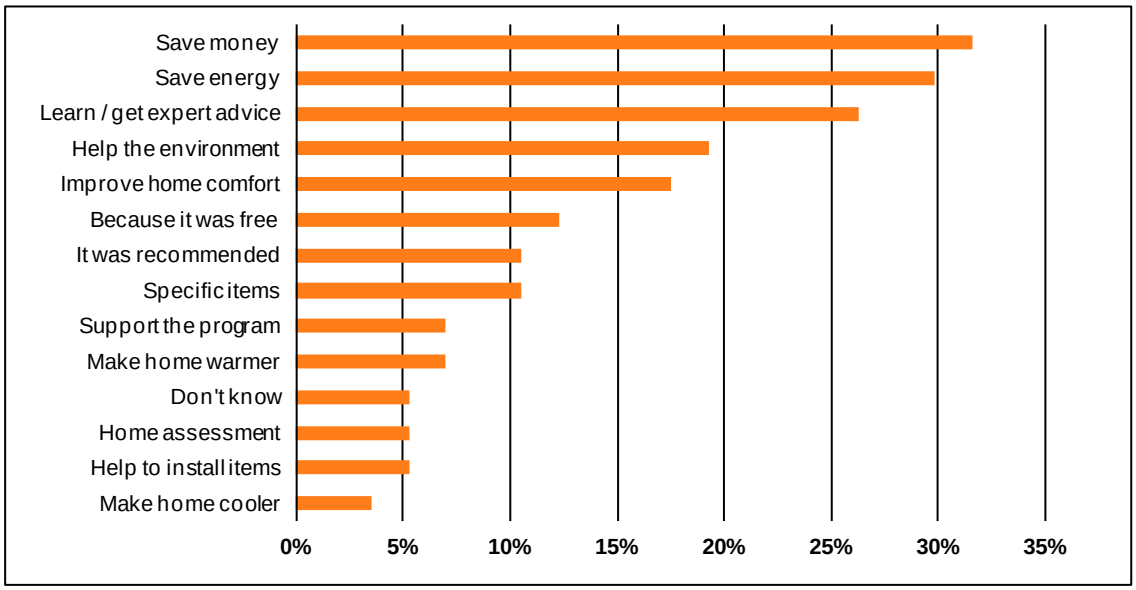

Figure 2.7 Reason for joining the program (N= 57, with multiple responses collected)

Some people had joined simply because the program was offered through a trusted source or because they trusted the BSL—for example, stating: ‘because someone from the council came to the RSL, so I put my hand up to check it out’—and some people could not remember or did not know why they had joined the program.

Satisfaction with the program

Satisfaction with the program was high:

- 55 per cent reported the program met their expectations;
- 29 per cent reported the program was better than expected;
- 16 per cent reported the program was below expectations.

Participants commented on the following positive aspects of the program:

- The products and advice received made a difference to the home comfort and energy usage of some participants.
- The work teams were polite and friendly, cleaning up after themselves and completing all the work.
- Despite not receiving a hardware retrofit intervention, some participants were glad they had had their homes checked and found that they had 'done all they could'.
- Participants appreciated the ease of the project's delivery (a phone call followed by a home visit) and the access to 'expert advice'.
- Having someone come and 'do it for me' was valued by participants who felt that they did not have the knowledge or physical ability to make changes, and by those who reported that they could not afford tradespeople to come and do the work for them.

Another group of people felt a wider sense of support from the project; for example, stating that the best thing about the program was:

> Knowing there are programs and assistance available.

And:

> It was a statement that someone cared.

Furthermore, two-thirds of the participants reported that they had recommended the program to family or friends.

Almost three-quarters of participants reported positive changes they had experienced as a result of the program. These included deepening awareness about energy use and energy savings in the home, thereby saving energy and saving money on bills, for example:

> Bills improved and usage down; that's financially AND morally positive.

Many others were positive about the specific items they had received, most commonly items that had decreased draughts in their home.

Suggestions to improve the program

Some participants gained less from the program than they had anticipated or hoped for. People who expressed dissatisfaction with the program had experienced faulty workmanship or products, had the job left unfinished, or had not experienced improvement in home comfort or decreased energy use. A small number felt that the work teams were not adequately trained or skilled to undertake the work safely, and some people felt that communication and follow-up needed to be improved; for example, one participant had not received items that she believed she would be given as part of the program. One person reported that the workers were rude, and one person felt the program was intrusive.

Of the 27 people providing ideas as to how to improve WHCH, almost half suggested either extending the program so it reached more people, or extending the types of actions that could be undertaken as part of the program, such as:

- fixing broken windows or upgrading them to double-glazing; fixing holes in walls;
- providing and installing insulation;
- fixing / replacing appliances (for example, one participant's stove hotplate was not working, so two needed to be used at once);
- providing subsidies to make energy efficiency upgrades (with information about these made available through WHCH);
- providing a written record of the audit and recommendations;
- making energy efficiency information available online.

This indicates that not only are some households unable to afford basic energy efficiency upgrades, they are unable to undertake or afford basic home maintenance that impacts upon their home's efficiency. Some issues will require a more bespoke service in order to be rectified.

Vulnerable populations

As discussed in the introduction, people on low incomes, renters, people with chronic illnesses and disabilities, and those living in poor-quality housing are more likely to experience the negative impacts of climate change and rising energy prices than others. High-energy users are more likely to experience greater energy-related hardship; and those in poor-quality housing with older and inefficient appliances, and those in large families face significant challenges to decreasing their energy use. Low-energy users whose usage is low because of rationing—and who potentially forgo benefits of household energy—also face significant hardship.

In this research, differences have emerged in the experience of the program and the benefit of the program for two of these groups: renters, and people with chronic illnesses and disabilities.

Renters

Just under one-quarter of the pre-participation sample (24 per cent) did not own their own home. This had decreased to 19 per cent at the follow-up interview.

Overall, renters presented more positive feedback on participation in the program than home owners, both in relation to the extent they engaged with the program and also in relation to the self-

reported benefits experienced. However, the data must be regarded with caution, as they only represent the views of 12 program participants.

Motivations for joining the program were divergent, with renters most likely to join the program to help the environment, followed by saving money. For home owners, saving money was the most commonly reported reason to join.

Renters were more likely than home owners to have made the changes recommended by the auditors (78 per cent compared to 71 per cent) and were also more likely to be implementing changes to a considerable extent, or completely (56 per cent compared to 43 per cent). Nonetheless, renters were also more likely to report barriers to implementing recommended changes (42 per cent) than home owners (31 per cent), most commonly being unable or unwilling to attain permission to make changes. The cost of energy efficiency upgrades was also a commonly reported barrier for this group, as it was for home owners.

Program impacts

As discussed above, participants were asked whether participation in the WHCH program had led to reductions in home energy use and improvements in home comfort, financial hardship and health. Again, renters presented a positive view of their experience.

Figure 2.8 indicates that more than half (58 per cent) of the renters—compared to 33 per cent of home owners—reported reductions in home energy use.

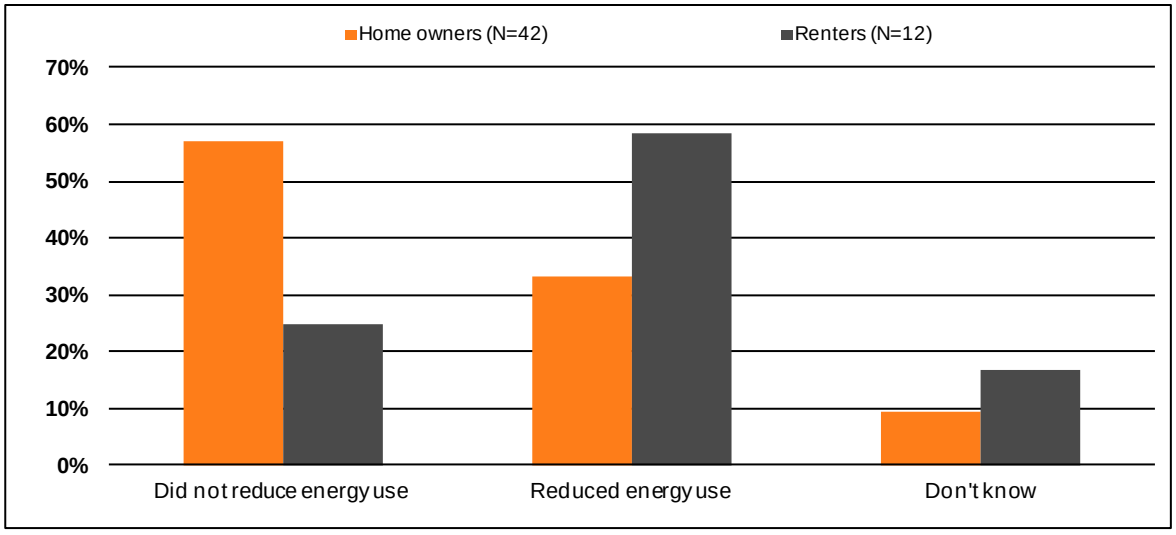

Figure 2.8 Self-reported reduction in energy use as a result of program participation

Most renters (82 per cent) reported improved home comfort on the thermal comfort scale, compared to 58 per cent of home owners. This is likely to relate to decreased draughts in the home (Figure 2.9), experienced by almost three-quarters of renters.

