

# Adaptive capabilities in older people during extreme heat events in Victoria: a population survey





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# Executive summary

The Victorian Department of Health funded *Adaptive capabilities in older people during extreme heat events in Victoria: a population survey*. The survey was undertaken by Population Research and Outcome Studies (PROS), University of Adelaide, in conjunction with Harrison Health Research, between 14 February and 10 March 2011. The aim of the survey was to identify the adaptive capabilities of older people in Victoria during periods of extreme heat.

Five hundred telephone interviews were conducted with older people in metropolitan and rural Victoria who lived in houses, units or retirement villages. Older people are particularly at risk of health impacts during extreme heat because ageing causes a reduced ability to physiologically deal with heat. Moreover, older people may have a pre-existing medical condition that may be exacerbated by heat or take certain medications that may be less effective or more toxic in the heat.

According to the survey, females and those taking medication for other heart problems (including stroke and angina, or a respiratory condition) were more likely to have experienced a heat-related illness during heatwaves in the past few years.

For many respondents, being in good health was associated with lower levels of perceived risk and lower levels of concern for health in the heat. More specifically, those with higher levels of self-reported health status (excellent, very good or good), those who did not receive assistance at home with personal or household tasks and those who did not take medication for other heart problems or diabetes were less likely to perceive themselves as being at the same or more risk than the average person in terms of harm from the heat. In addition, those not taking medication for other heart problems or a respiratory condition were more likely to be unconcerned about their health in the heat.

Overall, most older people said they adapted their behaviour to reduce the risk of harm from heat, such as by wearing cooler or lighter clothing and drinking more fluids. A small number of people did not change their behaviour, however.

According to the survey, most (86.2%) older people had an air-conditioner at home, although cost was the main barrier to using it. More than half (56.4%) had reverse-cycle air-conditioning, 22.9% had refrigerative-type air-conditioning and 21.7% had an evaporative type of air-conditioning. However, a third (34.2%) of air-conditioners were 10 or more years old and only one in five (20.9%) were serviced regularly.

Fans may be effective for cooling; however, it is important to use them with proper ventilation and a wet face washer or towel. Almost three-quarters (71.1%) of all survey participants used a fan at home.

Sustainable cooling options can provide a long-term, cost-effective means of cooling the home. Most (88.5%) participants had insulation in the home. More than half (58.5%) had blinds, awnings or shutters at home and the majority used them in summer.

Even though most participants said they changed their behaviour in the heat, survey results suggest risk perception may still be an issue among older people, as 46.7% believed they were at less risk of harm than the average person. Most said they kept appointments and kept doing regular activities when it was hot.

Participants who reported living alone were more likely to report a lack of confidence in being able to call on family members, friends or neighbours if they needed help.

Pet and animal welfare in the heat was noted as a concern for more than three-quarters of all survey participants.

The majority (75.1%) of participants said they recalled health warnings, but almost half (47.4%) of these people reported not changing their behaviour as a result of hearing the health warnings. Those more likely to change their behaviour following health warnings included those who reported using a mobility aide and those with a respiratory condition. Radio and TV were the best means of communicating heatwave warnings to older people in Victoria, followed by SMS.

# 1. Introduction and background

Victoria experienced a prolonged heatwave in the summer of 2009 that reached a record of three successive days of temperatures above 43 °C in Melbourne and record hot temperatures throughout Victoria. The impact on health was investigated using health outcomes from mortality and morbidity databases including data from Ambulance Victoria, Victorian public hospital emergency departments, death registrations from the Victorian Registry of Births, Deaths and Marriages and death referrals to the State Coroner's Office (Department of Human Services 2009). The data for the week of the heatwave (26 January to 1 February 2009) showed substantial increases in mortality and morbidity compared with the same calendar dates in previous years. The burden of impact was particularly high in older age groups. A higher percentage of people aged 75 years or over suffered heat-related conditions and had emergency department presentations than people aged under 75 years. The greatest number of all deaths occurred for people aged 75 years or more. This is consistent with worldwide evidence and can be explained by physiological and cognitive contributing factors associated with older people (Hansen et al. 2011a).

Health impacts from heatwaves in Australia are relatively well documented (Loughnan et al. 2010; Nitschke et al. 2011), but there is scant Australia-specific information about the potential environmental, behavioural and personal risk factors of falling ill during heatwaves. So, in early 2011 the Victorian Department of Health funded a survey to identify the adaptive capabilities of older people in Victoria during periods of extreme heat. This survey included questions about risk factors related to recent periods of extreme heat, including the 2009 heatwave. Information about demographic and accommodation-specific environmental factors among older people in Victoria was also collected. The survey questions were developed in conjunction with the findings from an earlier qualitative survey (focus groups and interviews) that investigated heat susceptibility, adaptive behaviours and barriers in the older population during periods of extreme heat. Key informants were service providers (government and non-government) working with older people in the community (Hansen et al. 2011b).



## 2. Methodology

### 2.1 Survey design

The population-based survey was undertaken for the Department of Health in Victoria by Population Research and Outcome Studies (PROS), University of Adelaide, in conjunction with Harrison Health Research, between 14 February and 10 March 2011. Ethics approval was obtained from the South Australian Health Human Research Ethics Committee and from the University of Adelaide.

The survey was conducted using computer-assisted telephone interviewing (CATI). This system is designed to rapidly collect data on large population samples by allowing data to be entered on the spot and for call backs to be correctly sequenced and organised.

All households in Victoria with a landline telephone connection and number listed in the current version of the electronic white pages (EWP) were eligible for selection in the sample. Telephone numbers were drawn randomly. Only people aged 65 years or over were eligible for inclusion and 5,640 households were contacted in order to reach the survey sample target of 500. Screening calls were undertaken to obtain people in this age category. An initial survey question established whether participants lived in houses, units or retirement villages. If they lived in aged care facilities or nursing homes, the interview was terminated. The interview was also terminated if the participant did not understand English or was not capable of completing the survey. If there were two or more people in the household aged 65 years or over, the selected participant was the person with the most recent birthday. People who were selected for interview were not replaceable. Once a household was selected, there were up to 10 call backs to establish contact with busy or unanswered numbers at different times during the day, regardless of whether the target number of interviews had been reached.

The questionnaire was piloted twice to ensure all difficulties with questions were resolved. Ten per cent of each interviewer's work was monitored by a supervisor.

### 2.2 Weighting/processing

Data were weighted by the inverse of an individual's probability of selection into the survey and then re-weighted using 'estimated residential population' figures from the Australian Bureau of Statistics (ABS) to ensure

the sample was representative of the metropolitan and rural age group and gender distribution of the population in Victoria (ABS 2010).

### 2.3 Data collected

Survey questions were based on a qualitative study conducted prior to the survey involving focus groups and interviews with stakeholders including older people and key personnel involved in aged care, community services, government sectors, emergency services and policymaking. The results from this study highlighted issues that were important for older people in relation to their perceived and existing health problems, and their socioeconomic, psychological and environmental situations. These main themes were used to develop questions that covered the following areas: demographics, including socioeconomic indicators; environment and housing; social connectedness; health status; vulnerability and health problems during recent heatwaves; heat health knowledge including awareness about heat advisories; and resilience during heatwaves.

### 2.4 Statistical analysis

The survey data were analysed using the Stata 11 (StataCorp LP, College Station, Texas) statistical package. A descriptive analysis of the general and topic-specific characteristics of participants was conducted using the survey prefix command (svy), which takes into account population weighting. Differences in proportions were assessed for significance using logistic regression. All percentages and 95% confidence intervals (95% CI) in tables are weighted estimates, unless otherwise stated.

Bivariate analysis was conducted using logistic regression to explore possible risk factors (age, gender, demographics, health status) associated with health outcomes and heat health behaviours (such as heat health awareness and vulnerability during heatwaves). Plausible influential risk variables with a p-value less than 0.2 at the bivariate level were simultaneously included in multiple logistic regression models. Using backward elimination, insignificant variables with the highest p-value were sequentially removed to yield the final models of risk factors associated with health outcomes and behaviours ( $p < 0.05$ ).

# 3. Results

## 3.1 Participation

Of the initial 5,640 households drawn in Victoria, a sample loss of 4,265 occurred. The sample loss was due to non-residential numbers (57), disconnected numbers (976), fax/modem response only (61), contact not established after 10 calls (349) and ineligibility due to age under 65 years or not residing in Victoria (2,822).

The remaining sample of 1,375 households constituted the eligible sample. Non-response was due to refusal of the interview (582), inability to speak English (148), illness/hearing impairment (126), termination of interview due to living in a facility (six), the person being deceased (one) and being unavailable (12). Five hundred interviews were conducted. This resulted in a participation rate of 36% of the eligible sample (500/1,375 x 100). Generally, the results for survey questions in this report are based on responses from 498 participants, unless otherwise stated.

