Improving the energy efficiency of homes in Moreland

Research sample, baseline measures and recruitment for the Warm Home Cool Home program evaluation

Victoria Johnson and Damian Sullivan

2011

Brotherhood of St Laurence
Working for an Australia free of poverty

Published by

Brotherhood of St Laurence
67 Brunswick Street
Fitzroy Vic. 3065
Australia
ABN 24 603 467 024

Ph: (03) 9483 1183

www.bsl.org.au

Contents

Acknowledgements

This research was funded through Moreland Solar City, an Australian Government Solar Cities initiative led by the Moreland Energy Foundation, in partnership with Moreland City Council, the Brotherhood of St Laurence and Sustainability Victoria.

The authors would like to thank Zoe Aldridge, Michael Hwang and Len Leonidas of the Brotherhood of St Laurence's Social Enterprises; Elle Morell, Paul Murfitt and Bruce Thompson of Moreland Energy Foundation; the research advisory group; and the residents of Moreland for their assistance with and support of the research. Thanks also to Deborah Patterson for her skilful editing.

1 Introduction

The Warm Home Cool Home (WHCH) program is a home energy audit and retrofit program delivered by the Brotherhood of St Laurence, in partnership with the Moreland Energy Foundation, Moreland City Council and Sustainability Victoria. It is a free service for Commonwealth concession card holders residing in the City of Moreland. The program consists of a home energy audit, recommendations of actions householders can take to reduce their energy use, and assistance to implement some recommendations such as ceiling insulation, tap aerators, draught seals on doors and windows and low-energy light globes.

Warm Home Cool Home research

The objective of this research is to identify the social impacts within households of the Warm Home Cool Home program. Specifically, the research investigates relationships between the audit/retrofit, energy use and energy use behaviour change. It will measure impacts on aspects of home comfort, financial hardship and health of low-income households. This research is a discrete component of a larger monitoring and evaluation framework for the Moreland Solar Cities project.

This report presents the results of analysis of the baseline data collected in the Warm Home Cool Home research. The purpose of the analysis is threefold:

- to describe the study population and identify the extent to which it reflects the demographic characteristics of the entire Warm Home Cool Home participant group and also the broader population of the City of Moreland
- to present the baseline data for the variables for which impact assessments are being made, namely, home comfort, financial hardship and health
- to provide information about which types of promotion were successful in recruiting people to the Warm Home Cool Home program and the reasons people chose to join.

The data was collected from Warm Home Cool Home research participants in telephone interviews conducted prior to their home energy audit.

Research context

A growing body of evidence suggests that, in addition to environmental impacts, there are potential social impacts of climate change and climate change policies such as carbon pricing. These include financial impacts (Green & Gilbertson 2008; Lawrence 2002; Spoehr, Davidson & Wilson 2006; Unkles & Stanley 2008), as well as impacts on health (Fritze et al. 2008; Horton & McMichael 2008; Rowe & Thomas 2008) and community strength and connectedness (Fritze et al. 2008; Rowe & Thomas 2008).

People on a low income have been identified as particularly vulnerable to climate change impacts for two main reasons. First, many people in low-income households live in poor-quality housing that has low energy efficiency with consequences of poor household comfort and high energy bills (KPMG 2008). Second, rising energy prices (partly influenced by climate change and climate policy) are impacting on the affordability of energy for households, in particular those with low incomes (Dufty 2007; Sullivan 2007).

Historically Australian residential energy prices have been low by international standards and energy has made up a relatively small proportion of household expenditure (Sims 2010). In recent times the situation has changed, with energy prices increasing (Garnaut 2011; Sims 2010). Low-income households have been most exposed to these price increases, as the proportion of their income spent on energy is rising faster than the average household (Sims 2010; Simshauser, Nelson & Doan 2010). There has been an increasing risk of fuel poverty[1] associated with higher energy prices (Simshauser, Nelson & Doan 2010). Even when energy prices were low, utility stress was identified as a major issue for a small but significant proportion of the population (see CfM 2004).

Energy efficiency measures are one of a number of interventions that have the potential to reduce household exposure to rising energy prices, improve household comfort, health and wellbeing, and reduce exposure to extreme weather events. Program evaluations have found improvements in health from insulation installation in New Zealand (Howden-Chapman et al. 2007) and reduced stress associated with decreased fuel poverty in the United Kingdom (Green & Gilbertson 2008). 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.

Howden-Chapman et al. (2005) assert that 'good quality housing can act as a protection against other socio-economic stress factors' (p.2602). This research seeks to test this assertion through an examination of the household energy audit and retrofit program Warm Home Cool Home.

The Warm Home Cool Home evaluation results will be used to:

- improve the delivery of WHCH and other similar projects
- increase the evidence base around effective household energy efficiency initiatives targeting low-income households
- provide evidence to assist advocacy for further household energy efficiency programs.

The evaluation will also include information about current levels of energy efficiency of both the building shell of homes and appliances and householders' behaviour, and may lead to identification of certain groups that experience less energy efficiency than others.[2]

A number of strong research designs have been implemented in evaluations of the health impacts of energy efficiency projects similar to Warm Home Cool Home in other countries. However, health impacts of such programs in Australia have not been quantified. Moreover, few examples exist of robust evaluations in the area of social impacts. This project provides an opportunity to develop research capacity in the field of social impacts of climate mitigation and adaptation measures in Australia.

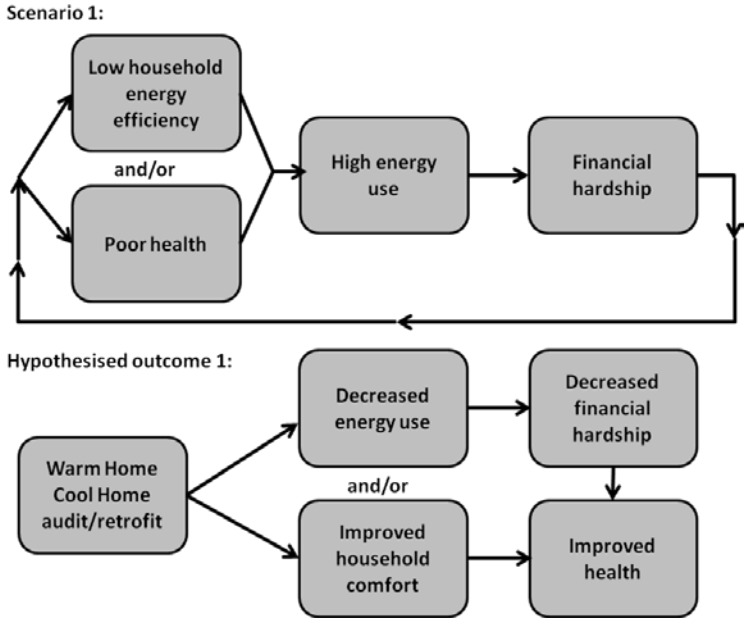
The research explores two possible scenarios, based on the simple hypothesis that improved energy efficiency of homes may lead to improvement in home comfort, health and wellbeing and reduction in financial hardship.

[1] Simshauser et al. (2010, p. 2) define fuel poverty as 'a situation where the combined energy costs of a household exceed 10% of income'. However, fuel poverty is a contested term and further research is required to develop a robust definition.

[2] Background research for this evaluation is outlined in Johnson (unpub.), Approaches to evaluating social impacts in household energy efficiency schemes (draft).

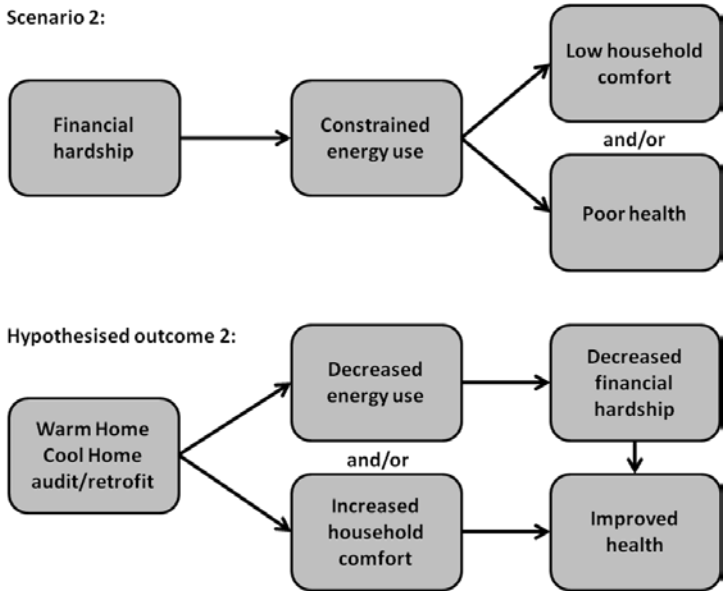
In the first scenario, households with poor energy efficiency and/or poor health are using more energy to meet their needs. In a low-income household, it is anticipated this may be leading to financial hardship as they struggle to meet the costs. It is hypothesised the Warm Home Cool Home audit/retrofit will have the impact of improving the energy efficiency of the home with subsequent decreased energy use and associated decreasing financial hardship, and/or improved home comfort leading to improved health. This is illustrated in Figure 1.1.

Figure 1.1 Research scenario 1



In the second scenario, existing financial hardship is constraining energy use by householders, with flow-on impacts of low home comfort and/or associated poor health. In this scenario it is hypothesised the Warm Home Cool Home audit/retrofit will have the impact of improving energy efficiency, with subsequent decreased energy use and associated decreasing financial hardship and/or improved home comfort leading to improved health. This is illustrated in Figure 1.2.