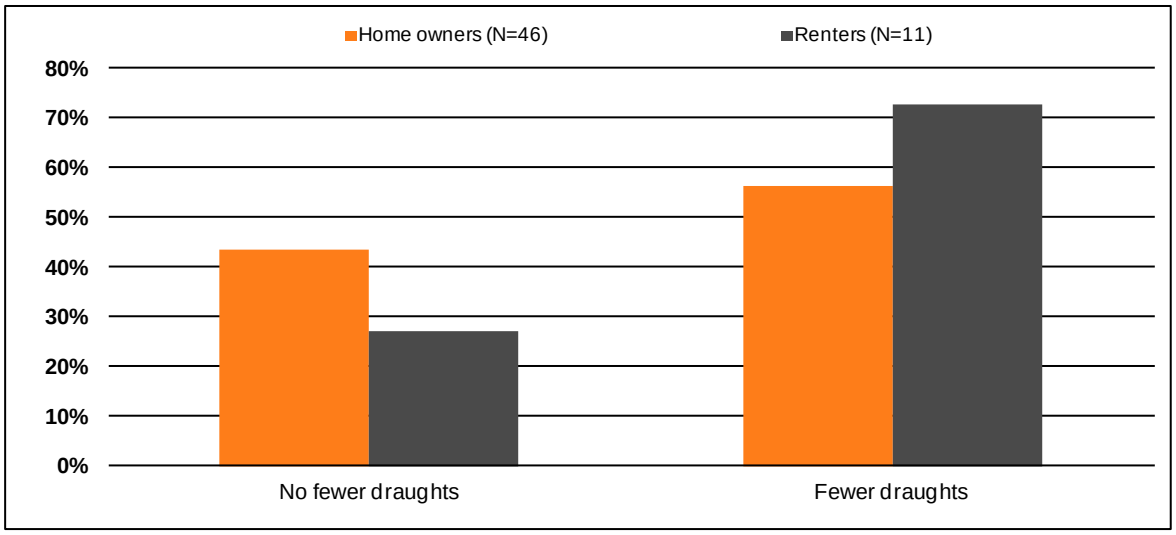

Figure 2.9 Change in draughts

The most striking difference between the two groups relates to health and wellbeing. All of the renters reported improved health and wellbeing as a result of program participation (Figure 2.10) compared to less than half of the home owners. This may relate to the relatively older age of home owners compared to renters.

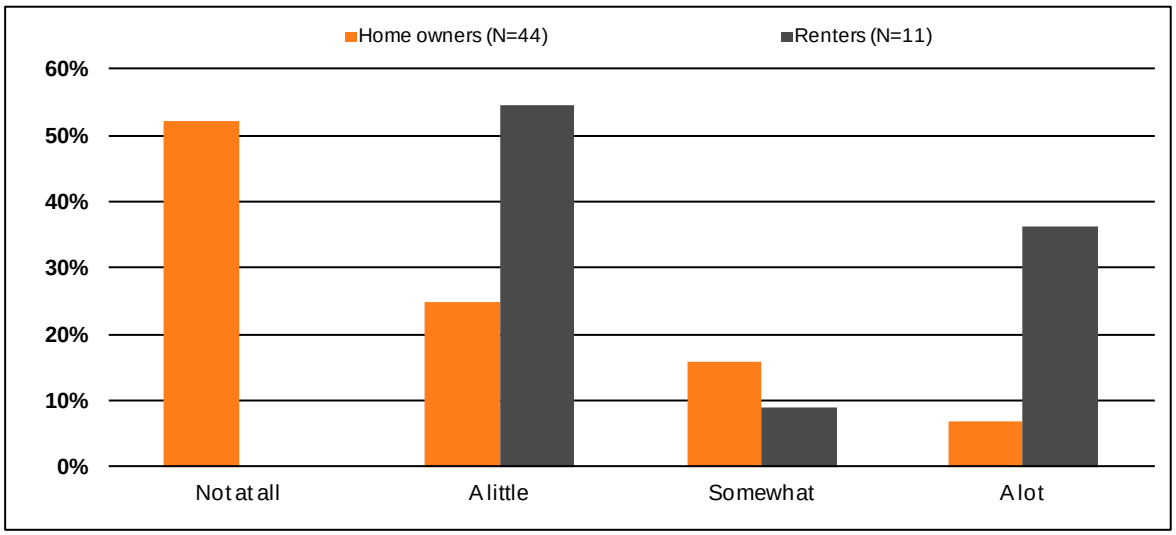

Figure 2.10 Extent to which the program improved health or wellbeing of self or household members

One important area where renters fared worse than home owners was reflected in the financial hardship score (Figure 2.11). Some 41 per cent of renters reported post-participation financial hardship that was worse than before participation in WHCH. This may relate to the combined pressures of increasing costs of both rental housing and electricity during the study period.

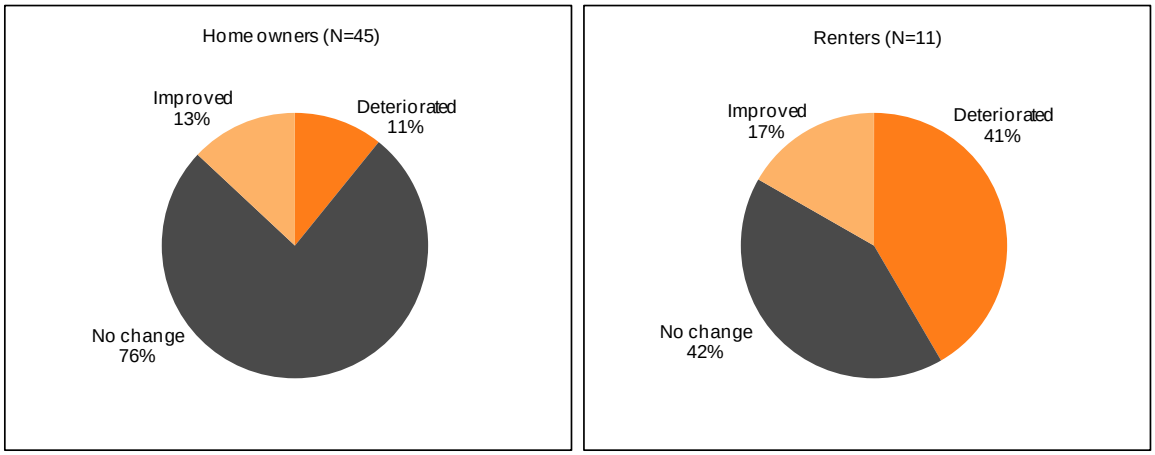

Figure 2.11 Financial hardship score change

People with chronic illnesses and disabilities

Almost 60 per cent of respondents felt their participation in the program had improved the health and wellbeing of either themself or a household member. However, separately reported health measures showed that, on average, participants reported poorer overall health post-WHCH than prior to participation. This seemingly contradictory result may be influenced by the tendency to report positively about services received. Comparison to the separately collected health measure provides important additional information in this case.

Both the incidence and severity of self-reported respiratory health conditions increased after participation in WHCH. Further, while the incidence of people reporting pain decreased, an increased proportion of those people experiencing pain reported 'severe' pain. Almost half the group reporting summer heat-related illnesses did not experience them in the summer following participation in the program. However, most of those with complex and chronic illnesses still experienced heat-related problems after having received the WHCH service.

It is difficult to assess the cause of these outcomes. Some possibilities include:

- The attrition rate from the program for younger people was higher than that for older people, and almost half of the final sample was aged over 65 years. A cohort of this age is likely to be experiencing declining health.
- The minimal depth of intervention may have been noticeable for those people experiencing mild or transient health problems, but not for those people experiencing major or severe chronic health problems.

3 Concession Assist

The WHCH program was significantly altered during 2010 and the scope of the program and mode of delivery were changed. The new program, Concession Assist (CA), was a free home energy efficiency audit and retrofit service provided to 664 households. It was delivered as a service of Zero Carbon Moreland.[10]

The primary changes in the program from WHCH to CA were:

- the integration of an enhanced behaviour-change component through Zero Carbon Moreland;
- streamlining the customer experience, including a scaled-down energy audit and a single-visit model for all households in the program;
- insulation was no longer offered as part of the program.

CA ran from November 2011 to June 2012 (WHCH ran from September 2009 to March 2011).

The CA program involved trained home energy efficiency assessors visiting householders at home and providing the following services:

- undertaking a home energy efficiency audit;
- installing energy efficiency products into the homes at no charge; items were installed based on the needs identified in the energy audit and could include one or more of the following:
    - draught stripping;
    - window shades;
    - water-saving showerheads;
    - energy-saving light bulbs;
    - insulation for hot-water pipes; and
    - easy-to-reach switches to reduce standby power usage (BSL 2011);
- providing the householders with energy efficiency advice for their home;
- providing ongoing support through Zero Carbon Moreland (MEFL 2011).

Methodology

This redevelopment of the program created an opportunity to undertake a second piece of research that was more forward-looking.

The CA research investigates the relationships between home energy use, the factors underlying home energy use, and barriers to more optimal use of energy in the homes of people on a low income living in the City of Moreland. The 'optimal outcome' is understood in terms of improved thermal comfort, decreased energy costs and carbon emissions reductions. Table 3.1 presents a summary of the issues explored with participants in this research; these are thermal performance of dwellings, energy-use behaviours, energy costs, energy management, the impact of the CA program, unmet needs and effective communication.

[10] Zero Carbon Moreland supports residents with a variety of tools and advice, including workshops, personal sustainability advice over the phone, special offers and incentives, and an online carbon calculator and action plan creator (MEFL 2013b).

The hypotheses underpinning this research are:

- the energy efficiency of homes and appliances of people on a low income is poor;
- the thermal comfort of homes of people on a low income is poor;
- people face cost, information and trust barriers to making changes to the efficiency and comfort of their home;
- people have insufficient information about energy markets to be able to participate effectively in them;
- the combination of these factors leads to poor outcomes for people on a low income in relation to thermal comfort, home energy costs and carbon emissions.