## 3.2 Survey sample

Table 1 provides information about the weighted and unweighted demographic profile of participants in the survey. The table provides an indication of the representativeness of the survey sample. The unweighted sample estimates represent the sample that was obtained from the survey, while the weighted sample estimates represent the sample that was sought and approximate the actual distribution of the major demographic characteristics of people aged 65 years or over in the Victorian population. The table suggests there was a smaller proportion of males, people aged 85 years or over and people living in the metropolitan area in the survey sample obtained (unweighted sample) than in the actual population (weighted sample).

The table shows that more than half (54.9%) of all older people in Victoria are female and almost half (47.6%) are aged 75 years or over. The table also shows that more than two-thirds (weighted sample 68.7%) of people aged 65 years or over in Victoria reside in the metropolitan area, compared with almost a third (31.3%) in rural areas of the state.

**Table 1: Demographic distribution of survey sample**

Selected characteristics	Count n = 498	Unweighted sample %	Weighted sample %	Lower 95% CI	Upper 95% CI
<b>Sex</b>					
Females	312	62.7	54.9	49.8	59.8
Males	186	37.4	45.2	40.2	50.2
<b>Age group</b>					
65–69 years	151	30.3	29.0	24.8	33.5
70–74 years	134	26.9	23.4	19.7	27.6
75–79 years	98	19.7	19.2	15.7	23.2
80–84 years	75	15.1	15.1	12.0	19.0
85 years+	40	8.0	13.3	9.6	18.1
<b>Geographic area of residence</b>					
Metropolitan	298	59.8	68.7	64.3	72.8
Rural	200	40.2	31.3	27.2	35.7

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

### 3.3 Health status and medication use

Survey participants were asked to assess their health status by indicating whether they felt their health was excellent, very good, good, fair or poor. Self-reported health is a reliable predictor of ill-health, future healthcare use and premature death, independent of other medical, behavioural or psychosocial risk factors.

Three-quarters (75.3%) of all survey participants reported their health status as either excellent, very good or good, and 24.3% reported their health as fair or poor (Table 2). A higher proportion of survey participants aged 75 years or over (31.8%) assessed their health status as fair or poor, compared with participants aged under 75 years (17.6%) (OR 2.2; 95% CI 1.4–3.5;  $p = 0.001$ ). There was no significant difference in health status outcomes between participants residing in metropolitan and rural areas ( $p > 0.05$ ).

Table 3 shows the specific medical conditions for which participants reported taking medication on a regular basis. These conditions were selected on the basis of evidence of their possible association with increased risk of heat-related illness.

At least one medication was taken for the conditions listed in Table 3 by three-quarters (74.7%) of all participants. Participants aged under 75 years were less likely to take medication for at least one of these conditions (67.4%), compared with those aged 75 years or over (82.6%) (OR 0.4; 95% CI 0.2–0.7;  $p = 0.002$ ). There was no significant difference in medication use between participants residing in metropolitan and rural areas ( $p > 0.05$ ).

More than half (55.2%) of all participants reported taking medication for high blood pressure, 6.8% for heart failure and 20.8% for other heart problems, including stroke and angina. Other listed health problems for which prescribed medication was being taken included respiratory problems (12.0%), diabetes (11.5%), mental health conditions (8.8%) and kidney problems (3.1%).

Three per cent of participants reported having been told by a doctor to restrict their fluid intake due to at least one of the medical conditions listed in Table 3.

**Table 2: Self-reported health status**

Health status	%	Lower 95% CI	Upper 95% CI
Excellent	13.6	10.6	17.3
Very good	31.8	27.3	36.6
Good	29.9	25.6	34.6
Fair	17.9	14.5	21.9
Poor	6.4	4.2	9.7

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

**Table 3: Prescribed medications taken regularly for heat-related medical conditions**

Medical condition	%	Lower 95% CI	Upper 95% CI
Diabetes	11.5	8.9	14.8
High blood pressure	55.2	50.2	60.1
Heart failure	6.8	4.7	9.6
Other heart problems (heart attack, stroke, angina etc.)	20.8	16.9	25.3
Kidney problem	3.1*	1.8	5.2
Respiratory problem (such as asthma, COPD)	12.0	9.0	15.7
Depression, anxiety, memory loss or other mental health condition	8.8	6.5	11.9
Parkinson's disease	**	–	–
Multiple sclerosis	0.0	–	–
Takes tablets/medication for at least one condition listed above	74.7	70.1	78.8
Don't take any tablets/medications for any of the conditions listed above	22.5	18.6	27.0

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

\*\* Estimate has a relative standard error greater than 50% and has not been reported as it is not reliable for general use.

### 3.4 Mobility aides and need for household assistance

Survey participants were asked whether they used any mobility aides and whether they had someone who helped them with personal or household tasks. Using mobility aides and having household assistance is associated with a loss of ability in activities of daily living and quality of life and may be associated with individual vulnerability.

The majority of survey participants did not use any mobility aides (84.0%) (Table 4). Walking aides, which includes walking frames and sticks, were the most common type of mobility aide used by participants (15.4%), followed by gophers/scooters (1.3%).

Survey participants who reported receiving assistance with household tasks (36.9% of all participants received assistance) mainly received help from their spouse (40.6%). Other major sources of household assistance were the Home and Community Care service or local council (22.7%), an agency (10.1%) and another family member other than a spouse (9.4%) (Table 5).

**Table 4: Use of mobility aides**

Mobility aide	%	SE	Lower 95% CI	Upper 95% CI
Walking aids (frames, sticks)	15.4	1.9	12.0	19.5
Gopher/scooter	1.3*	0.6	0.5	3.1
Other mobility aide (such as wheelchairs, crutches)	1.6*	0.6	0.7	3.3
No mobility aides used	84.0	1.9	79.8	87.4

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

**Table 5: Source of household assistance**

Source of household assistance	%	Lower 95% CI	Upper 95% CI
Spouse	40.6	32.4	49.3
Another family member	9.4	5.9	14.6
Friend	4.8*	2.4	9.2
Home and Community Care service or local council	22.7	16.8	30.0
An agency	10.1*	5.4	18.0
Domiciliary care service	5.0*	2.2	10.9
Other	11.1	6.9	17.4

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.5 Social interactions

Communication is central to developing and maintaining social ties, as well as sharing knowledge and information. There are many ways to stay in touch, including meeting face to face and talking over the telephone. Survey participants were asked about the number of times they talked with family or friends over the phone, the number of times they talked with friends, family or neighbours in person and how many times they had been out (for example, for an appointment, visiting people, going to church or shopping) in the preceding week. Although the number of times participants had contact with others over the past week may not necessarily reflect social isolation or social detachment, a lack of social contact may imply some vulnerability from not being in touch with other people.

Table 6 provides information on the frequency of social interactions for participants in the week before the survey. The majority of participants (93.9%) reported talking on the phone with friends or family at least once in the preceding week. People from rural areas (6.7%) of Victoria were more likely to report not having talked on the phone with friends or family in the past week than people from

the metropolitan area (2.4%) (OR 3.0; 95% CI: 1.0–8.5;  $p = 0.043$ ). There was no significant difference in the frequency of phone use with contacts between age groups (< 75 years vs  $\geq 75$  years) ( $p > 0.05$ ).

Most survey participants (93.3%) had talked at least once in person to friends, relatives or neighbours in the past week. Participants aged 75 years or over (5.8%) were more likely to have not talked in person to contacts in the past week than those aged under 75 years (1.5%) (OR 4.2; 95% CI: 1.4–13.3;  $p = 0.013$ ). There was no significant difference in the frequency of talking in person to contacts between participants residing in metropolitan and rural areas ( $p > 0.05$ ).

Table 6 indicates that 96.4% of participants had gone out of the house at least once in the past week for appointments, to visit people, or elsewhere. Participants aged 75 years or over (5.1%) were more likely to have not gone out of the house in the past week than those aged under 75 years (1.6%) (OR 3.4; 95% CI: 1.2–9.5;  $p = 0.021$ ). There was no significant difference in the frequency of weekly outings between participants residing in metropolitan and rural areas ( $p > 0.05$ ).