Figure 1.2 Research scenario 2



The following constraints need to be acknowledged:

- The variables are interrelated in multiple and complex ways; the influences of one on the others are not necessarily strictly directional.
- There are myriad other influences on the variables being investigated, beyond just home energy efficiency.

Nevertheless, investigation of the relationships between these factors is instructive in understanding the impacts of a program such as Warm Home Cool Home and will add to the evidence base around home energy efficiency interventions.

Research progress

Research to date includes a review of the literature regarding household energy efficiency programs and the collection and analysis of baseline data. This was collected in 85 telephone interviews undertaken between November 2009 and February 2011 and is reported here. Post audit/retrofit interviews are currently being conducted.

Approach to analysis

For this baseline data report, the demographic characteristics of the research sample (N=85) were compared to the population of the Warm Home Cool Home program, as represented in data collected for reporting purposes during the audit booking (N=366). The sample characteristics were also compared to the Australian Bureau of Statistics' 2006 Census data for the City of Moreland (ABS 2007), a population of 135,764 individuals residing in 52,152 households. In some comparisons, the sample size is smaller than 85, because non-responding individuals or households have been excluded from analysis.

Baseline data on home comfort, financial hardship and health is presented, as is information about how people heard about the program and why they decided to join. The last section of the report presents conclusions drawn from this data.

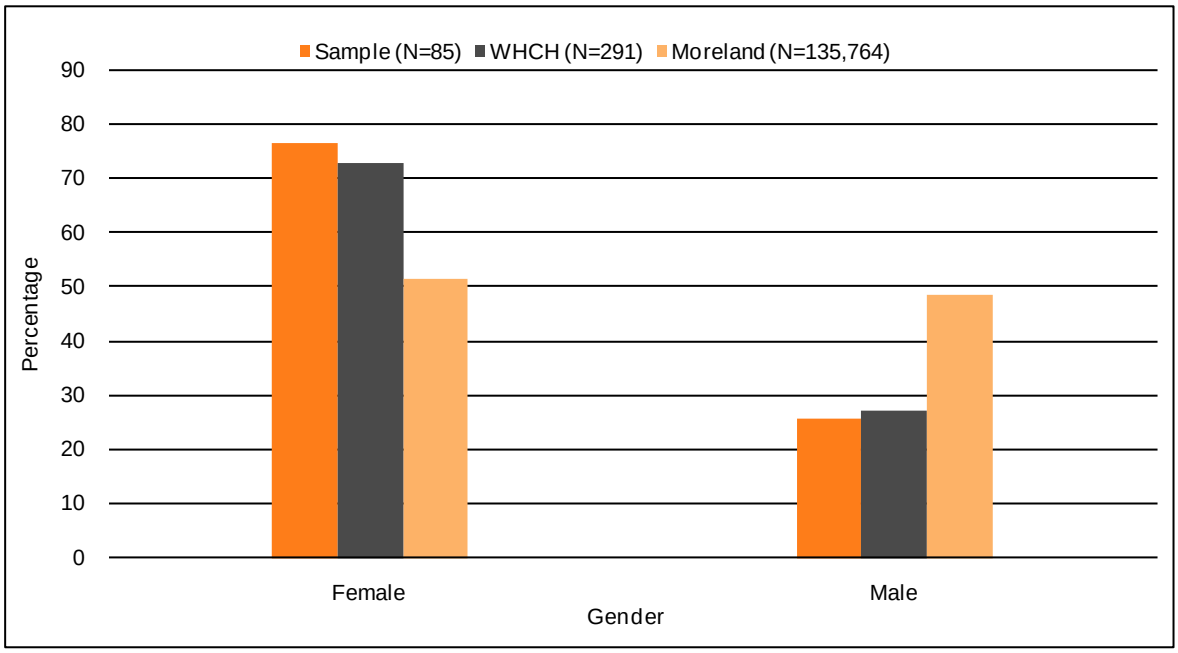
2 Comparison of research sample to WHCH and Moreland populations

This section compares characteristics of the research sample to both the population of the entire Warm Home Cool Home program and the broader population of the City of Moreland at the 2006 Census. Comparable data for all three is available for the variables of gender, household size and housing tenure type. For other characteristics, data is only available for the research sample and the Moreland population.

Gender

Figure 2.1 represents the gender split of the research sample, compared to the whole WHCH program and the population of Moreland. The research sample significantly over-represents women as interview respondents (77%), compared to the Moreland population as a whole (51%) and to a lesser extent the WHCH participants (73%).

Figure 2.1 Gender



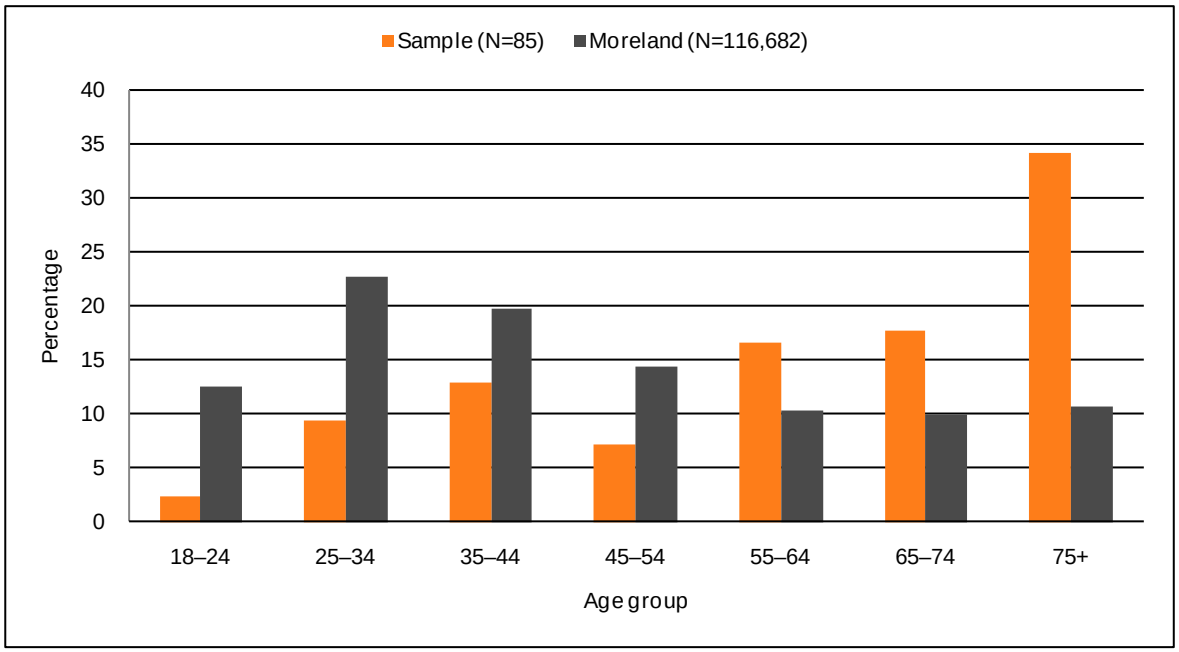
There are two points to note in relation to the gender imbalance in the study sample. First, women are over-represented as *interview respondents* and so will be over-represented in *individual level data* collected. However, as much of the analysis is undertaken at the *household level*, this imbalance will be less important for those aspects of the study. Second, the personal experiences of male program participants may not be adequately represented. The gender imbalance in both the participant and research populations could be explained by factors such as the following:

- a greater propensity of women to engage in social research
- a higher proportion of women than men in older age groups (who represent a larger proportion of the participant population, see Figure 2.2)
- a higher level of interest among women in issues of environmental sustainability
- a perception by women that they would be unable to undertake the hardware retrofit measures themselves and therefore a desire to seek assistance through a program such as WHCH.

Respondent age

The percentage of people in each age group is presented in Figure 2.2.

Figure 2.2 Age group



The research sample significantly under-represents people below the age of 54 (32%) compared to the population of the City of Moreland (69%). Conversely, the sample over-represents people aged 55 and over (68%), who make up only 31% of the Moreland population. The most striking difference is for people aged 75 or more, who make up 34% of the research sample but just 11% of the Moreland population.

Factors leading to the high proportion of respondents over the age of 55 may include:

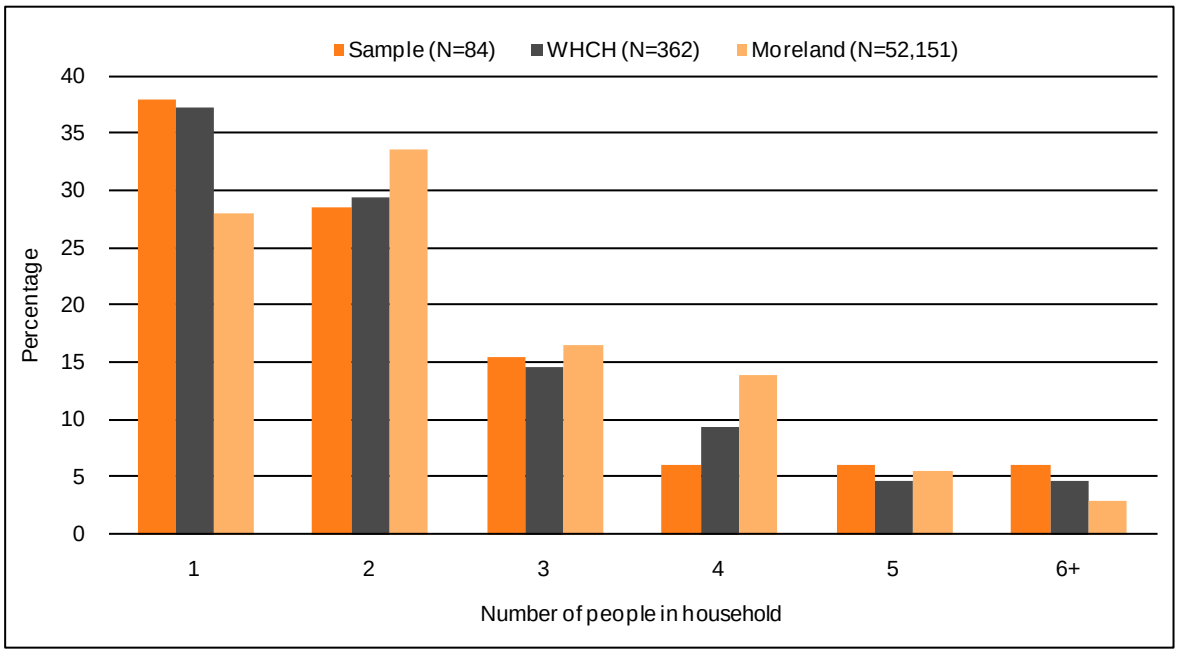
- the relatively high number of owner occupiers, who have substantially higher recruitment rates than private renters
- methods of recruitment which may favour this group, particularly those measures focused on community organisations with higher involvement of older people
- a perceived lack of ability to do the changes themselves.