Table 3.1 Summary of issues explored in the research

Issue	Topics covered
Thermal performance of dwelling	Self-reported home comfort levels
Energy use behaviours	Day-to-day and investment behaviours
Energy costs / fuel poverty / financial hardship	Energy-associated financial hardship currently being experienced
Energy management	Reading and understanding energy bills; attitudes to Green Energy
Impact of CA (where applicable)	Impact of CA on home energy efficiency, thermal comfort, householder knowledge and behaviour, and financial hardship
Unmet needs in relation to energy and appliance efficiency, thermal comfort, householder knowledge and behaviour, and financial hardship	Barriers to addressing unmet needs
Effective communication for engaging with low-income households about energy efficiency and energy literacy	Householders' knowledge of where to get good-quality, relevant information about energy optimisation and efficiency; householders' preferred modes of communication

The research groups

This research was conducted with three groups:

- completers: people who received the CA home energy audit and retrofit service, delivered by the BSL;[11]
- non-completers: people who joined the CA program but later discontinued their participation;
- workshop groups: people recruited to the research from outside the CA participant group.

Completers

The research with people who had completed the CA program examined their understanding of energy efficiency and energy management, and assessed whether this had been influenced by their participation in CA. A survey sought participants' views on what further action they felt was required to improve outcomes in their household in relation to energy efficiency and energy

[11] Note, however, that one of these households received the retrofit service from Kildonan UnitingCare.

management, and explored their preferred modes of communication for engagement regarding energy efficiency and energy literacy.

Non-completers

The non-completers' research also examined people's understanding of energy efficiency and energy management. A survey sought their views on what further action they felt was required to improve outcomes in their household in relation to energy efficiency and energy management, and explored their preferred modes of communication for engagement regarding energy efficiency and energy literacy. In addition, the research assessed their reasons for withdrawing from CA and sought to identify possible program modifications that could make the program more suitable to their needs.

Workshop groups

A further group of people who had not participated in CA were engaged in workshops about using energy and saving energy at home. This was done to explore and 'unpack' some of the issues identified in the research, and to discuss issues with a group that potentially differed from participating groups. The workshop group research primarily aimed to understand people's unmet needs in relation to:

- the thermal performance of their home;
- appliance efficiency;
- energy management (behaviour and participation in the energy market).

It also aimed to understand barriers that exist in relation to addressing these needs.

A summary of the questions explored with each of the three groups is presented in Table 3.2.

Table 3.2 Questions for groups

	Completers	Non-completers	Workshop groups
Thermal performance of home	✓	✓	✓
Understanding of energy efficiency and energy management	✓	✓	✓
Further action required to improve home energy efficiency	✓	✓	✓
Preferred communication about energy efficiency and energy management	✓	✓	✓
Feedback on CA program	✓	×	×
Reasons for withdrawing from CA and possible modifications to make program suitable for them	×	✓	×
Barriers to further action on home energy efficiency	✓	✓	✓

Data collection

Data was gathered from the three research groups in order to investigate the relationships between home energy use, the factors underlying home energy use, and barriers to more optimal use of energy in the home of people on a low income living in the City of Moreland. Results were obtained in areas such as household energy use, home comfort, financial hardship, additional action taken, future energy efficiency plans, feedback and reasons for discontinuation of the program. As the demographics of the groups varied, so too did some of the results.

As described above, data was collected from three groups of people: completers, non-completers and workshop groups. The methods of data collection with each group are described in the following sections.

Completers

All CA participants were sent a survey (via an emailed link or a posted hard copy) and invited to participate. A follow-up survey was distributed two weeks later to non-responding households. People who completed the survey received a $20 Coles Myer Gift Card. Of 281 surveys distributed, 84 useable surveys were returned.

Non-completers

All CA non-completers were sent a survey (via an emailed link or a posted hard copy) and invited to participate. A follow-up survey was distributed two weeks later to non-responding households. People who completed the survey received a $20 Coles Myer Gift Card. Of 123 surveys distributed, 30 were returned.

Table 3.3 Survey responses

	CA completers	CA non-completers
Surveys sent out	281	123
Surveys returned	96	30
Surveys used in final analysis	84	30
Proportion of participants represented in final analysis	**30%**	**24%**

Workshop groups

Data collection in this group involved participation in an interactive workshop designed to elicit information about people's experiences and knowledge, and to share information about energy efficiency and management. As indicated above, workshop participants were recruited from outside the CA program group.

Recruitment to the workshops involved a two-step process. First, community organisations—such as Neighbourhood Houses, Community Learning Centres and Community Health Centres—were contacted to discuss the research. Second, expressions of interest were sought from them to host a workshop.

Host organisations promoted the workshop and invited attendees. A total of 33 people participated and each received a $40 Coles Myer Gift Card. A follow-up phone survey was conducted with seven participants.

Workshop data was collected in semi-structured group discussions and through interactive activities.

Research sample characteristics

Completers

Nearly three-quarters of CA completers were home owners, with 50 per cent owning their homes outright, and another 23 per cent having a mortgage. The remaining 27 per cent were renters: 20 per cent in private rental properties and 7 per cent in public rental properties. Around three-quarters of CA completers lived in fully detached, freestanding, separate homes (73 per cent); 17 per cent lived in an apartment in a one or two-storey building or a complex of four or more storeys; and the remainder lived in a semi-detached unit, terrace, townhouse or dwelling combined with a non-dwelling (8 per cent), or a granny flat (3 per cent).

Respondents aged 75 and over made up 18 per cent of the completers group, with just under 40 per cent aged 55–74. Another 37 per cent were aged 25–54, with the remaining 6 per cent aged 18–24 (Table 3.4).

Table 3.4 Age of respondents (N=68)

Age group	Percentage
18–24	5.9
25–54	36.8
55–64	14.7
65–74	25.0
75+	17.6

Almost half the completers were aged 65 and over, and almost a quarter had children present in the home (Table 3.5).

Table 3.5 Proportion of age groups in households (N=84)

Age group	Percentage
Children (0–17 years)	23.8
Working age (18–64 years)	72.6
Older / retired (65+ years)	46.4

Household size tended to be small (Table 3.6), with over half the group living in single or two-person households.

Table 3.6 Household size (N=72)

Household size	Percentage
1	28.6
2	26.2
3	17.9
4	4.8
5+	8.3

Most respondents had received some education, with 37 per cent having a university or TAFE qualification and 17 per cent having completed Year 12 or equivalent. Of the remainder, 23 per cent had completed some secondary school, 14 per cent had attended primary school, and 2 per cent had not attended school.

English was spoken as a first language by 76 per cent of participants (N=20). The majority of participants who did not call English their first language spoke English well or very well (80 per cent). The remainder (20 per cent) did not speak English very well.

More than half of the CA participants (61 per cent) were holders of a Pensioner Concession Card, nearly a quarter (24 per cent) held a Health Care Card, and the remaining participants held a Veterans' Affairs Card (2 per cent) or Seniors Health Care Card (2 per cent).

Analysis of concession card type by age provides further insight into the group. All of the youngest cohort (aged 18–24 years) had a Health Care Card, indicating that they were either students, working with a low income, or jobseekers with an income of between $407.50 and $533.80 per fortnight.[12] The 25–54-year-old group was fairly evenly divided between Health Care and Pensioner Concession Card holders. Those aged 55 and above were mostly Pensioner Concession Card holders, indicating that they were not in the labour force due to retirement or disability, with an income of between $536.70 and $712.00 per fortnight.[13]

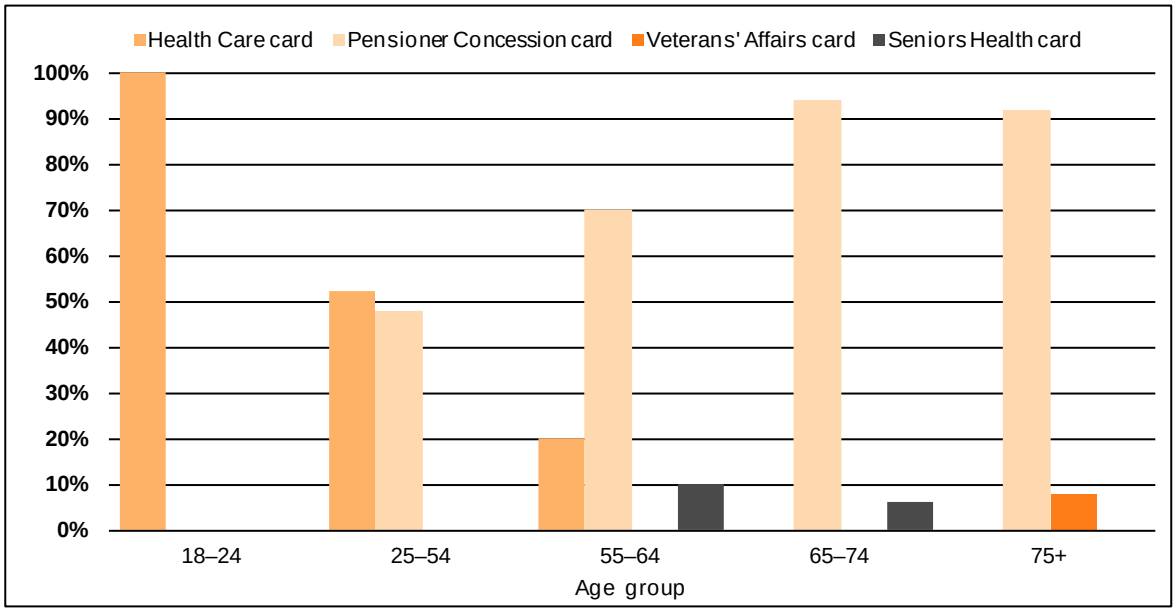

Figure 3.1 Concession type by age group (N=68)

Non-completers

The non-completers group were slightly less likely to own their home outright (46 per cent), but were more likely to be paying off a mortgage (32 per cent) than the completers group (23 per cent). The proportion of private renters was similar to those who had completed the program (21 per cent), but there were no public housing tenants in the non-completers group. Non-completers were more likely to be living in a semi-detached residence (25 per cent) than program participants (17 per cent).