**Table 6: Frequency of social contact in the past week**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Number of times talked on phone to friends or family</b>			
None	3.7*	2.3	6.2
1–2 times	16.2	12.7	20.3
> 2 times	77.7	73.2	81.6
<b>Number of times talked in person to friends, family or neighbours</b>			
None	3.5*	2.1	5.9
1–2 times	17.1	13.6	21.4
> 2 times	76.2	71.5	80.4
<b>Number of times went out (for appointment, church, shopping etc.)</b>			
None	3.2*	1.9	5.4
1–2 times	20.4	16.7	24.7
> 2 times	76.0	71.5	79.9

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.6 Access to transport

Being able to access transport is important to social connectedness and wellbeing. Transport and transport links connect people with one another and with goods and services. Having access to transport also provides people with greater choice in terms of where they live, work and spend their free time. People who are unable to access (or experience difficulties in accessing) transport may not only be more socially isolated than their peers but may also be limited in terms of consumer choice and how they spend their time.

When survey participants were asked about their normal form of transport, 76.3% nominated themselves as drivers of a car; another 17.5% reported being passengers in

a car, 9.3% reported using public transport and 8.1% reported walking or using a bicycle as their main transport option (Table 7).

Participants who did not drive themselves were asked how often they had problems accessing transport when they wanted to go out. Most survey participants (85.2%) who did not report being drivers of a car reported rarely or never experiencing problems with access to transport. There was no significant difference in reported access to transport between age groups (< 75 years vs ≥ 75 years) or between participants residing in the metropolitan and rural areas of Victoria ( $p > 0.05$ ).

**Table 7: Transport access and modes of transport**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Normal form of transport</b>			
Car as a driver	76.3	71.7	80.3
Car as a passenger	17.5	14.0	21.7
Public transport	9.3	6.8	12.7
Taxi/access taxi	3.5*	2.1	5.7
Walk, bicycle	8.1	5.8	11.3
<b>Frequency of problems experienced when accessing transport to go out</b>			
Never	71.7	62.2	79.6
Rarely	13.5	8.3	21.1
Sometimes	9.3*	5.2	16.2
Most of the time	4.3*	1.8	9.9

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

## 3.7 Housing

### 3.7.1 Housing type

Participants were asked about the type of dwelling in which they were living. Most participants reported living in a house (78.5%), followed by a unit (18.4%) and a retirement village (2.9%) (Table 8).

There were differences in housing type between age groups and between metropolitan and rural areas of Victoria. Survey participants from the metropolitan area (22.2%) were more likely to reside in a unit, flat or apartment than their rural peers (10.3%) (OR 2.3; 95% CI: 1.4–3.0;  $p = 0.002$ ). Participants aged 75 years or over (20.4%) were more likely to reside in a unit, flat or apartment than people aged under 75 years (16.7%) (OR 1.7; 95% CI: 1.0–2.7;  $p = 0.033$ ).

**Table 8: Housing type**

Housing type	%	Lower 95% CI	Upper 95% CI
House	78.5	74.2	82.3
Unit	18.4	15.0	22.4
Retirement village	2.9*	1.3	6.1

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

**Table 9: Use of blinds or awnings**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Have blinds or awnings at home</b>			
Yes	58.5	53.5	63.3
No	41.5	36.7	46.5
<b>Use blinds or awnings in summer</b>			
Yes	92.9	89.0	95.5
Rarely use them	3.6*	1.9	7.0
No	3.5*	1.9	6.4

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.7.2 Housing blinds and awnings

Blinds and awnings on housing provide shade and help insulate the interior of a dwelling against the heat of the sun in summer. More than half (58.5%) of all survey participants reported having blinds and awnings at home and the majority of these people (92.9%) stated that they used them in summer (Table 9). Of the people who had blinds and awnings at home but did not use them, most reported having difficulties pulling them up or down, or that they couldn't be bothered pulling them up or down, or that they left them down all summer. One person stated that they were broken.

There was no significant difference in the proportion of participants who reported having blinds and awnings at home by age group (< 75 years vs  $\geq 75$  years) or between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).



### 3.7.3 Insulation

The majority of survey participants (88.5%) reported that their home was insulated (Table 10). Three per cent of participants could not verify whether their home was insulated. There was no significant difference in home insulation between age groups (< 75 years vs ≥ 75 years) or between participants residing in the metropolitan and rural areas of Victoria (p > 0.05).

### 3.7.4 Air-conditioning

Having a working air-conditioner in the home is protective against heat-related illness and death during a period of extreme heat. Most survey participants (86.2%) had air-conditioning in their home, with more than half (56.4%) of these having reverse-cycle air-conditioning, almost one in four (22.9%) having refrigerated air-conditioning systems and about one in five (21.7%) having evaporative-type air-conditioning at home (Table 11). There was no significant difference in having air-conditioning at home between age groups (< 75 years vs ≥ 75 years) or between participants residing in the metropolitan and rural areas of Victoria (p > 0.05).

About one in three (34.2%) survey participants with air-conditioning at home reported that their air-conditioner was 10 or more years old. A further 37.1% reported that their air-conditioner was between four and nine years old. More than a quarter (27.3%) reported that their air-conditioner was under three years old.

About one in three (34.2%) participants with air-conditioning at home reported never servicing their air-conditioner, while about one in five (20.9%) reported having their air-conditioner serviced regularly.

When asked at what outside temperature they usually started using their air-conditioner at home, almost half (48.2%) of all participants with air-conditioning at home reported starting their air-conditioner when the temperature outside was 30 °C or more. While 28.5% reported starting their air-conditioner when the outside temperature was less than 30 °C, 11.2% reported starting their air-conditioner when their house warmed up and a further 8.8% started their air-conditioner when they felt hot.

The main reason people were hesitant about running an air-conditioner at home was the cost (19.1%). Other reasons for not running an air-conditioner included concerns about the environment, the noise, and that their air-conditioner did not work well when the humidity was too high. When asked about their level of concern about the cost of running air-conditioning, almost half (48.7%) of all participants with air-conditioning at home reported a fair to major level of concern about the cost involved.

Temperature settings were easy to identify and change for 92.9% of survey participants with reverse-cycle air-conditioning at home and one in 10 (10.1%) reported having accidentally had their air-conditioner on heating instead of cooling (or vice versa) at least once in the past.

The room most often cooled by air-conditioning was the lounge or sitting room (54.8%), followed by the kitchen/dining (30.5%), the main bedroom (20.0%) and family room (19.1%). One in five (19.7%) survey participants cooled the whole house and 4.1% cooled most of the house.

**Table 10: Home insulation**

Outcome	%	Lower 95% CI	Upper 95% CI
Yes	88.5	85.0	91.2
No	8.6	6.2	11.7
Don't know if have insulation at home	3.0*	1.7	5.1

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution

**Table 11: Use of air-conditioning at home**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Have air-conditioner at home</b>			
Yes	86.2	82.5	89.2
No	13.8	10.9	17.5
<b>Type of air-conditioner at home</b>			
Reverse-cycle ducted	5.4	3.5	8.5
Reverse-cycle split system	28.2	23.5	33.5
Reverse-cycle window/wall	22.8	18.4	27.9
Evaporative cooler (ducted or portable)	21.7	17.6	26.3
Refrigerative ducted	4.1*	2.5	6.6
Refrigerative window/wall	14.8	11.5	18.8
Refrigerative portable	4.0*	2.4	6.6
Other type of air-conditioner	3.4*	2.0	5.7
Have air-conditioner, but don't know type	3.4*	2.1	5.5
<b>Age of air-conditioner at home</b>			
0–3 years	27.3	22.7	32.3
4–9 years	37.1	31.8	42.7
10 years or more	34.2	29.2	39.5
<b>Frequency of servicing of air-conditioner at home</b>			
Regularly	20.9	16.8	25.7
Sometimes	23.3	19.0	28.4
Never	34.2	29.1	39.8
Filters cleaned only	12.4	9.4	16.2
Other (new air-conditioner etc.)	8.0	5.5	11.4
<b>Outside temperature when turn air-conditioner on at home</b>			
< 25 °C	5.1*	3.0	8.4
25–29 °C	23.4	19.1	28.2
30–34 °C	29.5	24.5	35.0
35–39 °C	15.5	12.0	19.8
> 39 °C	3.2*	1.8	5.8
Only when I feel hot	8.8	6.2	12.2
Only when the house warms up	11.2	8.1	15.4

**Table 11: Use of air-conditioning at home (continued)**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Barriers to using air-conditioner at home</b>			
Costs too much to run / I can't afford it	19.1	15.2	23.6
Other (too noisy, concerns about environment, humidity etc.)	12.8	9.6	16.8
No barrier to using air-conditioner at home	70.4	65.2	75.1
<b>Level of concern about costs of running air-conditioner at home</b>			
No concern	34.3	29.3	39.7
Little concern	15.7	11.9	20.4
Fair concern	9.3	6.3	13.6
Moderate concern	25.4	21.0	30.4
Major concern	14.0	10.7	18.0
<b>Are settings on RCA easy to identify and change from 'heat' to 'cooling'?</b>			
Yes, or has automatic setting for heating/cooling	92.9	88.3	95.8
No/sometimes	4.2*	2.0	8.6
<b>Ever had RCA settings on 'heat' instead of 'cooling', or vice versa?</b>			
Yes	10.1	6.6	15.1
No	88.0	82.9	91.8
<b>Room(s) at home usually cooled with air-conditioning</b>			
Lounge/sitting room	54.8	49.3	60.3
Main bedroom	20.0	16.0	24.6
Kitchen/dining room	30.5	25.6	35.9
Family room	19.1	14.9	24.0
Other room	3.7*	1.8	7.6
Whole house	19.7	15.8	24.2
Most of the house	4.1*	2.4	6.8

RCA = reverse-cycle air-conditioner

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.7.5 Fans

Electric fans may provide comfort, but when temperature and humidity are high they do not prevent heat-related illness and may be harmful if used in enclosed, hot environments. When asked about using fans, 38.3% of survey participants said they used a ceiling fan at home, 24.6% said they used another type of fan and 8.2% said they used both a ceiling and other type of fan at home (Table 12).