The relatively high number of older respondents may also have an impact on the incidence of existing energy efficiency measures within the target population. Previous studies suggest the homes of aged concession holders tend to have more ceiling insulation than other households (Roy Morgan Research 2007).

Household size

Figure 2.3 indicates the proportion of households of varying sizes represented in the research sample, compared to the whole WHCH population and the population of Moreland.

Figure 2.3 Household size



Both the research sample (N=84) and the WHCH program over-represent single-occupant households (38% and 35% respectively, compared to the Moreland population, 28%) and households with six or more occupants (6% and 5.7%, compared to 3%). They also under-represent households with four people (6% and 9%, compared to 14%) and those with two (28.5% and 29%, compared to 34%). Nonetheless, the study sample includes all household sizes.

The high percentage of single-person households in the research sample is likely to reflect the high numbers of people over 55 who are more likely to live alone.

The literature indicates that large households are likely to experience greater benefits from a household retrofitting program (KPMG 2008), in part because they are more likely to report inability to pay energy bills (Roy Morgan Research 2007). As large households are of particular interest in this research, oversampling of this population is advantageous.

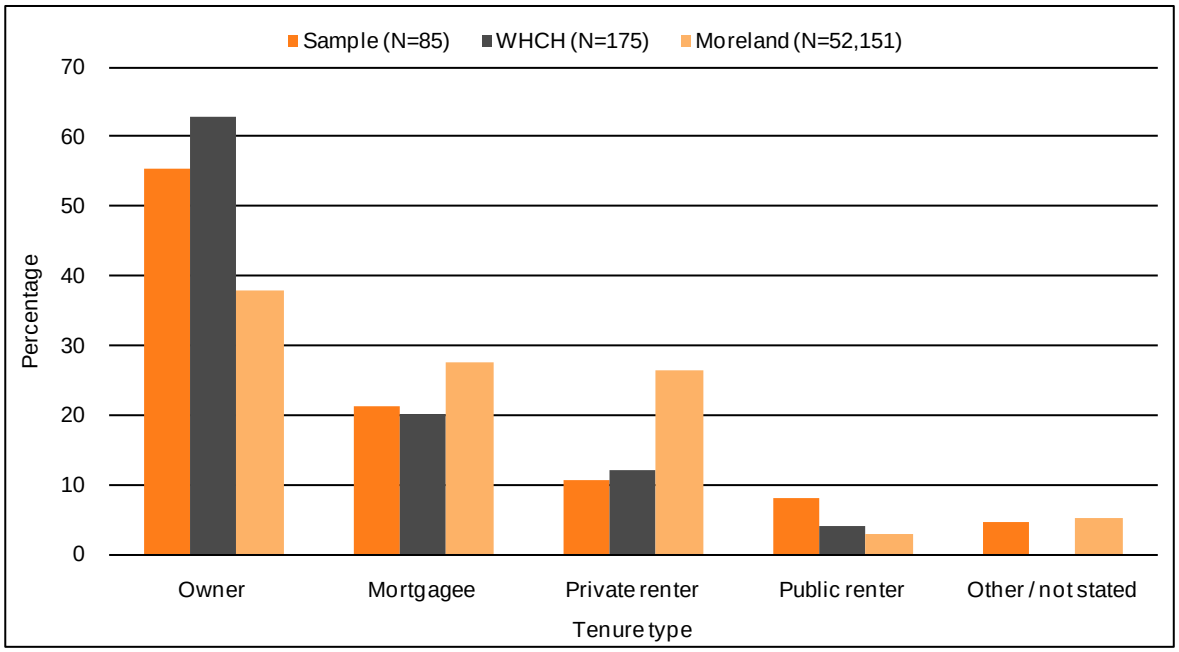
Single-occupant households are also of interest, because they have a higher per capita energy bill due to some energy costs being fixed (IPART 2010). As such, it is likely many single-person households spend a greater proportion of their income on energy costs, than do people living in larger households.

Housing tenure type

Housing tenure type is an important variable in this study as there is some evidence of split incentives operating as a barrier to improvements in energy efficiency in rental properties (see, for example, Miko 2005; Spoehr, Davidson & Wilson 2006). Recent research from Gabriel et al. (2010) indicates no evidence that private renters face higher energy bills than home owners due to split incentive problems. Nonetheless, private renters remain over-represented in data on households facing difficulties paying their bills (IPART 2010). Thus, private renters are a population of particular interest in this research.

Figure 2.4 indicates the proportion of households in each population according to their tenure type.

Figure 2.4 Housing tenure type



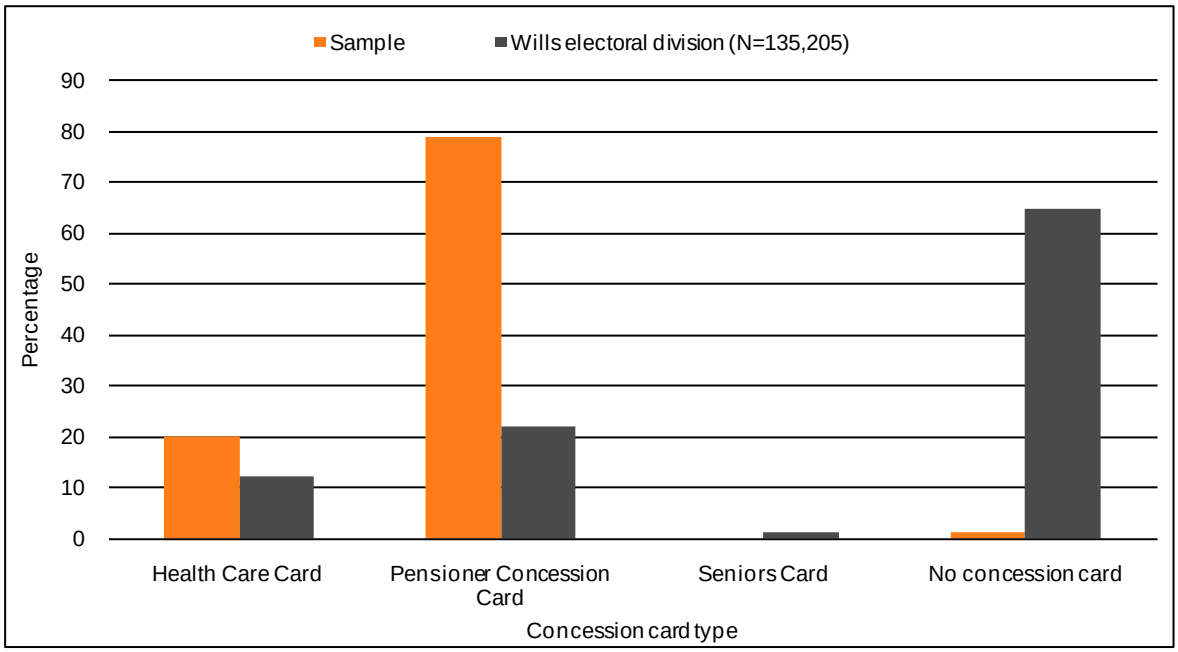
The research sample significantly under-represents private renters (11%) compared to the whole population of Moreland (26%) and, to a lesser extent, the WHCH population (13%). However, the reverse is the case for public renters. The percentage of people in the WHCH program who are renting public housing is higher than for Moreland overall (7% compared to 3%). The research sample further over-represents public renters (8%). People who own their home outright are also over-represented in WHCH (56%) and in the research sample (55%), compared to Moreland overall (38%). The WHCH population and the research sample also under-represent the people currently purchasing their home (mortgagees) (20% and 22%, compared to 28%).

The tenure type in the sample (and the program) largely reflects the recruitment approaches. Promotion through elderly citizens groups has tended to recruit people who own their home outright. The over-representation of public tenants is in line with a specific recruitment focus through public housing.

Concession card holders

Figure 2.5 compares the percentage of people in the research sample holding different types of concession card, to the percentage in the overall population of the City of Moreland. The data on concession card holders is published at the level of the Commonwealth electoral division of Wills, which has a very similar geographic boundary to the local government area of Moreland (ABS 2007).