[12] Based on maximum allowances for Abstudy, Youth Allowance and Newstart (DHS 2013a, 2013e, 2013d).
[13] Based on maximum allowances for Disability Support and Age Pensions (DHS 2013c, 2013b).

While the majority of the group were holders of a Pensioner Concession Card (56 per cent), nearly half were holders of a Health Care Card (40 per cent), and the remainder were holders of a Veterans' Affairs Card (4 per cent).

As shown in Table 3.7, some 43 per cent of respondents were aged between 25 and 54. There were also a high percentage of respondents (20 per cent) aged 75 years and older.

Table 3.7 Age group of respondents (N=30)

Age group	Percentage
18–24	3.3
25–54	43.3
55–64	13.3
65–74	6.7
75+	20.0

Most (90 per cent) of the non-completer households were made up of individuals of working age (18–64 years), and just under half (40 per cent) had children present in the home (Table 3.8). These figures may suggest why these participants did not complete the program—they may have had other commitments that did not allow them the time to be involved further.

Table 3.8 Proportion of age groups in households (N=30)

Age group	Percentage
Children (0–17 years)	40.0
Working age (18–64 years)	90.0
Older / retired (65+ years)	26.7

Household size tended to be moderate (Table 3.9), with over three-quarters of the group living in households of one to three people.

Table 3.9 Household size (N=29)

Household size	Percentage
1	26.7
2	23.3
3	30.0
4	10.0
5+	6.7

Workshop groups

Two of the groups were of women aged between their early 20s and their late 60s, most of whom spoke languages other than English. The third group comprised men and women mostly in their 70s who were mostly confident in English. Workshop participants lived in a range of household sizes, from one person to eight people. One participant was homeless.

Workshop participants were not asked whether they had a Commonwealth concession card; however the community house coordinators were advised that the groups were only open to those with a Commonwealth concession card. Coordinators reported that most, if not all, would have a Commonwealth concession card.

Most of the people participating in the telephone follow-up after the workshop identified that they had joined the workshop because they were already connected to the community centre and wanted to support its activities. One person had joined because she wanted to learn more about how to save energy:

> ... because of the carbon tax and bills in the future.

Another participated because of the Coles Myer Gift Card that was being offered in recognition of people's contribution to the research.

Feedback on participation in the program

The research explored reasons why people joined the CA program and what their experience of the program had been. Respondents were asked questions to help determine whether they had found the program useful or not, how it had been useful, and how they believed it could have been improved.

Saving money was the most commonly reported reason for joining the program (27 per cent). As one respondent explained:

> Due to my financial situation, I was seeking ways to save money and reduce bills.

Saving energy (21 per cent) was also reported as a major reason for participation. One respondent stated that they took part:

> To get advice about the best and simple ways of being energy efficient and how to save on my energy consumption.

Improving the temperature of their home was the third most commonly cited reason for being part of the program (18 per cent). One person said:

> My house is very cold in winter and hot in summer and I was hoping we could work out some strategies to help with this.

Some 15 per cent reported 'helping the environment' as a reason to be involved:

> To understand ways to improve the environmental impact of living in our flat.

Others explained that they participated because the service was free, the program had been recommended by friends or family, or they wanted to get an expert assessment of their energy use.

Non-completers (N=27) had a stronger focus on saving energy (42 per cent), followed by saving money (26 per cent) and improving the thermal comfort of their homes (8 per cent).

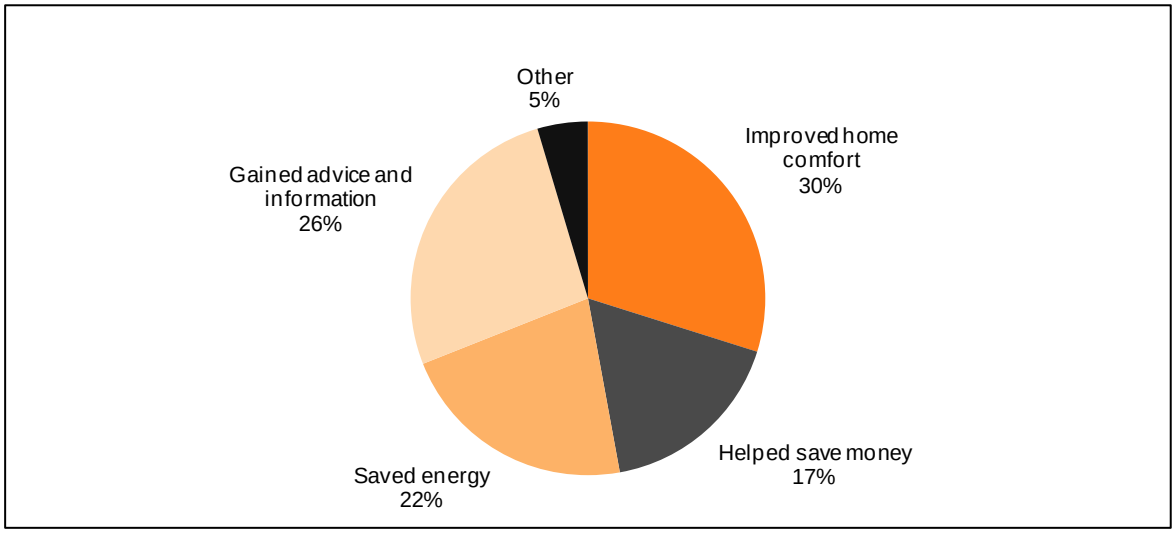

Figure 3.2 Ways in which the CA program was useful (N=84)

All respondents reported that the program had been useful, with 72 per cent stating that it was very useful and the remaining 28 per cent stating that it was a little bit useful (N=84). Figure 3.2 shows the ways in which respondents found the program useful. Improved thermal comfort within their home was the most commonly reported reason (30 per cent), with almost a quarter explaining how the elimination or reduction of draughts—via program products and advice—had been a major factor in improving their thermal comfort. As one respondent commented;

> [The program] taught me ways I didn't know of in regards to keeping house warm and cool.

Others commented generally that the advice and information they received was useful (26 per cent) or that the program had been useful in helping them save energy (22 per cent). Some reported that they were able to save energy via the installation of products they had received through the program, for example:

> Provided a controller to turn off power to TV video and set top box. Given a clothes-airer which I use in front of the heater to dry clothes on rainy days.

Others reported that the program had resulted in them saving money (17 per cent), for example:

> We got lower bills and we did not have to use as much energy at all.

> Helped me save energy and bring down energy bills.

Half of the respondents (50 per cent) reported that participating in CA had made them feel that they were doing something positive about energy efficiency, for example:

> Yes. I am keen to do all I can and the program assisted where financially I did not have the means to do so.

> It helped confirm the behaviours I already had to save energy were working and also inspired me to do more.

> Yeah, though there's always more that can be done, but limited as a renter ☹.

Although all 84 CA participants reported the program was useful, seven of them expressed some disappointment in the program. This was reportedly due to being unhappy with the service, or disappointed with product failure or installation difficulties. Some also believed that more should be done. Suggestions made to improve the program included providing more and larger products and installations, opening the program up to more people, providing discounts on related products and services, and providing more information. As one respondent said:

> Another exhaust fan in the toilet was not capped as your workers considered they could not gain access to it. No help at all with windows—apparently this aspect was not covered in Moreland (although I believe Hume had included it)

Most respondents (91 per cent, N=76) agreed the program had helped them understand their home energy use better. Of these, 53 per cent found that the program helped a lot and 38 per cent found that it helped a little, for example:

> It was great how preceding the induction stage we had a 'tour' of the house and things were pointed out to me that I did not realise.

> Understanding how in so many little ways huge changes in energy levels are possible.

A small proportion (8 per cent) reported that the program had not helped them understand their home energy use more, as the information, help and advice given was too basic, for example:

> Advice and products too basic for my needs. I was already aware I have a basic understanding of ways to reduce energy.

Discontinuation

Survey participants who did not complete the program provided a variety of reasons as to why, including moving house, going on holiday, health issues, bereavement, and service-related issues. For example, two respondents reported they were never contacted after signing up, while another was unable to make any of the appointments and was then not contacted further. Lack of information was also given as a reason by one respondent. Another reported that they were told they could not be involved because they were renters. One respondent reported that discontinuation was due to a lack of follow-up on their part, while another stated that they did not require the service.

While the majority of respondents did not have any suggestions for improvement or suggestions as to what could have helped them remain in the program, three respondents suggested that more and better communication and information was needed.

A further six of the 30 non-completing respondents seemed confused as to whether they had participated or not. They were recorded as having not received the service, but thought that they had.

Household energy use

The use of energy within homes is influenced by a number of factors, including climate and weather, characteristics of the dwelling and household appliances, and the behaviour of people living in the household (DEWHA 2008).

This research explored aspects of respondents' home energy use and sought feedback on whether the CA program had impacted positively on their energy use. More than three-quarters of respondents (76 per cent) reported that CA had helped reduce the amount of energy used within their homes. The remainder reported that due to the timeframe of the program and the research, they were unable to make an accurate comparison.