Participants from rural areas (77.3%) of Victoria were more likely to report using a fan at home than people from the metropolitan area (68.3%) (OR 1.7; 95% CI: 1.1–2.7;  $p = 0.029$ ). There was no significant difference in home fan use between age groups (< 75 years vs  $\geq 75$  years) ( $p > 0.05$ ).

**Table 12: Use of a fan at home**

Use of a fan at home	%	Lower 95% CI	Upper 95% CI
Ceiling fan	38.3	33.6	43.3
Other type of fan	24.6	20.8	29.0
Both a ceiling and other type of fan	8.2	5.8	11.4
No, I don't use a fan at home	28.0	23.7	32.8

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

## 3.8 Behaviour during heatwaves or very hot weather

### 3.8.1 Heatwave concerns

Participants were asked about what concerns them most when they hear there is a heatwave forecast (Table 13). Almost a third (31.8%) of survey participants had no concerns, while 67.8% had one or more concerns. Major concerns included how the heat makes them feel (hot, no energy) (17.5%), how they will cope (8.8%), how hot the house will get (7.7%), the disruption to their normal routine (7.5%), bushfires (6.3%), health concerns (6.0%) and concerns about the garden (5.6%).

### 3.8.2 Behaviours during very hot weather

To cool off during very hot weather, 28.8% of participants reported taking extra showers or baths (sometimes – most of the time) (Table 14) and, although this did not vary significantly between age groups (< 75 years vs ≥ 75 years) ( $p > 0.05$ ), this was more prevalent in rural areas (35.4%) than in the metropolitan area (25.8%) (OR 1.6; 95% CI 1.0–2.4;  $p = 0.037$ ). Almost one in four (23.9%) participants reported using wet clothes on their face or neck to cool down (sometimes – most of the time).

Most participants (93.9%) reported wearing lighter or cooler clothes during very hot weather (sometimes – most of the time), 90.9% reported closing their indoor blinds and curtains to keep the sun out and 95.2% reported staying inside to avoid the sun during very hot weather.

**Table 13: Concerns about heatwaves**

Outcome	%	Lower 95% CI	Upper 95% CI
Don't like how it makes you feel (hot, no energy etc)	17.5	14.2	21.5
How to cope	8.8	6.2	12.4
How hot the house will get	7.7	5.5	10.7
Disruption to normal routine	7.5	5.3	10.4
Bushfires	6.3	4.4	9.1
Health concerns	6.0	3.8	9.3
The garden	5.6	3.6	8.5
Welfare of pets/animals	2.7*	1.5	4.8
How others will cope	1.6*	0.7	3.6
Cost of cooling	1.4*	0.6	3.3
Inconvenience	1.2*	0.5	2.7
How long it will last	1.0*	0.4	2.7
Other	18.9	15.3	23.1
I don't get concerned at all	31.8	27.3	36.5

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

**Table 14: Behaviours during hot weather**

How often do you...	%	Lower 95% CI	Upper 95% CI
<b>Have extra cool showers/baths to cool off?</b>			
Most of the time	11.4	8.9	14.6
Sometimes	17.4	14.0	21.4
Rarely	23.3	19.5	27.7
Never	47.6	42.7	52.6
<b>Place a wet cloth on your face or neck to cool down?</b>			
Most of the time	6.8	4.9	9.5
Sometimes	17.1	13.9	20.9
Rarely	17.3	13.9	21.4
Never	58.7	53.9	63.4
<b>Wear lighter/cooler clothing when hot?</b>			
Most of the time	88.9	85.1	91.8
Sometimes	5.0	3.3	7.7
Rarely	2.8*	1.3	6.0
Never	3.2*	1.9	5.4
<b>Close indoor blinds or curtains to keep the sun out?</b>			
Most of the time	79.9	75.4	83.8
Sometimes	11.0	8.1	14.8
Rarely	3.5	2.1	5.6
Never	5.6	3.5	9.0
<b>Stay indoors and avoid the sun?</b>			
Most of the time	75.4	70.8	79.5
Sometimes	19.8	16.0	24.2
Rarely	2.8*	1.6	4.8
Never	2.1*	1.1	4.0

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.8.3 Activities during very hot weather

When asked about activities during very hot weather, most (93.4%) survey participants reported reducing outdoor activities in the heat of the sun (sometimes – most of the time) and 81.4% reported reducing the number of activities they do that require physical effort (Table 15). When the remainder were asked why they did not (rarely – never) reduce activities that require physical effort, almost a third (32.0%) of these participants reported the reason as ‘things still had to be done’.

More than three-quarters (76.7%) of all survey participants reported undertaking their regular activities during hot weather (sometimes – most of the time) and 94.4% reported keeping appointments – for example, with the doctor or hairdresser – regardless of the hot weather. Participants aged 75 years or over (17.9%) were more likely to report undertaking their regular activities (sometimes – most of the time) during hot weather than those aged under 75 years (6.8%) (OR 3.0; 95% CI: 1.6–5.6;  $p = 0.001$ ). There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

**Table 15: Activities during hot weather**

How often do you...	%	Lower 95% CI	Upper 95% CI
<b>Reduce outdoor activities in the heat of the sun?</b>			
Most of the time	76.5	72.0	80.5
Sometimes	16.9	13.4	21.0
Rarely	3.6*	2.1	6.1
Never	2.6*	1.5	4.4
<b>Reduce the number of activities that require physical effort?</b>			
Most of the time	52.3	47.3	57.2
Sometimes	29.1	24.9	33.7
Rarely	9.6	6.8	13.4
Never	7.8	5.5	11.0
<b>Undertake regular activities?</b>			
Most of the time	64.3	59.5	68.8
Sometimes	12.4	9.4	16.1
Rarely	3.9	2.4	6.2
Never	6.6	4.7	9.3
<i>Depends on situation</i>	6.8	4.8	9.5
<i>Reschedule until cooler</i>	5.5	3.7	7.9
<b>Keep your appointments?</b>			
Most of the time	88.6	85.0	91.5
Sometimes	5.8	4.0	8.3
Rarely	**	–	–

Note that percentages may not add to 100% due to rounding, a proportion of ‘don’t know’ and/or ‘refused’ responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

\*\* Estimate has a relative standard error greater than 50% and is not been reported as it is not reliable for general use.

### 3.8.4 Behaviours during recent heatwaves

When asked about their behaviour during recent heatwaves when their house was hot, 16.5% of survey participants reported going elsewhere to be cooler (Table 16). More than three-quarters (76.0%) reported not going somewhere cooler and 7.3% stated that their house did not get hot. Participants living in the metropolitan area were more likely to go out (19.3%) than those living in rural areas (10.4%) (OR 2.0; 95% CI: 1.1–3.6;  $p = 0.020$ ). There was no significant difference between age groups (< 75 years vs  $\geq 75$  years) ( $p > 0.05$ ).

When asked about where they went to get cooler, almost half (48.9%) of those who reported going elsewhere went to a shopping centre, followed by a family, friend or neighbour's house (20.1%), then the cinema (15.6%) or the beach (6.5%).

The majority (93.7%) of survey participants reported opening up their house to let in a cool evening breeze (most of the time – all of the time).