Figure 2.5 Concession card holders: sample compared to electorate of Wills



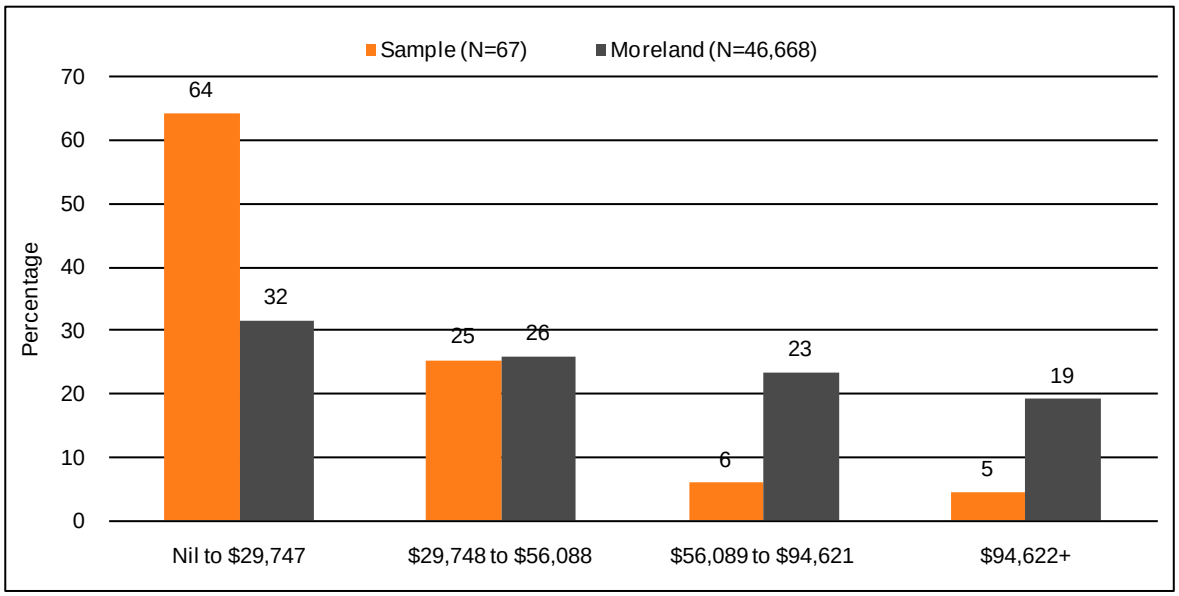
There is a much higher percentage of people with concession cards in the research sample, compared to the population of the electorate of Wills. This is to be expected, as the eligibility requirement for the WHCH program is that there is a concession card holder in the household. This data indicates that a very high proportion of people in the sample (79%) have a pensioner (or Veteran's Affairs) concession card, compared to just 22% of people residing in the electorate of Wills.

Household income

Data has been collected from householders about gross household incomes. Of the 85 people in the research sample, 67 provided information about their household income. This was provided variously as weekly, fortnightly, or annual income. Weekly and fortnightly amounts have been multiplied to create an annual estimate. It should be noted that the collection of income data is difficult and the reliability of self-reported income data cannot be guaranteed.

The gross household income data collected has been aggregated into four categories, representing the income quartiles of the City of Moreland from the 2006 Census. Figure 2.6 compares the estimated household income of the research participants who provided income information to the reported income of the Moreland population.

Figure 2.6 Estimated household income compared to Moreland income quartiles



The research sample has a much higher proportion of households in the lowest income quartile than the overall population of Moreland. This is an expected result, since to be eligible for the program a household member must have a Commonwealth concession card. In turn, eligibility for concession cards is in most (but not all) cases determined by low-income status.

Aboriginal and Torres Strait Islander residents

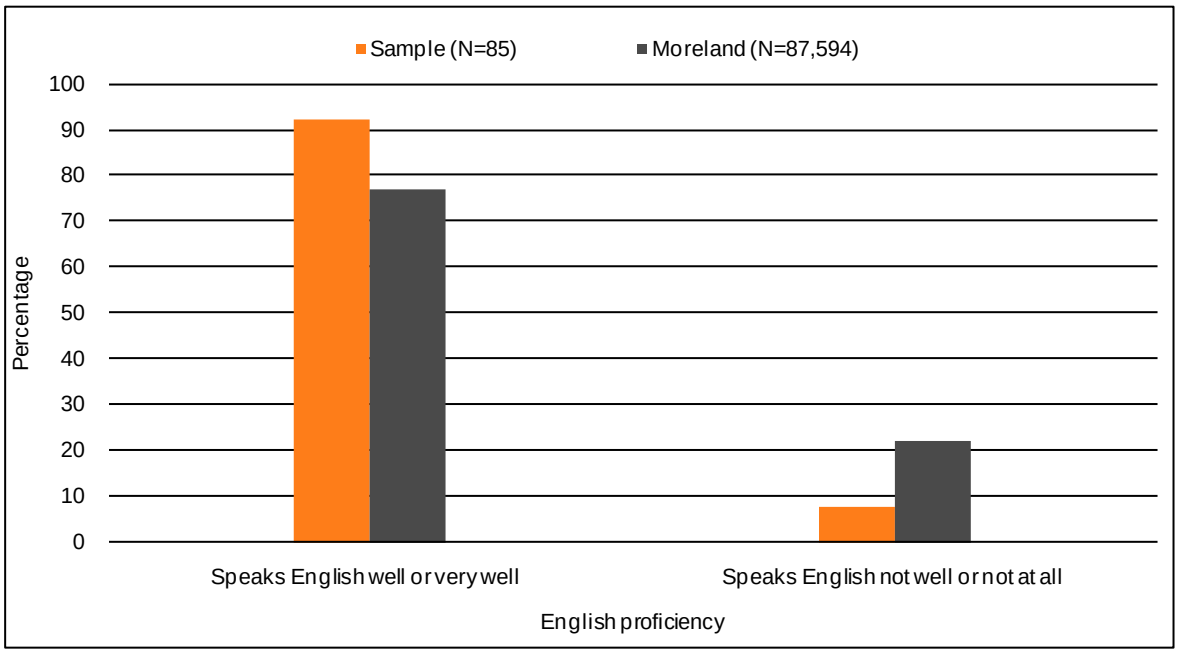
The research sample does not include anyone reporting they are Aboriginal or Torres Strait Islander. This does not represent the population of Moreland, where 0.5% of residents are Indigenous Australians and another 6% of residents did not state whether they were Indigenous or non-Indigenous. The latter group may include some Aboriginal and Torres Strait Islander residents.

Language

Data was collected from people in two areas relating to language: self-reported proficiency in English and the main language spoken at home.

Figure 2.7 compares the percentages of people in each population reporting they speak English ‘well’ or ‘very well’ to those reporting they speak English ‘not well’ or ‘not at all’. The research sample has a higher proportion of people who speak English well or very well (92%) than the population of Moreland (77%).

Figure 2.7 English proficiency



The under-representation of people who do not speak English well or at all may relate to the difficulty of conducting a research interview in a second language, particularly by telephone. This potential barrier had been identified during the development of the research methodology. Although interpreting services were offered to any program participants who requested them, or if a communication problem was experienced, the research sample includes few people with limited English.

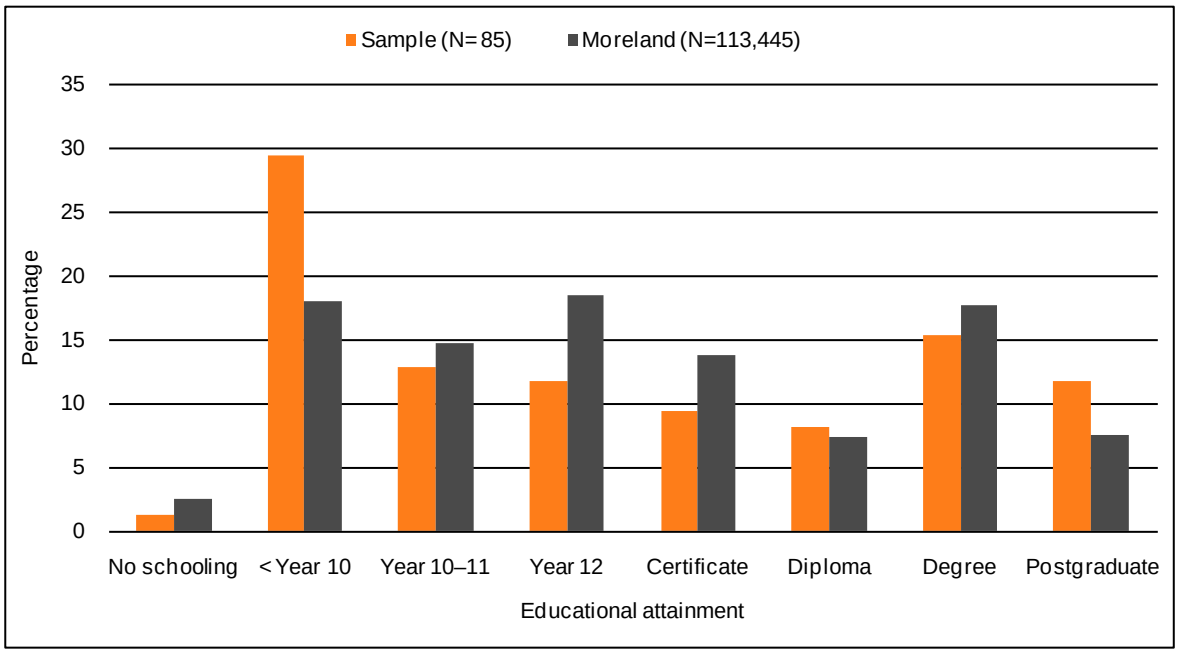
During the first months of the WHCH program, when face-to-face recruitment was conducted through community organisations, six survey participants required an interpreter for their interview. There has been only one instance of an interpreter being needed since that time. This change may indicate a reduction in the number of non–English speaking households being recruited.