Retrofit items and advice to households were the mechanisms provided to assist in energy-use reductions in the home.

Energy-saving items received by households that completed the program are shown in Table 3.10. Most households (90 per cent) received draught stripping and 76 per cent had standard light globes replaced with low-energy ones. Most participants were advised to use their dryer less and / or switch off power standby.

Table 3.10 Items received (N=72)

Item description	Number	Percentage
Install draught stripping	65	90.3
Replace standard globes	55	76.4
Increase fan numbers	26	36.1
Install external shading	30	41.7
Install 3-star showerhead	14	19.4
Install flow adjuster	8	11.1

Participants were also surveyed about some additional energy-using and energy-conserving practices undertaken before and after participation in CA. Around one-third (34 per cent) reported they had begun turning off appliances at the wall or using an energy-saving power board or switch since participating in the program.

Many workshop participants reported already having low-flow showerheads, insulation and low-energy light globes, which they had mostly received from door-knockers. One person had a solar PV system and others had external blinds, door snakes and cool-off bandanas. These had been independently purchased or installed, or received free from council or a hardware store.

Energy-conserving behaviours reported in workshops included washing clothes in cold water, taking 4- minute showers, putting on extra clothes / slippers / dressing gowns (in winter), turning off standby power, and closing doors / windows and blinds.

Shower length was hugely variable: from 3 or 4 minutes, to 10 minutes for hair washing, to 'stand[ing] under the shower for hours'. Most workshop participants did not know the energy source of their hot water (electric, gas, solar, other), nor their hot-water temperature. Many did not know what temperature their heating / cooling thermostat was set at, nor the temperature of their refrigerator, and indicated that they would use the thermometers provided during the workshop to

test this temperature. Follow-up phone calls indicated that some people had taken action, measuring and subsequently adjusting their refrigerator temperature.

Some participants reported that despite understanding the energy savings available by turning appliances off at the switch, they had difficulty reaching some switches (for example, microwaves) and so did not implement this action. When the topic of removing mobile phone chargers from the socket was raised, no-one reported taking this action; rather, group members indicated that they did not know a phone charger left in a power socket would still draw energy when not connected to the phone.

Home comfort

A key driver of energy use in homes is heating and cooling used to maintain a comfortable temperature (DEWHA 2008). The thermal performance of dwellings, from the perspective of householders, was assessed through the self-reported comfort levels of respondents using the Bedford thermal comfort scale.

Figure 3.3 shows that almost half the sample was too cool in winter (42 per cent) and / or too warm in summer (44 per cent), for example:

> I don't have a problem in the winter, I can always find a way of keeping warm, but I have a terrible problem in summer.

Three-quarters of participants (75 per cent) reported that the CA program improved their home comfort. This was mostly due to the reduction or elimination of draughts, thereby keeping cold/hot air in/out.

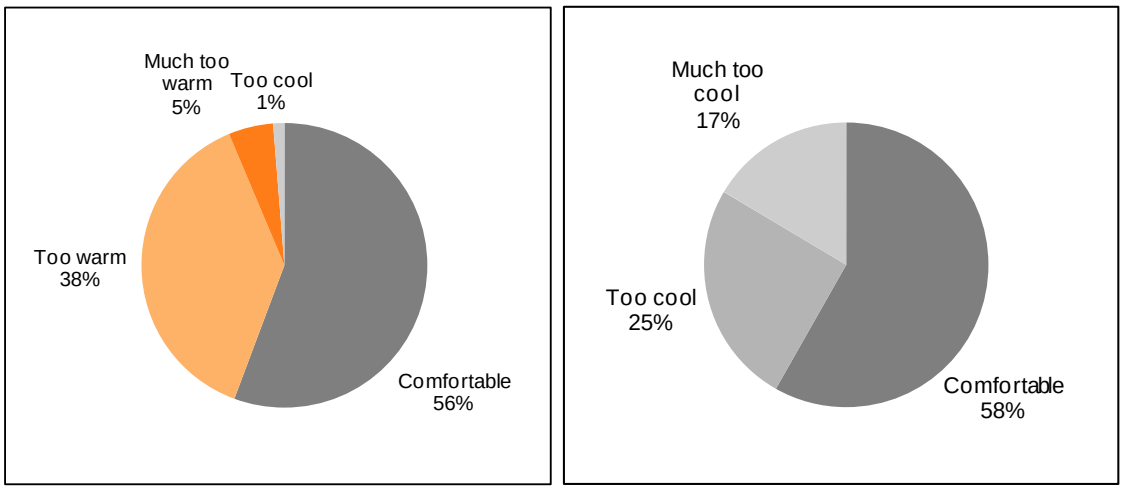

Figure 3.3 (*left*) Summer thermal comfort (N=79) and (*right*) winter thermal comfort (N=79)

Over half (59 per cent) of respondents reported that their homes were more comfortable in summer after participating in the program. Blinds and/or shades had led to improvement for 17 per cent of the group. People reported that improving thermal comfort could have the added benefit of reducing energy use, as demonstrated in the following example:

> Outdoor blinds help reduce heat and therefore helps to reduce use of air conditioner.

Three-quarters of respondents reported that their homes were more comfortable in winter, with a third of participants citing the elimination or reduction of draughts due to weather-sealing and draught-stripping products being installed:

> Yes, it's great to not be able to feel the draught coming in from under the door when I walk past.

Those who reported that the CA program had not helped improve the thermal comfort of their homes attributed it to the lack—or inefficiency—of their current heating and/or cooling systems or appliances. As one respondent explained:

> It is difficult to control the old ducted heating system in my home. It either runs too hot or I have to turn it off.

Others felt they had already done everything possible to improve the thermal comfort of their homes, so the program did not result in any change.

Two-thirds (67 per cent) of completers and 70 per cent of non-completers reported they would like to do more to improve the temperature and thermal comfort of their homes. Respondents expressed interest in installing insulation, and upgrading their heating and cooling systems and appliances.

However, nearly three-quarters of completers and 60 per cent of non-completers were experiencing barriers that stopped them. Cost was the most commonly reported barrier to making improvements, followed by problems associated with being a tenant in a rental property, and lack of a trusted source of advice and information.

Being too cold in winter was a popular discussion point in the workshops. Older people in particular reported being too cold in winter and experiencing draughty homes, and some reported going to bed early in order to stay warm enough. There was a strong shared sense of the injustice of this in one group, as described in this example:

> But it is wrong. I mean we're supposed to be the lucky country and there's people out there that are cold because they can't or won't use their electricity or their gas to keep warm. That's not on.

One workshop participant reported using three small electric portable heaters at once in order to keep her living area warm, and another described the amenity loss she accepts in order to have a warm home:

> [I] shut the blinds right down. It gets really dark and gloomy in there, but it really keeps it nice and warm.

Financial hardship

The research sought to gain an understanding of respondents' experience of financial hardship in relation to energy use. As well as exploring issues relating to energy affordability, we also investigated respondents' knowledge and understanding of energy bills.

Almost one-third (31 per cent) of completers reported having experienced one or two incidents of financial hardship in the previous six months, and 20 per cent reported three or more incidents (Table 3.11). Participants' most commonly experienced hardship was 'Could not pay electricity, gas or telephone bills on time', and for non-completers: 'Was unable to heat / cool home when needed'. Both of these are aspects of energy-related financial hardship.

Table 3.11 Indicators of financial hardship experienced in the previous six months

Indicator	Completers (%) (N=78)	Non-completers (%) (N=28)
Could not pay electricity, gas or telephone bills on time	30.8	17.9
Could not pay mortgage or rent on time	14.1	3.6
Pawned or sold something	14.1	3.6
Went without meals	6.4	7.1
Was unable to heat / cool home when needed	20.5	28.6
Asked for help from a welfare / community organisation	10.3	14.3
Asked for financial help from friends or family	26.9	21.4

People were also asked: 'Over the past year, how easy or difficult has it been for you to find the money to pay for electricity and gas?' Completers were more likely to find it 'very difficult' (13 per cent), or 'neither easy nor difficult' (43 per cent), compared to non-completers (see Figure 3.4).

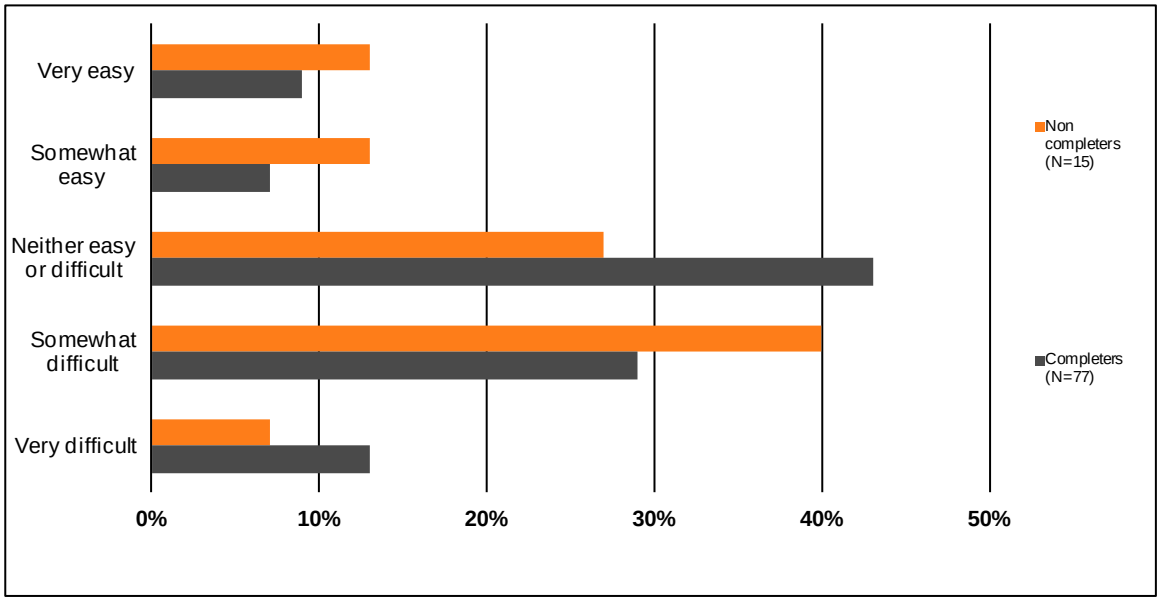

Figure 3.4 Ease or difficulty in paying for electricity and gas

Taken together, these data suggest that in the 12 months prior to the survey, the people who received the CA service were more likely to be experiencing financial hardship, were experiencing it across more domains, and were less likely to find it easy to pay their electricity and gas bills than those who did not receive the service.