**Table 16: Behaviours during recent heatwaves**

During recent heatwaves...	%	Lower 95% CI	Upper 95% CI
<b>If the house was hot did you go somewhere else to be cooler?</b>			
Yes	9.1	6.8	12.1
Sometimes	7.4	5.2	10.5
No	76.0	71.6	79.8
Not applicable – house doesn't get hot	7.3	5.2	10.2
<b>Where did you go to be cooler?</b>			
Shopping centre	48.9	37.3	60.6
Family, friend or neighbour's house	20.1*	12.2	31.3
Cinema	15.6*	8.4	27.1
Beach	6.5*	2.5	15.9
Other	18.3*	10.8	29.1
<b>If you wanted to go somewhere cooler, what stopped you?</b>			
Didn't want to leave home	21.6	17.4	26.5
OK at home	58.2	52.5	63.6
Other	18.0	14.7	21.9
<b>When there was a cool breeze in the evenings did you open up the house to let the breeze in?</b>			
All of the time	69.7	64.7	74.2
Most of the time	24.0	19.8	28.8
Sometimes	5.1	3.4	7.6
Never	1.0*	0.4	2.6

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.



### 3.8.5 Welfare concerns during recent heatwaves

Table 17 relates to questions about the welfare of participants during recent heatwaves. When asked if anyone had phoned to check on their welfare during recent heatwaves, 28.5% of survey participants reported having received regular phone calls (sometimes – yes). Of those who were contacted, the majority (91.4%) were contacted by family members while 7.6% were contacted by friends and 7.2% by neighbours (agency contact was minimal and is included in the category ‘other’).

Participants aged 75 years or over (39.5%) were more likely to have received regular phone calls during recent heatwaves (sometimes – yes) than those aged under 75 years (18.7%) (OR 2.7; 95% CI: 1.7–4.2;  $p < 0.001$ ).

There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

When asked whether they had been visited by anyone to check on their welfare during recent heatwaves, 17.8% of participants reported having been visited by someone (sometimes – yes). Almost two-thirds (65.4%) reported having been visited by a family member, 19.1% reported having been visited by a neighbour and 18.6% reported having been visited by a friend.

Participants aged 75 years or over (23.1%) were more likely to have been visited during recent heatwaves (sometimes – yes) than those aged under 75 years (12.9%) (OR 2.0; 95% CI: 1.2–3.3;  $p = 0.005$ ). There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

**Table 17: Phone calls and visits to check on welfare during recent heatwaves**

During recent heatwaves....	%	Lower 95% CI	Upper 95% CI
<b>Did someone phone you regularly to check on your welfare?</b>			
Yes	22.1	18.5	26.3
Sometimes	6.4	4.2	9.8
No	65.9	61.1	70.4
No, I'm quite OK	4.9	3.1	7.6
<b>Who phoned to check on your welfare?</b>			
Family member	91.4	84.5	95.4
Friend	7.6*	3.9	14.3
Neighbour	7.2*	3.6	13.8
Other	7.0*	3.6	12.9
<b>Did someone visit you regularly to check on your welfare?</b>			
Yes	14.7	11.8	18.2
Sometimes	3.1*	1.8	5.2
No	82.1	78.3	85.4
<b>Who visited to check on your welfare?</b>			
Family member	65.4	54.4	75.0
Neighbour	19.1	11.9	29.3
Friend	18.6	11.2	29.2
Other	12.0*	6.6	20.7

Note that percentages may not add to 100% due to rounding, a proportion of ‘don't know’ and/or ‘refused’ responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.8.6 Fluid intake during very hot weather

Most (90.9%) survey participants reported drinking more fluids when the weather was very hot (sometimes – yes) (Table 18). However, participants aged 75 years or over (86.5%) were less likely to drink more fluids when the weather was very hot (yes – sometimes) than those aged under 75 years (94.9%) (OR 0.4; 95% CI: 0.2–0.8;  $p = 0.009$ ). There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

When participants were asked what stops them from drinking more fluid, 34.5% reported that they either ‘don’t get thirsty’ or ‘don’t think of it’.

The first fluid preference when it was very hot and participants were thirsty was water (87.5%), followed by tea (9.8%), cordial (9.3%), soft drink (9.3%) and alcoholic beverages (6.5%).

**Table 18: Fluid intake during very hot weather**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Drink more fluids during very hot weather</b>			
Yes	84.0	79.7	87.5
Sometimes	6.9	4.7	10.2
No	8.8	6.2	12.4
<b>Is there something that stops you drinking more fluids in very hot weather?</b>			
I don’t get thirsty/I don’t think of it	34.5	22.7	48.5
Other	23.9*	13.3	39.0
No, nothing	41.6	29.1	55.4
<b>If you were very hot and you were thirsty, what would you most often drink?</b>			
Water	87.5	83.6	90.5
Tea	9.8	7.2	13.2
Cordial	9.3	6.9	12.6
Soft drink	9.3	6.9	12.6
Alcoholic beverage	6.5	4.2	9.9
Fruit juice	5.8	3.9	8.6
Coffee	4.1*	2.5	6.8
Other	7.6	4.9	11.6

Note that percentages may not add to 100% due to rounding, a proportion of ‘don’t know’ and/or ‘refused’ responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

### 3.8.7 Concerns about pets or animals during very hot weather

Among participants who had pets or animals, more than three-quarters (77.7%) expressed concern (some – major concern) for them during hot weather (Table 19). The level of concern for pets did not vary by age group (< 75 years vs ≥ 75 years) or between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

### 3.8.8 Behaviours that helped during the 2009 heatwave

Participants were also asked about the things they found useful in helping them get through the January 2009 heatwave in Victoria. The most useful behaviours that helped participants get through the heatwave included wearing cool or light clothing (78.6%), staying inside (76.1%), drinking more fluids (74.0%), using an air-conditioner (73.1%) and reducing physical activities (70.5%) (Table 20).

**Table 19: Level of concern about pets or animals during very hot weather**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Level of concern about pet or animal welfare/health in heat</b>			
No concern	15.1	10.7	21.0
Little concern	7.2*	4.2	12.2
Some concern	6.7*	4.0	11.1
Moderate concern	22.3	16.8	29.0
Major concern	48.7	41.4	56.0

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

**Table 20: Behaviours that helped during the 2009 heatwave**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Behaviours that helped during 2009 heatwave</b>			
Wearing cool/light clothing	78.6	74.4	82.4
Staying inside	76.1	71.6	80.0
Drinking more fluids	74.0	69.5	78.1
Using an air-conditioner	73.1	68.6	77.2
Reducing physical activities	70.5	65.8	74.7
Using a fan	60.0	55.0	64.7
Going somewhere cooler	16.9	13.7	20.6
Other	7.5	5.3	10.4

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

### 3.9 Resilience during very hot weather

There are a number of preparatory or preventive actions that people can take to enhance their resilience to heatwaves and minimise the risks of associated harm. Participants were asked questions about their level of concern about some of the risks and their preparedness for a heatwave.

When asked whether they would be concerned about a long blackout or power failure during a heatwave, two-thirds (66.6%) of survey participants reported being concerned (some – major concern) (Table 21). Participants aged 75 years or over (57.2%) were less likely to express concern (some – major concern) than those aged under 75 years (75.0%) (OR 0.5; 95% CI: 0.3–0.7;  $p = 0.001$ ). There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

**Table 21: Resilience during very hot weather**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Level of concern about long blackouts or power failures during heatwaves</b>			
No concern	16.6	13.4	20.4
Little concern	13.6	10.3	17.7
Some concern	12.0	8.9	15.9
Moderate concern	19.6	15.9	23.8
Major concern	35.0	30.5	39.7
<b>Level of preparedness with essential supplies in the home during a heatwave</b>			
Well prepared	72.8	68.3	76.9
Quite prepared	20.4	16.8	24.6
Somewhat prepared	4.7	3.1	7.2
Not prepared at all	1.6*	0.7	3.5
<b>Level of confidence to call on friends or neighbours if you need help</b>			
Very confident	61.4	56.5	66.1
Confident	19.6	15.9	24.0
Somewhat confident	7.2	5.1	10.1
Not confident	10.0	7.5	13.3
Not sure	1.7*	0.8	3.6
<b>Level of confidence to call on a family member if you need help</b>			
Very confident	78.6	74.3	82.3
Confident	7.8	5.6	11.0
Somewhat confident	2.4*	1.4	4.0
Not confident	9.7	7.2	13.0
Not sure	1.5*	0.8	3.1

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

In the event of a major heatwave, 93.2% of participants said that they would be (quite – well) prepared with supplies (such as medication, food and drink). The majority (88.2%) were (somewhat – very) confident that they could call on neighbours or friends in case they needed help and 88.8% were (somewhat – very) confident they could call on a family member if they needed help.

Multivariate logistic regression showed that participants who lived alone were significantly more likely to report not being confident in calling on family members, friends or neighbours if they needed help (Table 22). Participants who received assistance at home with personal or household tasks were significantly less likely to report not being confident in calling on family members, friends or neighbours if they needed help.