Of the 85 people in the sample, a total of 19 speak a language other than English most of the time. The main languages spoken are Greek (8%) and Italian (4%). Turkish, Arabic (Lebanese) and Bengali are also spoken. These figures are not directly comparable to the 2006 Census data for Moreland because the question asked in the WHCH research is 'What is the language you speak *most of the time*?', whereas the census question was about the *language spoken at home*. Rates of Greek, Italian and Arabic spoken at home in the City of Moreland were high in the 2006 Census data. In addition, the census showed that 2% of the population spoke Chinese languages and a further 0.8% spoke Vietnamese; however, these communities are not represented in the WHCH research sample.

Educational attainment

Data comparing the educational attainment of the people participating in the WHCH research to the population of the City of Moreland is presented in Figure 2.8.

Figure 2.8 Educational attainment



The research sample contains a higher proportion of people with less than Year 10 education (29%) than does the City of Moreland (18%). These are mostly older people in the research sample, many of whom reported moving to Australia around the end of primary school and not continuing schooling in Australia.

3 Non-demographic baseline data

The following sections present the non-demographic baseline data, which relates to home comfort, financial hardship, health and home energy use behaviour.

Home comfort

A number of thermal comfort measures are available, with the ASHRAE scale and Bedford scale being commonly used (see, for example, Hong et al. undated; Wong & Khoo 2003).The Bedford scale has been selected for this study, partly because it is simple to use and can be self-reported in an interview. Moreover, the Bedford scale has been identified as superior to the ASHRAE scale (Wong & Khoo 2003) because people not only rate their thermal sensation (cool, warm) as in the ASHRAE scale, but also identify whether they are comfortable or experiencing too much of the sensation (for example, too warm, much too warm).

People were asked to describe their usual level of comfort in their home during summer and during winter (see Figure 3.1 and Figure 3.2).

Figure 3.1 Thermal comfort, summer

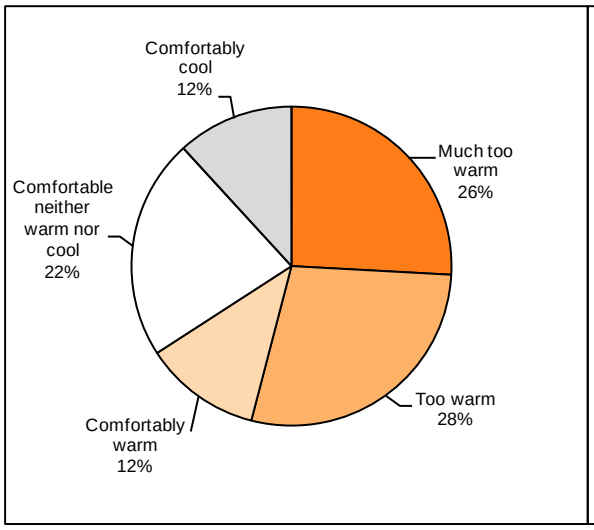


Figure 3.2 Thermal comfort, winter

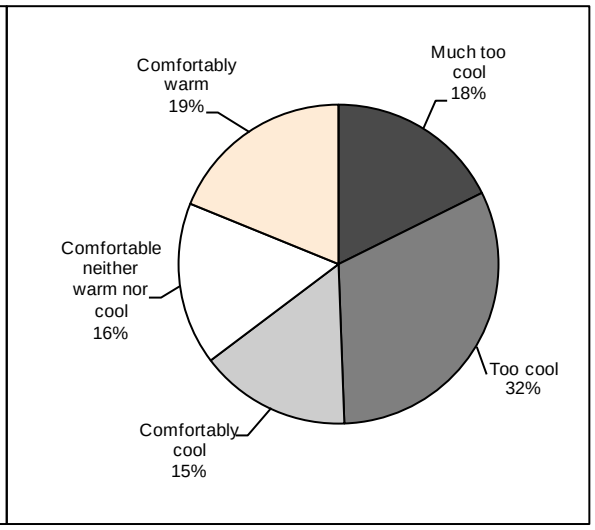


Figure 3.1 shows that more than half of the sample (54%) report that during summer their home is usually too warm or much too warm, and therefore uncomfortable.

Conversely during winter, almost half of the sample (49.4%) report home comfort levels that are too cool or much too cool. Just over half of the sample (50.6%) report their home is comfortable during winter (see Figure 3.2).

These results suggest home comfort needs in this sample may relate more to keeping cool in summer than keeping warm in winter.

Financial hardship

The research uses two measures of financial hardship. One is a hardship measure (Butterworth & Crosier 2006) based on the Household Income and Labour Dynamics Australia (HILDA) data (Melbourne Institute 2011). This measure asks people to indicate whether they experienced any of the following situations in the last six months due to a shortage of money:

- were unable to pay gas, electricity or telephone bills on time
- could not pay the mortgage or rent on time
- adults or children went without meals
- were unable to heat or cool their home (when needed)
- pawned or sold something
- sought assistance from a welfare or community organisation
- sought financial help from family or friends.

The measure is a count of how many of these 'hardships' the households experienced and ranges from zero to seven. Results for the WHCH research sample are shown in Figure 3.3.

Figure 3.2 Financial hardship

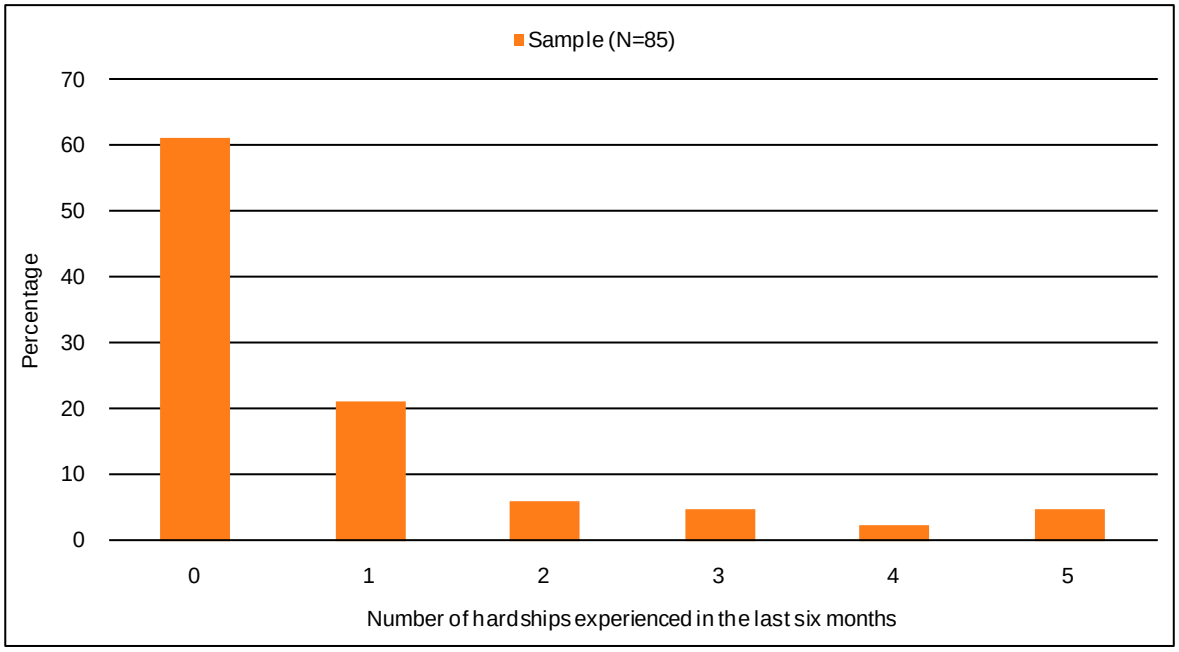


Figure 3.3 indicates that 61% of the sample did not report experiencing any of the HILDA hardships. Just over 20% experienced one hardship event, and small numbers of participants experienced multiple stressors during the preceding six months. Interviewees in four households (5% of the sample) reported experiencing five of the tested hardships.

An important factor influencing this result is that 55% of the sample own their home outright and hence the variable 'could not pay rent or mortgage on time' is not applicable for them.