Just over half of the completers (54 per cent) felt that the service had reduced the amount they paid on their energy bills (Table 3.12), with a small proportion (8 per cent) reporting that it had not. The remainder (38 per cent) reported there had been insufficient time between the service and the research to receive comparable energy bills on which to make an assessment.

Table 3.12 Has CA reduced the amount you pay on your energy bills ?

Indicator	Percentage (N=72)	Sample comments
Not at all	8.3	Most items the program was looking for, I already had installed in my house.
A little bit	41.7	My bills are a little less.
		I believe it has lowered the bill in comparison to this time last year.
A lot	12.5	Yes, because the energy saving equipment helped us.
I don't know	37.5	Haven't been able to compare bills yet.

Examples from the more exploratory data collected in the workshops indicate that some people are feeling quite desperate and frustrated about their inability to manage household energy costs:

> Well I'm getting to the stage where I'm thinking very seriously of pulling the plug on the electricity and using candles because I just don't know how I'm going to keep these bills down and I know I'm sounding like I'm a wet blanket and a whinging whinny but that's exactly how I feel it's getting to because living on the single pension is just getting so difficult it's not funny.

Some workshop participants, who felt they are failing in their attempts to save on energy bills, said that this is causing them to give up attempting to save energy, for example:

> **Person 1:** It's disappointing though really when you cut back on all these things and your bill is still going up. That's what really overall frustrates me.
>
> **Person 2:** Me too.
>
> **Person 3:** It makes you wonder whether it's worth it.
>
> **Person 4:** And I think people give up because my brother says his bills are just as high so he just leaves everything on, he won't turn anything off, honestly. TV, standby, lights. And he says nothing's making a difference so he just doesn't do it. He's given up.
>
> **Person 5:** It gets to the stage where there's nothing more that you can do to save energy but as you say, your bill just keeps going up.
>
> **Person 2:** That's what I find is extremely frustrating.

Additional action

Almost half (49 per cent) of the respondents who completed CA had taken additional action above and beyond the program to make their homes more energy efficient, including:

- installing products such as door snakes, showerheads, and energy-saving globes and switches;
- undertaking larger works such as double-glazing windows or installing insulation, sun blinds, verandahs or solar power;
- updating and/or servicing appliances such as hot-water systems.

Table 3.13 also shows substantial increases in the number of people practising everyday energy-conserving behaviours after participating in the program. The greatest increases were seen in behaviour centred around hot-water services: 26 per cent more people set their hot-water service to 60 degrees Celsius and 25 per cent more people reported switching their hot-water service off when they were away than prior to participation in the program.

Table 3.13 Uptake of additional energy-conserving practices since participation

Low-energy behaviour practised	Uptake (%)
Keep showers to 4 minutes or less	0.6
Wash your clothes in hot water	8.7
Switch off lights when no in use	19.3
Turn the hot-water service off if away from more than a few days	24.5
Close up the house and shade all the windows on hot days	16.3
Set your hot-water service to 60 °C	25.6

However, Table 3.14 shows that high-energy behaviours among respondents also increased (with the exception of heating unused rooms in the home). This is an unexpected result and cannot be explained with the available data.

Table 3.14 Increased practice of high-energy-using practices since participation

High-energy behaviour practised	Uptake (%)
Rinse dishes under running hot water	21.4
Run a second fridge / freezer	14.9
Heat your house in winter above 20 °C	12.7
Cool your house in summer below 26 °C	31.7
Heat rooms that you aren't using	–9.3

Despite not receiving the service, 60 per cent of the non-completers group also reported having taken action to improve the energy efficiency of their homes. The most commonly reported actions were installing draught excluders, external shading, insulation, heavy curtains and energy-efficient light globes. Some people reported changing their energy-use patterns, including measuring temperatures and adjusting thermostats on heating, cooling and refrigeration.

Many people in the workshops had also taken action to improve energy efficiency in their homes, as described above; but discussion also teased out how information gaps were a barrier to more efficient use of energy in the home, including a lack of information about:

- thermostats settings on hot-water services, air-conditioners, refrigerators and freezers;
- what star ratings represent;
- where to go to get energy efficiency information.

Future energy efficiency plans

The research also sought to develop understanding of people's future plans to improve the energy efficiency of their homes. As indicated above, 60 per cent of non-completers took independent action to improve the energy efficiency of their home, and almost half of those who completed the program had taken additional action above and beyond CA to make their homes more energy efficient.

We asked people about their intentions in relation to upgrading selected household items that would improve energy efficiency in their homes. The results are presented in Table 3.15. In total, 30 per cent of completers and 40 per cent of non-completers indicated an intention to upgrade at least one thing in their home that would likely decrease the amount of energy used. Insulation, shading and refrigerators were the items most likely to be upgraded.

Table 3.15 Future energy efficiency plans

Yes, I'm planning to ...	Completers (%)	Non-completers (%)
Improve your home's insulation or shading	15.2	33.3
Upgrade your refrigerator to a more energy-efficient one	18.4	28.6
Upgrade your heating or cooling to a more energy-efficient heater / cooler	9.2	17.9
Upgrade your hot-water service to a more energy-efficient one	9.5	14.3

Open comments also indicated a desire to install:

- double-glazed windows;
- curtains or carpet;
- a more energy-efficient oven.

The decision not to make major energy efficiency upgrades mostly related to already having an energy-efficient refrigerator / hot-water service / heating / cooling system, for example:

> They are already energy efficient.

> My house has been insulated and I have exterior awnings.

This was followed by an unwillingness to replace the current item until broken. For some people this may be a value choice, for example:

> Current units are still working fine. Would only replace if unfixable.

However, for others this relates to cost, for example:

> Cannot afford to do this when I already have a working fridge—I would like to though.

Many participants were well aware they could offset running costs with a more efficient appliance, but were still unable to afford the upfront capital investment, for example:

> Can't afford to, despite our fridge costing more money to run due to its condition.

One workshop participant described how she had been given an old dryer and a large washing machine by friends. The cost of replacing these was unaffordable for her, so she was left with the inefficient appliances.

Some people reported that due to being a tenant of a rental property, it was not their responsibility or their choice to make upgrades (except in the case of refrigerators).

During the workshops, participants nominated small hardware or behavioural changes they would like to make at home. These included checking and adjusting the temperature of refrigerators, freezers and hot-water services; shortening shower length; switching off standby power; and using dryers less. Larger changes included installing external shading, upgrading washing machines and installing solar power. Follow-up phone calls indicated that participants had tried some of their nominated changes, most commonly those relating to checking and adjusting temperature settings.

Green Energy

We were also interested to examine people's uptake of Green Energy (for example, solar or wind power). We found that 15 per cent (N=106) had some form of Green Energy. Of those who did not, over half (56 percent, N=83) would like to install solar power or switch to a Green Energy contract. Some people already purchased a proportion of their energy as 'Green Energy', and some of these indicated a desire to increase that proportion. Some workshop participants also wanted to install rooftop solar power, but reported cost barriers, for example:

> I think the solar panels are wonderful and they definitely do save but they're so expensive.

This indicates a high value placed on renewable energy by the majority of householders in this research. Cost was the main reason provided for not switching (Table 3.16), followed by a lack of information, being a renter (for those wanting solar PV systems) and a reluctance to change energy providers.

Table 3.16 Reason why those who wanted to switch to Green Energy had not done so

Reason	Percentage (N=43)
Cost	70
Renter	16
Information	7
Don't want to switch energy providers	7

Barriers to action on energy efficiency

In order to inform the development of future home energy efficiency programs for households with low incomes, this research also sought to identify barriers to energy efficiency that had not been overcome by CA. We asked people about their plans in relation to energy efficiency upgrades to save energy, save on bills and improve the thermal comfort of their homes.

Overall, 47 people (61 per cent of research participants) reported barriers (including multiple barriers) to improving the energy efficiency of their homes. Of these, half reported cost as a barrier and just under one-quarter reported rental tenure. Aspects of house design, trouble installing products and a lack of trustworthy advice and assistance were also reported, for example:

> Cost. Getting honest, trusting advice and tradesmen!

A disaggregation of results by tenure type indicated that renters were more likely to report cost barriers than home owners (37 per cent compared to 29 per cent). This is likely to reflect higher disposable income in the home-owner group in this research, of which almost two-thirds own their home outright and are therefore likely to have lower housing costs. Renters were also more likely than home owners to report difficulty in installing products (27 per cent compared to 18 per cent). This is likely to reflect the need for landlord consent for the installation of some items, for example:

> As a renter I have to rely on the landlord to do this unfortunately—no legislation in place to make landlords improve the efficiencies of their properties.