### 3.10 Heat health

Participants were asked about any health conditions they may have experienced from heatwaves in the past few years, their perceptions of health risk from heatwaves and who they felt they could call on for assistance if they felt unwell in the heat. They were also asked a series of questions about health warnings or messages during heatwaves or periods of very hot weather.

#### 3.10.1 Experiencing heat-related health conditions

When asked if they had experienced any heat-related health conditions from heatwaves over the past few years, 38.9% of survey participants reported having experienced at least one condition, while 60.8% hadn't experienced any heat-related health conditions (Table 23). Participants aged 75 years or over (44.9%) were more likely to have experienced at least one heat-related health condition during heatwaves over the past few years than those aged under 75 years (33.4%) (OR 1.6; 95% CI: 1.1–2.5;  $p = 0.018$ ). There was no significant difference between participants residing in metropolitan and rural areas of Victoria ( $p > 0.05$ ).

Table 23 shows that 13.6% of survey participants reported having experienced heat stress, 12.8% had experienced a loss of balance (or felt dizzy), 12.0% had experienced shortness of breath and 9.5% had experienced a headache from the heat.

When asked if they had experienced any of these conditions during the January 2009 heatwave in Victoria, 15.7% of survey participants reported having experienced at least one condition.

**Table 22: Factors associated with participants who were 'not confident' in calling friends, family or neighbours when they needed help**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Living arrangements</b>				
Live with others	1.0			
Live alone	3.0	1.1	8.1	0.033
<b>Household assistance</b>				
No assistance in home with personal or household tasks	1.0			
Receive assistance in home with personal or household tasks	0.2	0.1	0.9	0.035
<b>Constant</b>	0.0	0.0	0.1	0.000

Survey participants were asked to report their level of concern about extreme heat and their health. Almost half (48.2%) reported extreme heat as a concern (some – major concern) for their health. When asked about their perceived level of risk of heat-related ill health, 13.4% of survey participants felt they were more at risk from

the heat than the average person. Almost half (46.7%) felt they were less at risk than the average person. There was no significant difference in concern or perception of health risk between age groups (< 75 years vs ≥ 75 years) or between metropolitan and rural areas of Victoria ( $p > 0.05$ ).

**Table 23: Heat-related health conditions**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Heat-related health condition experienced during heatwaves in the past few years</b>			
Heat stress	13.6	10.3	17.8
Loss of balance/felt dizzy	12.8	9.8	16.5
Shortness of breath	12.0	9.2	15.5
Headache	9.5	7.2	12.5
Anxiety	4.7	3.2	6.9
Heart condition	4.2	2.6	6.7
Had a fall	1.1*	0.5	2.5
Other	4.7	3.1	7.2
No, none of the above	60.8	55.9	65.6
<b>Experienced heat-related health condition during the January 2009 heatwave</b>			
Yes	15.7	12.6	19.5
No	73.9	69.3	78.0
Can't remember	7.9	5.4	11.5
<b>Level of concern about heat and health</b>			
No concern	27.2	22.9	31.9
Little concern	23.6	19.8	27.9
Some concern	17.6	14.0	21.9
Moderate concern	21.7	18.0	26.0
Major concern	8.9	6.6	12.1
<b>Perceived level of risk of heat-related health conditions</b>			
Less at risk than average person	46.7	41.8	51.7
Same risk as average person	32.9	28.4	37.8
More at risk than average person	13.4	10.1	17.6

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

Multivariate logistic regression showed that females participants who regularly took medication for other heart problems (including medication for angina or stroke) or medication for respiratory disease (including asthma or COPD) were significantly more likely to have experienced at least one heat-related illness during heatwaves in recent years (Table 24).

Multivariate logistic regression showed that participants who did not take medication for other heart problems (including medication for angina or stroke) or medication for respiratory disease (including asthma or COPD) were significantly more likely to report that the heat was of no concern to their health (Table 25).

**Table 24: Factors associated with heat health illness during heatwaves in recent years**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Sex</b>				
Male	1.0			
Female	1.9	1.2	2.9	0.005
<b>Medication use for a pre-existing chronic condition</b>				
Don't take medication for 'other heart problems'	1.0			
Take medication for 'other heart problems'	3.1	1.8	5.3	0.000
Don't take medication for respiratory disease	1.0			
Take medication for respiratory disease	2.3	1.2	4.3	0.011
<b>Constant</b>	0.2	0.1	0.4	0.000

'Other heart problems' includes heart attack, angina and stroke.

Respiratory disease includes asthma/COPD.

**Table 25: Factors associated with participants who reported that the heat was of no concern to their health**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Medication use for a pre-existing chronic condition</b>				
Take medication for 'other heart problems'	1.0			
Don't take medication for 'other heart problems'	1.9	1.1	3.2	0.021
Take medication for respiratory disease	1.0			
Don't take medication for respiratory disease	2.7	1.4	5.1	0.003
<b>Constant</b>	0.3	0.1	0.5	0.000

'Other heart problems' includes heart attack, angina and stroke.

Respiratory disease includes asthma and COPD.

Multivariate logistic regression showed that participants with higher levels of health status, those who did not receive assistance at home with personal or household tasks and those not taking medication for ‘other heart problems’ (including medication for angina or stroke) or medication for diabetes were significantly less likely to report being at the same or more risk than the average person when it came to the heat affecting their health (Table 26).

**Table 26: Factors associated with participants who reported being at the same or more risk than the average person of the heat affecting their health**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Self-reported health status</b>				
Fair/poor health	1.0			
Excellent/very good/good health	0.4	0.3	0.7	0.002
<b>Household assistance</b>				
Receive assistance in the home with personal or household tasks	1.0			
No assistance in the home with personal or household tasks	0.6	0.4	0.9	0.017
<b>Medication use for a pre-existing chronic condition</b>				
Take medication for ‘other heart problems’	1.0			
Don’t take medication for ‘other heart problems’	0.4	0.2	0.7	0.001
Take medication for diabetes	1.0			
Don’t take medication for diabetes	0.4	0.2	0.8	0.016
<b>Constant</b>	0.5	0.4	0.7	0.000

‘Other heart problems’ includes heart attack, angina and stroke.



### 3.10.2 Assistance during very hot weather

Survey participants were asked who they felt they could call on for assistance if they felt unwell in the heat.

Most participants identified a family member (43.2%) or a spouse (28.1%) (Table 27). Less than 1% of survey participants reported having no one they felt they could call on for assistance if they felt unwell in the heat.

### 3.10.3 Health warnings

Participants were asked whether they could recall any health warnings being issued during heatwaves in recent years. Three-quarters (75.1%) of all survey participants recalled health warnings being issued in recent years, but 22.4% could not recall any health warnings being issued (Table 28).

Participants heard about health warnings mainly via the radio (67.8%), the TV (53.0%) and the newspaper (10.1%). More than half (54.6%) could recall some of the messages about how to maintain their health in the heat. Of those who could recall these messages, 73.0% recalled messages about staying hydrated or drinking more fluids in the heat, 54.8% recalled messages about minimising sun exposure or staying indoors and 17.3% recalled messages about dressing for summer.

When asked whether heatwave warnings changed when and how participants did things such as chores and shopping, half (49.9%) reported changing their behaviour (sometimes – yes) as a result of hearing warnings about the heat, but 47.4% reported that they did not change when and how they did things.

**Table 27: Assistance during very hot weather**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Who could you call on for assistance if feeling unwell in the heat?</b>			
Family member	43.2	38.5	48.1
Spouse	28.1	23.6	33.0
Doctor	14.1	10.8	18.2
Neighbour	12.7	9.8	16.3
Ambulance	11.3	8.7	14.7
Friend	5.0	3.5	7.1
Emergency call button/pendant	3.8	2.1	6.8
Triple zero	3.4*	2.0	5.5
NURSE-ON-CALL service	2.8*	1.6	4.9
Other	2.8*	1.7	4.8

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

**Table 28: Recollection of health warnings**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Can recall health warnings being issued during heatwaves in recent years</b>			
Yes	75.1	70.6	79.1
No	22.4	18.5	26.8
<b>How heard health warnings issued during heatwaves in recent years</b>			
Radio	67.8	62.1	72.9
TV	53.0	47.3	58.7
Newspaper	10.1	6.9	14.7
Newsletter	1.8*	0.7	4.5
Other	3.8*	2.1	6.8
<b>Recall messages about how to maintain good health in the heat</b>			
Yes	54.6	49.6	59.5
Some	3.3*	1.8	5.9
No	40.2	35.4	45.2
<b>Messages recalled from health warnings during heatwaves in recent years</b>			
Stay hydrated/drink more	73.0	66.9	78.4
Minimise sun exposure/stay indoors	54.8	48.5	61.0
Dress for summer	17.3	13.2	22.4
Make use of air-conditioners	8.0	5.2	12.0
Check on those at risk	2.5*	1.1	5.4
Look after your pets	2.1*	1.0	4.5
Other	29.5	24.0	35.7
No, don't recall any messages	3.5*	1.9	6.3
<b>Change in behaviour as a result of hearing health warnings</b>			
No	47.4	42.4	52.5
Sometimes	14.2	11.1	18.1
Yes	35.7	30.9	40.7

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

Multivariate logistic regression showed that participants aged 75 years or over and those who went out less than twice in the past week were significantly more likely to be unable to recall hearing any health warnings during heatwaves in recent years (Table 29).