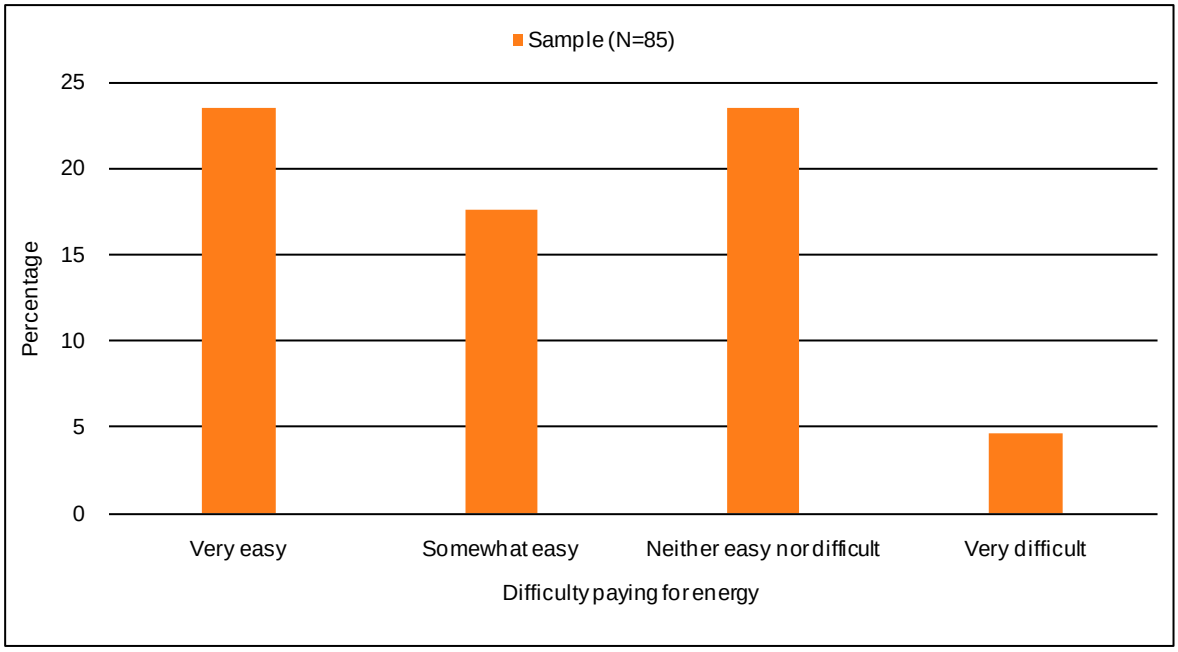
A second measure, a measure of fuel poverty used in a UK study (Green & Gilbertson 2008) of a program similar to Warm Home Cool Home, was also used. Interviewees were asked:

> Over the past six months, how easy or difficult has it been for you to find the money to pay for electricity, gas and other fuel? (very easy, somewhat easy, neither easy or difficult, somewhat difficult, very difficult)

The data in Figure 3.4 indicates that 31% of the sample reported paying for energy as somewhat difficult, followed by 24% who reported it as neither easy nor difficult and 24% who reported it as very easy. Several people noted that it was not difficult because they paid their utility bills using

Centrepay.[3] Others stated that such bills are always paid first, so they may not have difficulty paying utility bills but their other spending may be significantly constrained.

Figure 3.3 Fuel poverty measure



A correlation of these two measures (using Pearson's *r*) indicates a significant positive correlation between the financial hardship score and the fuel poverty score (expressed as a scale) ($r = .493$, $p < 0.01$). This means that the higher the number of financial hardship factors reported, the greater the reported difficulty in finding the money to pay fuel bills. However the $r^2=0.243$ indicates that only 24% of the variability in financial hardship score is shared by the fuel poverty score (76% of the variability is accounted for by other things).

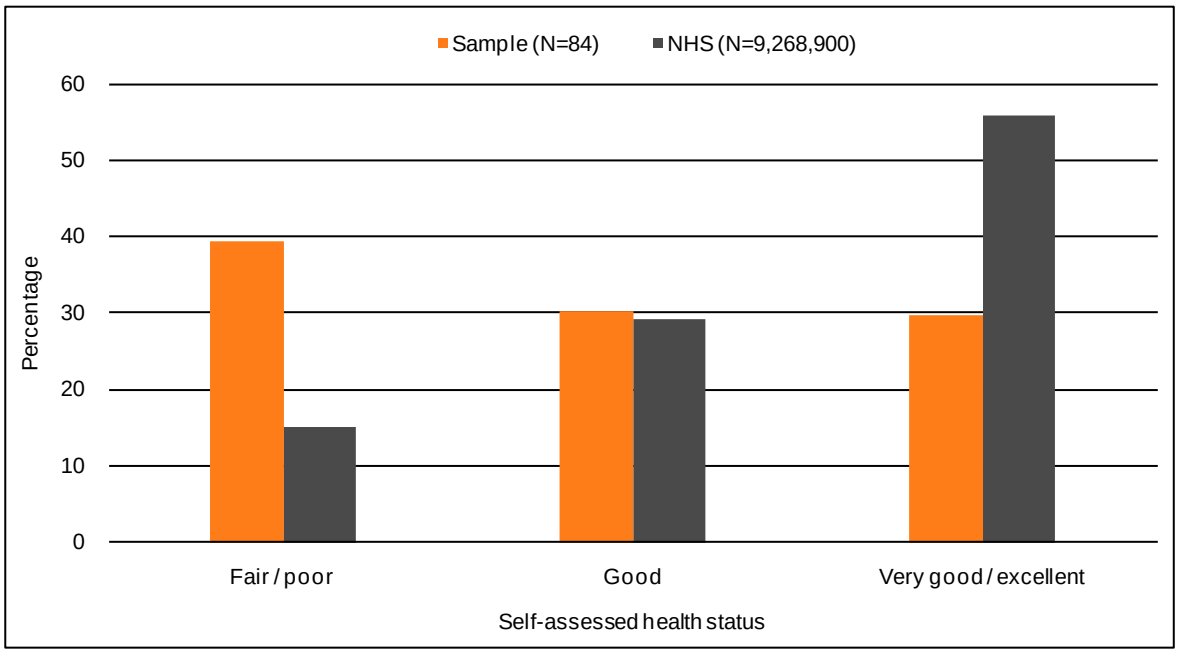
Health

Green and Gilbertson (2008) and Howden-Chapman et al. (2007) indicate a number of different health impacts of home energy retrofitting programs. These include overall self-reported health, respiratory health, chronic pain and stress. Improvements in respiratory and chronic pain conditions were related to improvements in insulation and in some cases heating. Improvements in stress were mainly a secondary benefit resulting from improved financial and or medical conditions (Green & Gilbertson 2008). These aspects of health are being assessed in the Warm Home Cool Home research. Interest from the Victorian Department of Health has led to the inclusion of a question about heat-related illness.

The baseline data for overall self-assessed health is illustrated alongside national figures from the National Health Survey (NHS) for 2007–08 (ABS 2010) in Figure 3.5.

[3] Centrepay is a free, direct bill-paying service available to customers who receive a Centrelink payment (see <http://www.centrelink.gov.au/internet/internet.nsf/forms/sa325.htm>).

Figure 3.4 Self-assessed health status



Around one-third of the sample reported being in good health, with almost 40% rating their health as fair or poor and 29% rating their health more highly, as very good or excellent. One person did not provide a rating of their health.

The NHS indicates a similar proportion of the population reporting their health as good (29%), but a much higher proportion of the sample reports very good or excellent health (56%) and only 15% rate their health as fair or poor (ABS 2010, Table 1). This suggests a higher burden of health in the WHCH sample than in the general population.

In relation to specific health conditions, 39% of the sample reported themselves or a member of their household as suffering from a respiratory condition, with 33% of the sample having experienced symptoms in the four weeks prior to the interview. Of these, 41% experienced mild symptoms, 44% moderate and 15% severe (requiring medical advice or attention). As a general comparison, 25% of the NHS respondents reported asthma, hay fever or chronic rhinitis (ABS 2010). This suggests a lower incidence of respiratory conditions but is not directly comparable because the survey questions differed.

Chronic pain conditions, such as arthritis, back pain and pain associated with multiple sclerosis, endometriosis and fibromyalgia were common in the sample, being experienced by 62% of the interviewees (or a member of their household). Some 59% of the sample had experienced pain symptoms in the past four weeks. Of these, 22% were mild, 64% moderate and 14% severe. This large proportion of people with chronic pain conditions is likely to be due to the high proportion of older people in the WHCH sample. As a general comparison, 29% of the NHS reported arthritis or back pain / problem disc disorder (ABS 2010).

Interviewees were also asked whether anyone in their household had any other chronic illness or disability that affected their electricity or gas use. Some 24% of the sample reported this was the case. The types of special energy use reported included requirements for oxygen, recharging of electric wheelchairs, air-conditioning and heating for people with thermoregulatory problems associated with multiple sclerosis and acquired brain injury and additional lighting due to vision

impairment. For one person, the causes were less clear. She explained her son's high usage of heating as due to:

> Mental illness. He keeps the heater on because he says he's cold; I'm not sure what's wrong with him. I need to take him back to the doctor.

Just over one-quarter of the sample (27%) reported an illness affecting themselves or a household member that was caused or made worse by extreme heat the previous summer. In almost one-third of cases (30%) the illness was severe (requiring medical advice or attention); in 52% of cases it was moderate and in 8% it was mild.

Insulation is the main energy efficiency measure that was anticipated to influence health status. There has been a lower than anticipated uptake of insulation as part of the Warm Home Cool Home program, so it is now doubtful that changes in physical health status will be measurable from the interventions that were made in people's homes under the program.

Home energy use behaviour

A series of household energy use behaviours were presented and interviewees were asked to indicate whether people in their household practised the behaviour *always*, *sometimes*, or *never*. The results are presented in Table 3.1.

Table 3.1 Energy use behaviours (N=85)

Behaviour	Always (%)	Sometimes (%)	Never (%)	Don't know / not applicable (%)
Low energy use behaviours				
Keep showers to 4 minutes or less	37.6	45.9	7.1	9.4
Turn off appliances at the wall power point (prompt for TV, radio)	18.8	43.5	37.6	0.0
Switch off lights when not in use	68.2	30.6	1.2	0.0
Turn the hot water system off when away on holidays	12.9	7.1	63.5	16.5
On mornings of hot days, close up the house and shade all windows	85.9	9.4	3.5	1.2
Wash clothes in cold water	52.9	25.9	21.2	0.0
Set hot water system to 60°C	14.1	0.0	1.2	84.7
High energy use behaviours				
Behaviour	**Always**	**Sometimes**	**Never**	**Don't know / not applicable**
Heat house above 20°C	14.1	25.9	40.0	20.0
Heat rooms not being used	21.2	16.5	62.4	21.2
Run a second fridge/freezer	42.4	3.5	54.1	0.0
Rinse dishes under running hot water	16.5	30.6	52.9	0.0

These behaviours were selected after consultation with Moreland Energy Foundation. The literature does not indicate any definitive group of behaviours that can be tested to indicate a household's overall efficient use of energy. The measures utilised in this study represent an initial attempt to bring together a useful group of behaviours representing home energy use patterns.