> Not my house. Landlord not interested in spending money on house. If they did they would put rent up.

Public housing tenants in the workshops said draughts around doors and windows and broken external shading had been reported but not repaired at their properties.

Some workshop participants (this group had not had contact with the CA program) were no longer using power-saving switches that had been installed, or had declined offers of free power-saving switches, because of loss of amenity, such as having to reset programming on appliances.

Additional issues raised in workshop discussions related to household size. People living alone reported feeling constrained in their ability to control their energy bill exposure because of the large, fixed-price service fees that could not be minimised by decreasing energy use. People in larger households reported household size as a barrier to minimising energy use. In particular, teenagers came under significant criticism for being wasteful with energy.

Energy information

One of the issues identified in the literature is that energy contracts and pricing are overly complex, leading to poor outcomes for consumers (Asher 2012). As a beginning exploration, we asked people to rate the ease or difficulty of understanding their energy bill on a scale from ‘very easy’ to ‘very difficult’. While most found their energy bills ‘easy’ to understand (Figure 3.5), just over a quarter of people reported they were ‘difficult’ or ‘very difficult’ to understand.

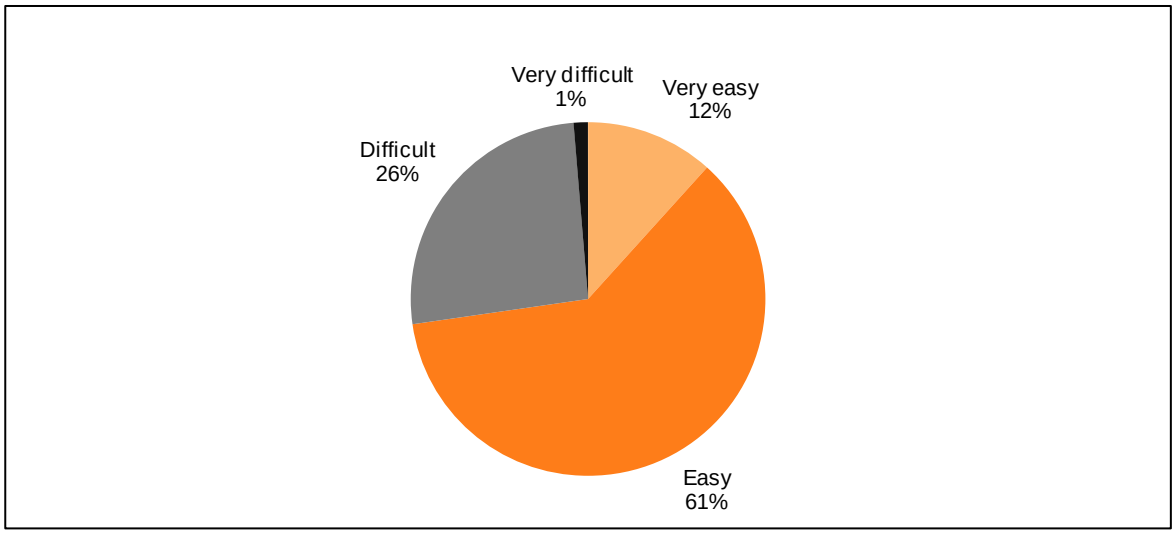

Figure 3.5 How easy or difficult is it for you to understand your energy bills? (N=77)

The types of difficulties encountered included:

- problems understanding rates and added costs;
- problems understanding terminology;
- lack of clear information and poor layout.

Analysis of results by language showed that 74 per cent of the group (N=84) speak English at home. In the group reporting they do not speak English at home, 3 of the 4 respondents reporting they speak English 'not very well' found it difficult to understand their energy bills, compared with just 3 of the 23 that speak English 'well' or 'very well'. This suggests information failure in service delivery to non–English speaking consumers.

Furthermore, over a quarter (26 per cent) of all respondents reported that they had encountered problems in relation to their energy bills. These included overcharging, contracts being changed without consent, and issues in relation to estimated bills, concessions, door-to-door sales and BPAY. Questions about smart meters were raised in all three workshops. People were unclear about how and why they would be charged for smart meters, whether or not they were required to provide access to their property for installation of smart meters, how smart meters would influence their energy bills, and what the benefits of smart meters were.

How people get the information they need

The research also aimed to explore the current methods people use to access information on household energy use, energy efficiency and ways to save money on energy bills. The responses shown in Figure 3.6 indicate a preference for internet resources, for around one-third of participants.

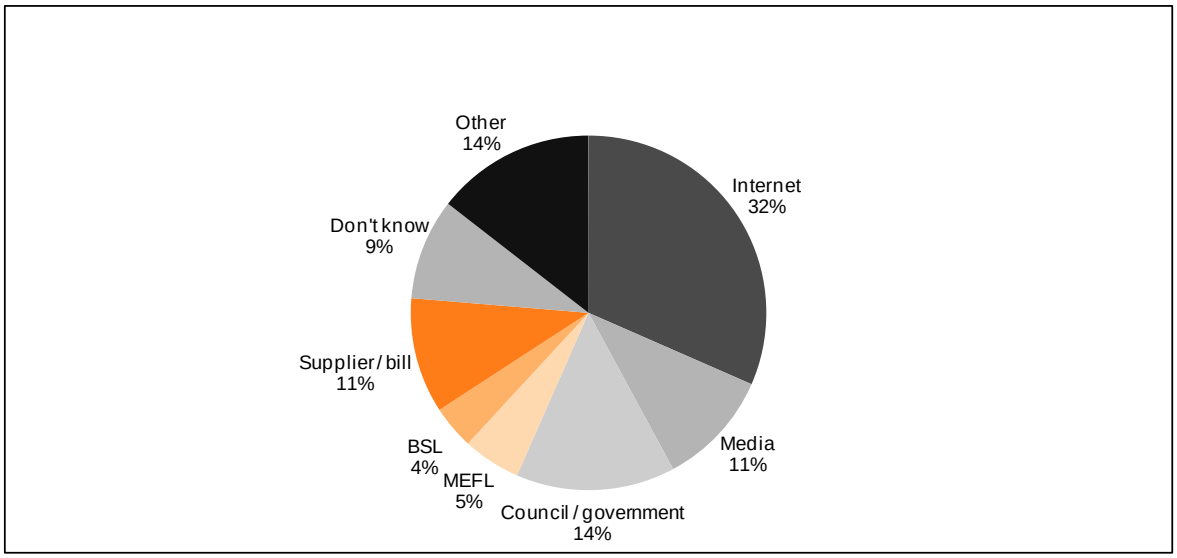

Figure 3.6 Where would you go to get information on household energy usage, energy efficiency and ways to save money on energy bills? (N=76)

The 14 per cent of 'other' methods people reported they would use to access information included the local library, star ratings on products, sustainable living and environmental magazines or organisations, and discussions with peers, friends and family.

Disaggregation of the 'internet' variable indicates that over a quarter would use Google to find answers to their questions; 25 per cent would go to a government website; 20 per cent would look at their own and / or another energy retailer's website; and 18 per cent would look at the web resources of environmental groups.

Workshop participants nominated the internet, energy retailers, friends and family, door-knockers, the council, and hardware / appliances stores as places they would go to obtain information about energy efficiency. Internet users were likely to use a search engine to find answers to their questions directly, for example typing in 'save money on hot water'. Older workshop participants were less likely to use computers, or to have one at home. As one person said:

> We'd need a computer class to know how to do that.

Around three-quarters (74 per cent) of survey respondents were interested in receiving more information on how to get a better deal on their energy bill. Over half (56 per cent) would like to receive further information on everyday ways to save energy at home, and 30 per cent would like additional information on long-term investments in home energy efficiency.

Some indicated that they would like further information on window coverings, toilet systems, government grants and other free programs, and ways to improve rental properties.

People in the workshops raised additional questions, including:

> Tiles or floorboards, which is better in regard to keeping the warm air in?
>
> Do we have to pay for smart meters even if we don't have one?
>
> We know using cold water instead of hot saves money when washing clothes, what about warm?

> If you turn off the power is anything going to happen to the computer?
>
> If you push the button, but don't pull out the plug, is it still using energy?
>
> What does 'low', 'medium', ' high' mean on freezers?
>
> Do less stars use less energy?
>
> What is the maximum time to choose on the [front loader] washing machine?

These questions suggest that there are many areas people do not fully understand. For example, the 'hot versus cold versus warm water' question suggests people have learned the 'cold, not hot water' message, but do not have a full understanding of how this works and so are unable to apply their knowledge to a new situation (warm water).

The questions about washing machines point to the need for energy efficiency advice to be constantly updated as technology develops. It may even be that priming people with the types of questions to ask at the point of sale could be better than trying to provide population-wide information about items that are rapidly changing.

When respondents were asked how they would prefer to receive information about energy efficiency and energy bills, 67 per cent selected 'via the post'. The fact that the survey was conducted via the post (and via email) is likely to have influenced this result. 'Email' was the second most popular option (30 per cent), and 'on the internet' and 'face to face within their home' were also common choices (22 per cent). Some respondents suggested information could be relayed within a community forum or via exhibitions. Workshop participants reported positively about the question-and-answer format of the group discussions, and some nominated the community venue they were already at as an ideal location for such interactions.

4 Discussion

The results of this research point to some key issues pertinent to the delivery of residential energy efficiency in low-income homes and the development of future programs. Further discussion of the implications for future policy and programs are made in the associated publication, Sullivan & Johnson (forthcoming).