Multivariate logistic regression also showed that participants were significantly more likely to report a change in behaviour as a result of health warnings if they reported being users of a mobility aide or if they reported taking medication for a respiratory disease, including asthma or COPD (Table 30). Participants were significantly less likely to report a change in behaviour if they reported taking medication for kidney disease.

**Table 29: Factors associated with participant non-recall of health warnings during heatwaves in recent years**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Age group</b>				
< 75 years	1.0			
≥ 75 years	2.8	1.7	4.5	0.000
<b>Social interactions</b>				
Gone out two or more times in the past week (2+ times)	1.0			
Gone out less than twice in the past week (< 2 times)	2.1	1.2	3.5	0.009
<b>Constant</b>	0.1	0.1	0.2	0.000

**Table 30: Factors associated with changes in behaviour due to health warnings during heatwaves**

Factors	Odds ratio	Lower 95% CI	Upper 95% CI	p-value
<b>Mobility aide</b>				
No mobility aide used	1.0			
Use a mobility aide	2.3	1.2	4.3	0.008
<b>Medication use for a pre-existing chronic condition</b>				
Don't take medication for respiratory disease	1.0			
Take medication for respiratory disease	2.0	1.0	4.0	0.046
Don't take medication for kidney disease	1.0			
Take medication for kidney disease	0.2	0.1	0.9	0.036
<b>Constant</b>	0.2	0.1	0.4	0.000

Respiratory disease includes asthma and COPD.

### 3.10.4 Heatwave communication

This section provides information about heatwave risk communication. Table 31 shows that heatwave warnings were likely to be seen by almost three-quarters (74.0%) of all survey participants if broadcast via TV. A similar proportion (73.2%) of participants stated that they were likely to hear about warnings if broadcast via radio, 71.4% were likely to read about warnings if information was delivered to their letterbox and 60.7% were likely to read about warnings if information was provided in the newspaper. The internet was less popular as a means for communicating warnings, with only 22.2% of survey

participants likely to read warnings on the internet; however, 41.6% of all participants stated that they would be likely to see warnings if delivered by SMS to their mobile phones.

When participants were asked about the best means of communicating heatwave warnings to them, participants expressed a preference for radio stations (42.3%), followed by TV (38.2%), then SMS to mobile phones (22.6%) and newspapers (10.1%). The most popular radio stations among participants for broadcasting heatwave warnings in Victoria were the ABC (50.2%), 3AW (24.3%) and Magic 1278 (6.2%).

**Table 31: Most effective communication methods for heatwave warnings**

Outcome	%	Lower 95% CI	Upper 95% CI
<b>Likely to hear, read or see heatwave warning</b>			
TV	74.0	69.2	78.3
Radio	73.2	68.7	77.3
Information in letterbox	71.4	66.7	75.6
Newspaper	60.7	55.8	65.5
SMS to mobile phone	41.6	36.9	46.6
Internet	22.2	18.4	26.5
<b>Best means of communicating heatwave warnings</b>			
Radio	42.3	37.5	47.3
TV	38.2	33.5	43.2
SMS to mobile phone	22.6	18.8	26.9
Newspaper	10.1	7.5	13.4
Landline phone	6.2	4.4	8.8
Information in letterbox	3.4	1.9	5.8
Internet	1.7*	0.8	3.7
Other	1.3*	0.5	3.2

Note that percentages may not add to 100% due to rounding, a proportion of 'don't know' and/or 'refused' responses, or because a question was multi-response in the survey.

\* Estimate has a relative standard error between 25% and 50% and should be interpreted with caution.

## 4. Discussion

This is the first study to focus on possible heat-related health risk factors (behaviours, environmental and health status) for people aged 65 years or over in Victoria. Older people were selected for this study because they have previously been shown to be at increased risk when exposed to extreme heat (Department of Human Services 2009; Hansen et al. 2011a).

A number of studies have explored heat health risk factors following major heatwaves in other countries (Naughton et al. 2002; Semenza et al. 1996; Vandentorren et al. 2006), but the risk factors identified in these studies are not necessarily relevant in the Victorian context. This study aimed to glean relevant information from older people about their behaviours, perceptions and pre-existing illnesses at the population level in Victoria. Questions about risk were formulated following an initial qualitative study that was based on interviews with focus groups, policymakers and healthcare providers engaged in caring for older people. The qualitative study focused on the four broad themes of physiology and age-related health problems, socioeconomic factors, psychological issues and adaptive behaviours (Hansen et al. 2011b).

Variables for gender, age and geographic area of residence (metropolitan and rural area) were used to calculate relevant survey weights. The data showed that the survey response in Victoria was better in rural areas than in the metropolitan area, females were more likely to participate in the study than males, and people aged 85 years or over were less likely to participate than their younger counterparts. The random selection of participants was based on the availability of landline telephone numbers; hence, the study did not include people without a landline. It also excluded people who did not speak English and those living in aged care facilities but not retirement villages. The survey was representative of older people able to live an independent lifestyle in Victoria.

Air-conditioning has previously been shown to be protective against heat-related illness and death (Naughton et al. 2002; Semenza et al. 1996). While the survey results suggested most (86.2%) older Victorians had an air-conditioner in their home, some issues were also identified. The survey indicated that most (80.0%)

participants with an air-conditioner did not air-condition the main bedroom in their home, about a third (34.2%) of air-conditioners were at least 10 years old and only one in five (20.9%) were serviced regularly. Cost was identified as the main barrier to using an air-conditioner in the heat and almost half (48.7%) of those with an air-conditioner at home had fair to major concerns about the cost of air-conditioning. While only a few participants had concerns with recognising the cooling and heating settings, one in 10 (10.1%) reported having had their reverse-cycle air-conditioner on the wrong setting at least once in the past.

Blinds, awnings and outdoor shutters can assist in keeping a home cool during periods of extreme heat (Health Canada 2011). In terms of long-term planning, sustainable cooling methods for housing are desirable and it has been argued that a reliance on air-conditioning alone may place householders at risk if power outages occur during times of peak electricity demand (Maller & Strengers 2011). The results of this study suggest that although more than half (58.5%) of all participants had blinds, awnings or shutters at home and most reported using them in summer to help shade their home, there was a sizeable proportion (41.5%) of older people in Victoria with no window shading at home.

The survey indicates that most people aged 65 years or over in Victoria adapt their behaviour during periods of extreme heat to reduce the risk of ill health and death. More than two-thirds have concerns when a heatwave is forecast (67.8%) and, overall, they make good decisions that have the potential to reduce the risks associated with the heat. Most participants reported wearing cooler or lighter clothing (93.9%), closing indoor blinds and curtains (90.9%), reducing physical effort (81.4%), staying indoors to avoid the sun (95.2%), reducing outdoor activities (93.4%), opening up the house for a cool breeze in the evening (93.7%) and drinking more liquids (90.9%) in the heat.

Nevertheless, almost half (46.7%) of all survey participants considered themselves at low risk of harm from the heat compared with others, which raises concerns about their willingness to adopt preventive behaviours. The majority of older people who were surveyed reported

taking medication for a chronic health condition that is exacerbated by extreme heat, which may make them vulnerable, and this was more prevalent among people aged 75 years or over. Most reported keeping regular appointments (94.4%) and undertaking regular activities (76.6%) during very hot weather and this has the potential to adversely affect their health in extreme circumstances. Being in good health was associated with lower levels of perceived risk and concern for health in the heat. There may be an ongoing need for messages about the risks to all in the heat and messages advising that it is acceptable to change appointments and activities in the event of extreme weather. Repeating advice of this nature may assist in changing behaviour and the perception of risk among older people in the community.