The most commonly reported *energy saving* behaviours were:

- on mornings of hot days, closing up the house and shading all windows: 86% report *always* doing this
- switching off lights when not in use: 68% report *always* doing this
- heating rooms that are not in use: 62% report *never* doing this.

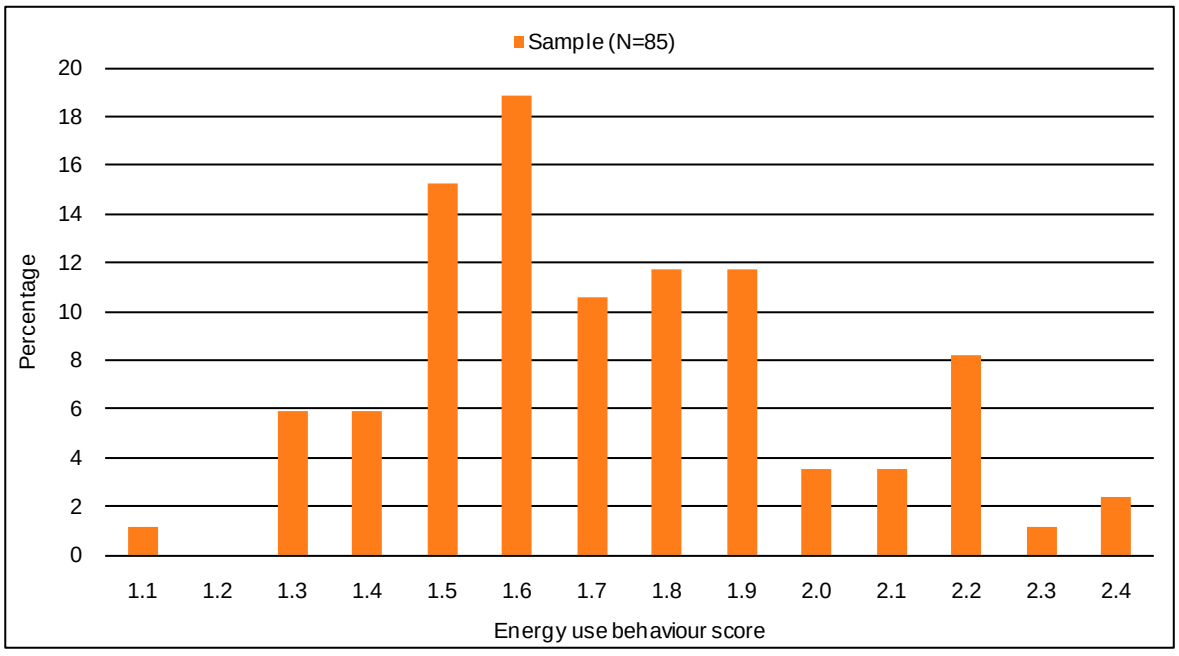
The most commonly reported *high energy use* behaviours were:

- *never* turning off the hot water service if away from home for holidays or an extended period (64%)
- having a second fridge or freezer that is *always* running (42%)
- *never* turning electrical appliances off at the wall power point (38%). Of the 44% of people who reported *sometimes* turning appliances off at the wall, many explained they turned off things they could reach easily, but power points for televisions and sound systems were too difficult to reach.

Some 81% of interviewees did not know the temperature setting of their hot water service.

An overall *energy use behaviour score* was created. Each item has a possible score of one, two or three representing low, medium or high energy use of the behaviour. For example 'Keeping showers to four minutes or less' scores always (1), sometimes (2), never (3); and conversely 'Heating rooms that you aren't using' scores always (3), sometimes (2) and never (1). A sum score is created by simply adding the scores for each item, then dividing the total by the number of items. Lower sum scores indicate lower overall energy use. This data is presented in Figure 3.6.

Figure 3.5 Energy use behaviour score (N=85)



The mean energy use behaviour score is 1.73 (SD=.28) with a pattern close to a normal distribution. Only one person (1.2% of the sample) had a very low score of 1.1. There is a small group of people (11.8% of the sample) with a high score between 2.2 and 2.4.

Billing data

Billing data is being collected for the households in the research sample in order to provide an objective measure of energy use that can be compared to other subjective measures adopted in the study.

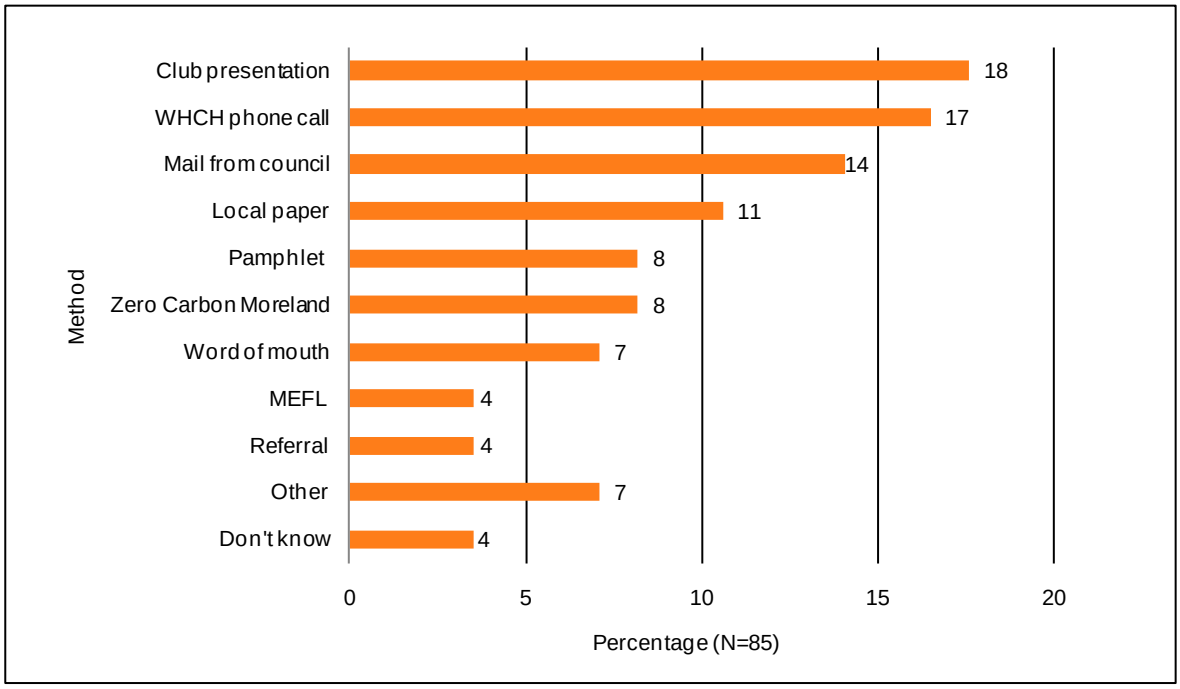
The collection of billing data has been slow. To date there are only 11 households for which baseline energy data is available, which is insufficient for meaningful analysis. When sufficient data has been collected, analysis will include correlations between energy use and:

- energy use behaviour score
- self-reported health status
- home (thermal) comfort
- financial hardship.

4 Recruitment

During the interviews, people were asked how they heard about the Warm Home Cool Home program. This data is presented in Figure 4.1.

Figure 4.1 How participants heard about the Warm Home Cool Home program



In the research sample, the most effective means of recruitment to the WHCH program between November 2009 and February 2011 were presentations at clubs, for example the RSL and the senior citizens clubs in specific cultural communities including Greek and Turkish. Some people mentioned more than one way of hearing about the program—for example, a pamphlet and a local newspaper advertisement—suggesting that for some people multiple reminders or prompts are effective in recruitment. For others it may be that the opportunity to discuss the program face-to-face prompts them to take action, as described in the quote below:

> I saw it in the paper, then a couple of girls came from the Council to the Enfield Club.

The reasons people joined the program were varied. The most common reasons were to keep their home warmer or cooler:

> The winter cold getting into the house all around. The doors and windows are the main culprit. I also wanted to contribute to the research and the data on what's going on.

> Because my house is freezing in winter. It's not, obviously, ventilated properly. I don't know how to manage and what to do next so the main thing is advice—what can I do to reduce my heating and cooling expenses. Someone who can identify problem areas and provide practical help, because I'm not that good at doing it myself and tradespeople cost a mint.

> To get draughts stopped on the doors; any help is greatly appreciated!

Others joined to save money:

> All the little things add up and at the moment any dollar we can save we need.

> Because there was no reason not to. I was brought up in the hard time, the depression, and I was taught to take what you're given with your left hand and give what you can with your right hand.
>
> Save on bills.

Others joined to help the environment. This was expressed in various ways including the following:

> I've always been fond of using less of the environmental goodies.
>
> I want to minimise my use of resources, water and energy, but my children are not, they are not caring about the crisis of energy and water. We got a water flow restrictor, maybe there is more we can get.
>
> I've got small children. I want the earth to be here when I'm gone. I suppose I think about the future.