Scope of the research and the nature of the program intervention

The varied results for the WHCH research presented above in part reflect a shift in the nature of the intervention offered to participants. The WHCH research aimed to investigate impacts on home comfort, health and wellbeing, financial hardship and home energy-use behaviour change in the WHCH program. The starting point of the research was the hypothesis that improved energy efficiency of homes may lead to improvement in home comfort, health and wellbeing, and reductions in financial hardship. The study design, research methods and measures were modelled on studies of programs that were similar in nature to the proposed WHCH program. There were, however, significant unanticipated changes to the program design and delivery—most notably the removal of insulation from the range of services that could be offered—that had the following effects on the research:

- the program did not achieve the depth of intervention the research was designed to evaluate;
- disruption to the delivery of the program impacted upon the ability to recruit a sufficiently sized interview sample;
- many of the anticipated statistical tests were not able to be conducted because of the insufficient sample size.

In addition, the quality and quantity of audit and billing data were insufficient for some of the analysis that was originally planned.

Nevertheless, the qualitative data collected in the research has shed valuable light on the challenges faced by householders in the context of rising energy costs, and has provided important feedback regarding householders' experiences of participation in the program. As part of the program process, participants also provided comments on how valuable they found the ongoing research contact.

Thermal comfort, health and wellbeing

One of the most commonly reported outcomes of the programs was improved thermal comfort in homes, mostly due to eradicating or lessening draughts through the use of draught-stripping products such as door stoppers and the sealing of windows. This simple use of low-cost products resulted in increased home comfort, and respondents repeatedly noted how well door snakes and draught strips worked. At the start of the WHCH program, more than three-quarters of householders reported having draughty homes; one year after participation, this had decreased to less than a third. Given the literature indicating links between poor health and poor thermal comfort in homes, this is an important improvement.

As discussed above, the limited nature of the intervention (no insulation and very limited shading) meant the final intervention was unlikely in and of itself to have a substantial impact on participants' health. There was however, an improvement in the health of those participants with

milder summer heat-related health problems. Given the limited nature of the intervention and the correlation in thermal comfort results with changes in the temperature year on year, we would be reticent to ascribe this improvement to the program. It is however an area worthy of further research, particularly given the links identified in other research (Green & Gilbertson 2008; Gilbertson, Grimsley & Green 2012; Howden-Chapman et al. 2005).

Energy savings

The lack of sufficient energy consumption data makes it difficult to assess any material changes in the amount of energy used and hence the likely amount spent or saved on energy bills.

The findings relating to actual and perceived energy savings are mixed. Half the group reported that they had saved energy; however, there is insufficient energy consumption data to be confident in any cross-comparisons made between the self-reported subjective data sets and objective data sets. Nonetheless, similar to other studies (for example Green & Gilbertson 2008), average energy use increased slightly for the WHCH group.

Complicating households' self-reported understanding of their energy usage and bills were increasing energy prices during this period. Householders' ability to ascertain the impacts of the program on their energy usage was likely to be limited to those who paid attention to their energy usage, rather than those who just perceived higher energy bills. Such considerations have implications for how energy efficiency programs are marketed to households, and the householders' perceptions of the ultimate value of the intervention.

Many participants made changes to the way they used energy in the home and have reported increased adoption of energy-saving behaviours. The increase in energy-saving behaviours is a welcome result from the program intervention perspective. However, without consumption data it is difficult to ascertain the likely impact on the householders' energy bills. Exploring the impact of everyday behavioural changes from programs such as WHCH and CA is an area of future research need.

Financial hardship

The research group were experiencing high levels of financial hardship and around 40 per cent also reported that it was 'somewhat difficult' or 'very difficult' to find the money to pay their energy bills. Coupled with the high proportion of householders reporting cost as a barrier to undertaking further energy efficiency action in their homes, we can see a difficult Catch-22 being experienced: people are unable to afford their energy bills, but cannot afford to take action to bring their energy use (and associated costs) down. This is particularly the case for renters, who experience an additional double-bind of having less disposable income and less capacity to make changes to a home they do not own. This research further reinforces that this is an entrenched problem.

People's experience of financial hardship in general—and of having difficulty in paying energy bills in particular—suggests deterioration for many householders in their ability to afford their costs of living. Two factors are likely to have contributed to this: first, the rapid increases in energy prices during the study period; and second, the fact that the depth of the intervention was unlikely to make a substantial impact on household bills during a period when electricity prices were rising. Further research is warranted in order to understand the potential benefits of deeper energy efficiency interventions in households that are in financial hardship.

Feedback on the programs

In general, the feedback on both the WHCH and CA programs was very positive and householders reported multiple benefits from their participation, including improvements to home comfort, health and wellbeing, and energy savings.

Respondents appreciated the information and help given, and some were inspired to do more now they had an introductory understanding. Basic knowledge—such as closing off rooms and shutting blinds to keep a home at a comfortable temperature—was not known to many respondents and they were appreciative of this simple advice. Conversely, there was also a group for whom the advice provided was too simple. This group would benefit from more complex information or advice on carrying out deeper changes in their homes. The variation in energy information needs suggests that energy information provided during in-home visits needs to be flexible enough to account for a high degree of variability in awareness around energy efficiency and energy usage.

The data suggest two main groups of people joining the program: those who joined because they wanted save money, save energy or help the environment (or a combination of these motivations); and those who joined the program because it was provided by, or recommended by, a trusted organisation.

Emergent issues

Some of the emergent issues from the research included the following:

- Aspects of housing quality that impacted negatively on energy efficiency, but were beyond the scope of the program were discovered. These included broken windows, holes in walls and broken stoves.
- Exploratory research in group discussions elicited questions about energy use and energy efficiency that indicated significant gaps in understanding for some people.

There may be a need for a more tailored service offering to address these problems.

Barriers to further action

Participants' responses confirmed our expectation that money is the major barrier for participants in improving their home's energy efficiency. Whether the improvement was the upgrading of major systems or the installing of small products, the most commonly mentioned barrier was financial.

The financial barriers reported to making larger energy efficiency improvements (such as solar power, hot water, heating and cooling) coupled with ongoing concerns about energy prices, suggest a need to facilitate households making deeper savings so that they see the rewards on their energy bills. This research did not set out to undertake an in-depth investigation of attitudes to Green Energy, but nonetheless revealed a high value placed on renewable energy by the majority of householders surveyed. Investigation of models for delivering renewable energy to homes on low incomes warrants consideration.

5 Conclusion

This research has explored factors underlying home energy use and barriers to energy efficiency for people on low incomes on the City of Moreland, Victoria. Participants joined the WHCH and CA programs to save money and save energy, and generally reported very positively about their experiences of the program. Discontinuation was due in some cases to personal reasons, such as moving house or bereavement, but in some cases was due to a lack of follow-up on the part of either the householder or program provider.

The results of the research suggest that the programs had some success in addressing known barriers to energy efficiency action in homes: cost, information and trust. However, there is more to be done to make meaningful gains in energy efficiency that will be felt by householders.

The research also indicates a significant appetite for further action on energy efficiency; however, cost and rental tenure are they key issues holding people back. More needs to be done to support people in achieving their energy efficiency goals, and addressing rising energy costs and greenhouse gas emissions.

The programs sought to understand what—if any—impact the programs had on thermal comfort, energy-saving behaviours, health and financial hardship. Key results in these areas included the following.

Thermal comfort

The majority of households experienced significant improvements in the thermal comfort of their home, where this was assessed. The proportion of the group reporting draughty homes decreased from over three-quarters to less than one-third after receiving the service.

Energy-saving behaviours

- Participants reported undertaking more energy-conserving behaviours and less energy-using behaviours following their involvement in the program.
- Many CA participants took additional action beyond that offered by the program, and 60 per cent of the non-completer group also took action to improve the energy efficiency of their home, as did many workshop participants.

In the areas of health and financial hardship, the minimal depth of the program intervention—which, following the removal of insulation from the range of services that could be offered, was relatively shallow—is likely to have impacted upon the results.

Health

Results for health were mixed and, where it was assessed (that is, in the WHCH group), tended to vary depending on the severity of the health issue being experienced.

Financial hardship

Measures of financial hardship did not show improvement after participation in the program.

The research also sought to identify any barriers to future action on energy efficiency and information requirements. Key results included the following.

Barriers to upgrades

- Almost one-third of CA completers and 40 per cent of non-completers reported an intention to upgrade an appliance or fixture that would improve the energy efficiency of their home; however almost a third of all research participants reported barriers to making upgrades.
- The most commonly reported barrier to further improvements to home energy efficiency was cost, followed by rental tenure.
- More than half the group who did not have Green Energy would like to install solar power or purchase Green Energy; however, three-quarters of them could not afford to do so.

Information

- Over a quarter of research participants reported that their energy bills were 'difficult' or 'very difficult' to understand, and a quarter reported that they had experienced energy bill or contract-related problems, including issues with estimated bills, concessions, overcharging and door-to-door sales.
- Almost a third used the internet to search for information about household energy usage, energy efficiency and ways to save on bills, with one-quarter of these using Google. Other people looked to mass media channels, government (federal, state and local) or organisations with which they already had contact.

Vulnerable groups

The findings of this research further reinforce a difficult Catch-22: some people are unable to afford their energy bills, but cannot afford to take action to bring their energy use (and associated costs) down. This is particularly the case for renters, who experience an additional double-bind of having less disposable income and less capacity to make changes to a home they don't own.

In light of the international evidence, the mixed findings on health and wellbeing in the WHCH research suggest the need to trial deeper energy efficiency interventions in the Australian context, in order to assess their impact on health and wellbeing, in particular for people experiencing chronic or severe health issues.

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