Overseas studies have shown that social connectedness is protective against the risk of death during a period of extreme heat (Bouchama et al. 2007; Naughton et al. 2002). The results of this study suggest social isolation is an issue for a number of older people in Victoria. For instance, only 28.5% of older people recalled being contacted regarding their welfare by phone, and only 17.8% were visited during recent heatwaves. One in 10 older people stated not feeling confident about calling on friends and neighbours (10.0%) or family members (9.7%) if they needed help in the event of a major heatwave. Participants living alone were more likely to feel less confident about calling on others for help. About one in five older people surveyed reported talking on the phone (19.9%) or talking in person (20.6%) with family, friends or neighbours fewer than three times in the week before the survey. Further, about one in four (23.6%) participants went out fewer than three times in the week before the survey. This is an area of concern, given the association between social isolation and the risk of harm during extreme heat, especially for those with a pre-existing health condition and those who rely on mobility aides. On the positive side, survey participants aged 75 years or over received almost three times more check-up phone calls than those aged under 75 years and they reported being visited twice as often as their younger counterparts during recent heatwaves. This indicates an awareness of the risks and a heightened level of concern among family, friends and

neighbours in relation to the heat. Health messages that emphasise the need to look after the more vulnerable, including older people, reinforce these behaviours and assist in reducing the health impacts of extreme heat.

Almost one in 10 (8.8%) survey participants said they do not drink more fluids when the weather is very hot. A similar rate was found in a New South Wales survey of the general population, where 6% of all adults ( $\geq 18$  years) reported not increasing their fluid intake (Oakman et al. 2010). The main reason for not increasing fluid intake in our study was that participants did not feel thirsty or did not think to drink more fluids (34.5%). Participants aged 75 years or over were less likely to drink more during hot weather than their younger counterparts. This raises issues of potential dehydration, especially in the older age group. It is well known that in order to lower body temperature when the ambient temperature exceeds body temperature it is necessary to sweat. Due to age-related physiological changes, older people are less capable of sweating, they do not always feel the heat and may have health problems or take medications that impact on their ability to perspire (Wilson et al. 2011). This has important implications for health because a diminished fluid intake can cause adverse renal and coronary outcomes. Heat health messages that explain biological causal relationships in a clear manner and emphasise the importance of increasing fluid intake in the heat may assist in reducing the risk of dehydration in older people.

Heatwaves can have adverse effects on health, with heat stress being the most common heat-related health condition experienced by older Victorians during heatwaves in recent years, followed by loss of balance, shortness of breath and headaches. Survey participants aged 75 years or over were more likely to report having experienced one or more heat-related health condition during recent heatwaves than their younger counterparts. This is in line with current evidence indicating that physical and physiological factors increase the risk in this age group (Hansen et al. 2011b; Wilson et al. 2011).

Females and participants who reported using medication for other heart problems (including medications for stroke and angina) or medication for respiratory disease (including

asthma and COPD) were more likely to have experienced a heat-related health condition during recent heatwaves in Victoria. An increase in hospital admissions for ischaemic heart disease during the 2009 heatwave in Adelaide and an increase in myocardial infarction cases during a period of high temperature in Melbourne among males aged under 65 years highlights the need to look at effective prevention measures for cardiovascular-related disease during periods of extreme heat (Loughnan et al. 2010; Nitschke et al. 2011).

Although three-quarters (75.1%) of older people remembered health warnings being issued during recent heatwaves in Victoria, recall was significantly reduced among participants aged 75 years or over and those who went out less than twice in the preceding week, which is a challenge for the 'one size fits all' approach to health warnings. Despite hearing the health warnings, 47.4% of older people said that they did not change their behaviour as a result of hearing the warnings. Participants who used a mobility aide or were taking medication for a respiratory disease were more likely to report having changed their behaviour. A low level of risk perception among older people in relation to extreme heat has also been shown in a UK study, where very few older people (72–94 years old) considered themselves at risk from the heat, even though most had at least one chronic condition, and the majority felt that they had taken the appropriate steps to reduce the impacts of the heat (Abrahamson et al. 2009). The low level of risk perception among older people in these studies has important implications for heat health promoting strategies and heat health messaging in Victoria.

Radio and television were favoured as the best means of communicating heatwave warnings, but SMS was also popular among older people. Interestingly, only one in 10 participants considered newspapers to be the best means of communication.

There may also be a need for messages that incorporate the welfare of pets and animals as the survey showed that more than three-quarters (77.7%) of all participants with pets or animals had concerns for their welfare in the heat.

In conclusion, this survey was undertaken to investigate the risk factors, behaviours and perceptions of older people in Victoria during periods of extreme heat. Overall, the results of the study suggest older people in Victoria are reasonably well informed about the risks associated with extreme heat and adopt appropriate adaptive behaviours to reduce the risk of harm. However, the survey results also suggest there are a number of people aged 65 years or over in the community who do not regard themselves as vulnerable and do not engage in behaviour change to reduce the risk of harm from extreme heat. The results of the survey have important implications for preventing heat-related health conditions in this vulnerable population and they provide a rich evidence base to inform heatwave planning and heat health messaging during periods of extreme heat in Victoria.

## 5. Recommendations

- **People aged 75 years or over, females and those with heart or respiratory disease should be targeted with heat health prevention strategies.**
- **Older people who have minimal social interactions may be reluctant to telephone friends, neighbours or family members and may need support during heatwaves. Hence, the messages encouraging people to look out for their older neighbour or older family member and friend during extreme heat should be reinforced.** This message is also supported by the findings that 10% of participants said they did not feel confident calling on their neighbours, friends or family members if they needed help. Contacting older people during heatwaves is important, but only 29% had received regular phone calls and 18% had regular visits during recent heatwaves.
- **Rebates for older people for electricity for air-conditioners may be an option to ease financial pressures during heatwaves.** Use of air-conditioning in households of older people should be supported financially so they are less concerned about the running costs; that may increase the use of air-conditioning in Victoria. Also, the survey indicated that most of the participants' air-conditioners are quite old and are not regularly serviced (only 27% were relatively new (under three years). Almost 14% of participants had no air-conditioning, 19% were hesitant to use them because of running costs and 49% had fair to major concerns about running costs; furthermore, only 20% keep the whole house cool and only 20% cool their bedroom.
- **Settings on reverse-cycle air-conditioners should be made for easier reading and people need to be reminded to check their settings at the start of summer.** While only 4% had trouble identifying the settings, 10% of the survey participants reported that they accidentally had the reverse-cycle air-conditioner on the wrong setting (such as heating not cooling).
- **Advice on how to adapt to heat should be given to older people so they can look after their health based on evidence.** According to the survey, 68% of older people have one or more concerns about looming heatwaves, but only 6% were worried about their own health. However, during recent heatwaves 39% experienced one or more symptoms, with heat stress being the most prevalent problem (14%). Other conditions experienced included loss of balance or dizziness (13%), shortness of breath (12%), headache (10%), anxiety (5%) and heart conditions (4%). The survey also indicated that during the 2009 heatwave the following behaviours provided relief: wearing cool or lighter clothing, staying inside, using an air-conditioner, drinking more fluids, reducing physical activities, using a fan and going somewhere cooler.
- **Heat health advice and warnings should specifically target people aged 75 years or over.** The survey indicated that people aged 75 years or over are less likely to recall heat-related health messages, have a higher prevalence of heat-related health conditions during recent heatwaves and are more likely to take medications that reduce the ability to perspire efficiently.
- **Homes could be protected from heat by using outdoor blinds, awnings or shutters on their windows.** Forty-two per cent of older people did not have any outdoor shading on windows.
- **Health messages should reinforce the need to take it easy during periods of extreme heat.** While the survey indicated that most people reduce their activities during extreme heat (93%), they continued to undertake (most – sometimes) their regular activities (77%) and kept their appointments (94%).



- **People need to be reminded to keep hydrated when temperatures are extreme. Those advised by their doctor to restrict fluids should seek medical advice.**

It is important to remain hydrated during very hot weather; however, 9% said they do not drink more fluids when it is very hot. More than a third (34.5%) of these people said the main reason they do not drink more fluids is a lack of thirst, which is in line with published literature. When people feel thirsty during an extreme heat event they have already lost body water and are starting to get dehydrated. People aged 75 years or over were more likely not to drink more fluids during hot weather than people aged under 75 years.

- **Advice should be provided for pet care during extreme heat.** Seventy-eight per cent of pet owners had 'some' or 'major' concerns about their pets during hot weather.
- **Older people should prepare for extreme heat events in summer by having enough medication, food and drink supplies on hand.** Most people (93%) feel prepared (quite to well prepared), but some people (6%) stated that in the event of a major heatwave they did not have adequate supplies of essential items at home.
- It is also important that people are aware **that they should call for medical assistance** if they feel unwell during the heat, but only 14% said they would call their doctor and 11% said they would call an ambulance. Additionally, people on medications for certain chronic diseases should be adequately informed about risks during extreme heat.

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