Other reasons for joining were:

- because the program was recommended by a friend or trusted service provider
- to get expert information or advice on energy efficiency
- to get assistance with improvements the householder had identified but could not implement due to a lack of knowledge, time or physical limitations (especially being unable to climb ladders to replace light bulbs).

5 Conclusion

This report presents comparisons of personal and household level characteristics of people participating in the Warm Home Cool Home research, the entire group of Warm Home Cool Home program participants and the population of the City of Moreland.

In general, this analysis indicates that the Warm Home Cool Home program and the associated research are skewed toward older, single-person, female households. The influence of gender in relation to household energy efficiency has not been proven.

Older people are more likely to have poor health or disabilities that can be influenced by the thermal comfort of their home. It is anticipated that this group will receive the greatest benefit from the program in relation to improved thermal comfort. They are therefore a population of interest in this research.

At the same time, older people have reported higher rates of lower cost energy efficiency modifications in their home (Roy Morgan Research 2007). As a result, unless the program reaches older people who have not already made energy efficiency modifications, it may result in smaller changes in energy efficiency than might otherwise be possible.

Households on low incomes are generally identified as more likely to experience financial hardship associated with energy bills; however, this is not the case for older people (Roy Morgan Research 2007), who reportedly have a tendency to be more frugal with their electricity and gas use. It is therefore anticipated that the financial hardship and energy consumption aspects of the program will have a greater impact on other groups than on older households with low incomes and all groups therefore need to be better represented in the data if these aspects are to be adequately understood.

The research sample group has a high burden of health compared to the general population. Accordingly energy efficiency interventions that improve the ability to keep the home warm in winter (insulation and weather sealing) and cool in summer (insulation, weather sealing and cooling) are likely to be of value to participants. The final research results will be instructive in understanding relationships between current levels of insulation and health and any changes that may occur as a result of insulation and weather sealing improvements made through the Warm Home Cool Home program.

The home comfort data suggests that a significant proportion of households are either too warm in summer or too cool in winter. These findings may suggest that some households have insufficient heating or cooling to meet their needs. From an energy consumption point of view, this in turn suggests there could be a rebound effect in energy usage as households convert energy savings into marginal improvements in comfort. From a health and wellbeing point of view, however, this may be a positive step.

The correlation that exists between the HILDA hardship measure and the difficulty in paying utility bills suggests the research provides an opportunity to assess financial hardship outcomes of Warm Home Cool Home using a robust measure.

The post-participation interviews are now being conducted and comparative results will be reported as they become available. There is currently uncertainty, however, about the future direction of the Warm Home Cool Home program. This will have implications for the research and may require a significant revision of the research methodology.

References

Australian Bureau of Statistics (ABS) 2007, *2006 Census of Population and Housing*, ABS, Canberra, <http://www.abs.gov.au>>.

—— 2010, *National Health Survey: summary of results, 2007–2008 (re-issue)*, cat. no. 4364.0, ABS, Canberra.

Butterworth, P & Crosier, T 2006, *Deriving a measure of financial hardship from the HILDA survey*, Australian Social Policy 2005, Department of Families, Community Services and Indigenous Affairs, Canberra, viewed 1 July 2011, <http://www.fahcsia.gov.au/about/publicationsarticles/research/austsocialpolicy/Documents/austsocpolicy_2005/article1.htm>.

Committee for Melbourne (CfM) 2004, *Utility Debt Spiral Project*, Committee for Melbourne, viewed 3 December 2007, <http://www.ewov.com.au/site/DefaultSite/filesystem/documents/PDF/Reports/Utility-Debt-Spiral-Study_April-2005.pdf>

Dufty, G 2007, *Electricity pricing: delivering social justice and environmental equity*, St Vincent de Paul Society, Melbourne.

Fritze, J, Blashki, G, Burke, S & Wiseman, J 2008, 'Hope, despair and transformation: climate change and the promotion of mental health and wellbeing', *International Journal of Mental Health Systems*, vol. 2, no. 13.

Gabriel, M, Watson, P, Ong, R, Wood, G & Wulff, M 2010, *The environmental sustainability of Australia's private rental housing stock*, AHURI final report; No.159, Australian Housing and Urban Research Institute, Melbourne.

Garnaut, R 2011, *Transforming the electricity sector*, Update Paper no. 8, Garnaut Climate Change Review, Canberra, viewed 1 July 2011, <http://www.garnautreview.org.au/update-2011/update-papers/up8-transforming-electricity-sector.pdf>.

Green, G & Gilbertson, J 2008, *Warm front better health: health impact evaluation of the Warm Front scheme*, Centre for Regional, Economic and Social Research, Sheffield Hallam University, Sheffield, UK, viewed 1 July 2011, <http://www.shu.ac.uk/_assets/pdf/cresr-WF_final+Nav(2).pdf>.

Hong, SH, Gilbertson, J, Oreszczyn, T, Green, G, Ridley, I & the *Warm Front* Study Group (undated), *A field study of thermal comfort in low-income dwellings in England before and after energy efficient refurbishment*, Bartlett School of Graduate Studies, University College, London.

Horton, G & McMichael, T 2008, *Climate change health check 2020*, The Climate Institute, Sydney.

Howden-Chapman, P, Crane, J, Matheson, A, Viggers, H, Cunningham, M, Blakely, T, O'Dea, D, Cunningham, C, Woodward, A, Saville-Smith, K, Baker, M & Waipara, N 2005, 'Retrofitting houses with insulation to reduce health inequalities: aims and methods of a clustered. randomised community-based trial', *Social Science and Medicine*, vol. 61, pp. 2600–10.

Howden-Chapman, P, Matheson, A, Crane, J, Viggers, H, Cunningham, M, Blakely, T, Cunningham, C, Woodward, A, Saville-Smith, K, O'Dea, D, Kennedy, M, Baker, M, Waipara, N, Chapman, R & Davie, G 2007, 'Effect of insulating existing houses on health inequality: cluster randomised study in the community', *British Medical Journal*, vol. 10, no. 1136.

Independent Pricing and Regulatory Tribunal of New South Wales (IPART) 2010, *Residential energy and water use in Sydney, the Blue Mountains and Illawarra: results from the 2010 household survey*, IPART, Sydney, viewed 1 July 2011, <http://www.ipart.nsw.gov.au/files/Report%20-%202010%20HH%20survey%20report%20FINAL%20website%20-%20APD.PDF>.

KPMG 2008, *A national energy efficiency program to assist low-income households*, KPMG, the Brotherhood of St Laurence & Ecos Corporation, Melbourne, viewed 1 July 2011, <http://www.bsl.org.au/pdfs/KPMG_national_energy_efficiency_program_low-income_households.pdf>.

Lawrence, J 2002, *Electricity: it's just essential: Low Income Electricity Consumers Project final report*, South Australian Council of Social Service and Council on the Ageing (SA), Adelaide, viewed 1 July 2011, <www.sapo.org.au/binary/binary442/Electricity.pdf>.

Melbourne Institute 2011, *Household Income and Labour Dynamics in Australia (HILDA) Survey*, University of Melbourne, Parkville, Vic., viewed 31 May 2011, <http://melbourneinstitute.com/hilda/>.

Miko, RM 2005, *An evaluation of energy efficiency and its applicability to low income, inner city groups in West Broadway, Winnipeg, Manitoba*, Master of Natural Resource Management thesis, University of Manitoba, Winnipeg, viewed 18 August 2011, <http://www.umanitoba.ca/institutes/natural_resources/canadaresearchchair/thesis/rmiko%20masters%20thesis%202005.pdf>.

Quantum Market Research 2007, *Energy and Water Task Force Program: an assessment through market research* South Yarra, Vic.

Rowe, R & Thomas, A 2008, *Climate change adaptation: a framework for local action*, Policy Signpost no. 3, The McCaughey Centre, University of Melbourne.

Roy Morgan Research 2007, *Victorian Utility Consumption Household Survey*, Department of Human Services, Melbourne, <http://dhs.vic.gov.au/__data/assets/pdf_file/0008/307358/VUCHS-2007-Final-Report.pdf>.

Sims, R 2010, *Energy market outlook: overview of presentation to Multi-party Climate Change Committee, 10 November 2010*, Multi-party Climate Change Committee, Canberra, ACT, <http://www.climatechange.gov.au/government/initiatives/~/media/publications/committee/rod-sims-energy-market-outlook.ashx>.

Simshauser, P, Nelson, T & Doan, T 2010, *The boomerang paradox: how a nation's wealth is creating fuel poverty—and how to defuse the cycle*, Working Paper no. 17, AGL Applied Economic and Policy Research, North Sydney, NSW, viewed 1 July 2011, <http://www.aglblog.com.au/wp-content/uploads/2010/10/No.17-Boomerang-Paradox-Final-Oct-20102.pdf>.

Spoehr, J, Davidson, K & Wilson, L 2006, *An evaluation of the Energy Efficiency Program for Low Income Households*, Energy Division, Department for Transport, Energy and Infrastructure, University of Adelaide.

Sullivan, D 2007, *Climate change: addressing the needs of low-income households in the private rental market: background paper*, Brotherhood of St Laurence, Fitzroy, Vic., viewed 1 July 2011, <http://www.bsl.org.au/pdfs/Sullivan_climate_change_renters_background_paper.pdf>.

Unkles, B & Stanley, J 2008, *Carbon use in poor Victorian households by local government area*, Brotherhood of St Laurence, Fitzroy, Vic.

Wong, NH & Khoo, SS 2003, 'Thermal comfort in classrooms in the tropics', *Energy and Buildings*, no. 35, pp. 337–51.