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Heat-Ready: Heatwave awareness, preparedness and adaptive capacity in aged care facilities in three Australian states: New South Wales, Queensland and South Australia

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three Australian states:
New South Wales, Queensland and South Australia**

Final Project Report

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The role of NCCARF is to lead the research community in a national interdisciplinary effort to generate the information needed by decision-makers in government, business and in vulnerable sectors and communities to manage the risk of climate change impacts.

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ABSTRACT

Relevance

Heat-waves are increasing in frequency, intensity and duration due to global climate change, and account for more deaths in Australia than any other natural hazard. Research has identified the aged, and those living in residential aged care facilities (ACFs), at increased risk of heat-related morbidity and mortality.

Aims

The study aims were to: 1) investigate current heat-wave planning, policies, staff knowledge and heat prevention strategies and 2) identify barriers to adaptation and successful implementation of adequate heat-wave health care in ACFs in three Australian states (NSW, Queensland and South Australia).

Methods

Residential ACFs were identified across three states using Department of Health and Ageing databases, white pages and internet searching. After removal of duplicates, 1,561 facilities were invited to participate in the study. Each participating facility was asked to provide informed consent and invited to select one administrative and one clinical staff member to participate in a 15 minute Computer Assisted Telephone Interview (CATI). Participants were asked about their knowledge of the effects of heat on the elderly and to detail current plans and policies which addressed residents' health during heat-waves, and barriers to care during periods of extreme heat. Data was entered into a purpose-built database and analysed using Statistical Package for the Social Sciences (SPSS) Version 19.

Results

Two hundred and eighty seven (287) facilities (18%) participated in the telephone interview. The ACFs enrolled represented 20,928 Australian aged care residents. Ninety percent of facilities had a current ACF emergency plan, although only 30% included heat-wave emergency planning. Heatwave policies were not routine in all ACFs in any state. Staff used a range of strategies to keep residents cool in extreme heat, although strategies were not consistent across all states or facilities. The issues raised in relation to clinical care in this group can be synthesised into four key messages; cooling, hydration, monitoring and emergency planning, which, at a practical level are essential to maintain the health of older people in very hot weather.

Conclusions

This study identifies the current policies and strategies Australian ACFs use to keep residents well, and highlights the barriers to heatwave adaptation and maintaining wellness in the residential aged during periods of extreme heat. As the Australian population ages, planning for the health effects of extreme heat in elderly residents is critical to ensure wellness in this population group is maintained.

EXECUTIVE SUMMARY

Australia has a hot, dry climate and a projected rise in average daily temperatures by 4°C by the year 2100. As a result periods of extreme heat are increasing in frequency, duration and intensity. Extreme heat is associated with an increase in illness and death, particularly in vulnerable groups such as the frail aged. As Australia's population ages, more frail aged Australians will be exposed to periods of extreme heat. Many of these will reside in Aged Care Facilities (ACFs) who provide continuity of care to the aged.

The Heat-Ready study was designed to capture information on the current knowledge, policy status, preparedness and adaptive capacity to heatwaves in staff who work in ACFs in three Australian states. The three states (New South Wales (NSW), Queensland (QLD) and South Australia (SA)) were chosen because of their differing climates, experience of extreme heat events and variation in level of heatwave preparedness. This report presents the results of the Heat-Ready Study conducted in NSW, Queensland and South Australia and discusses the similarities and differences between states. Clinical and administrative ACF staff were invited to participate in the study, which involved a semi structured computer assisted telephone interview (CATI) of 20 minutes duration. In total 1,561 ACFs were invited to participate in the study. Although 568 facilities or organisations agreed to participate in the study, at study close only 287 facilities (18%) participated in the telephone interview. The ACFs enrolled represented 20,928 Australian aged care residents.

Heatwave policies were not routine in all ACFs in any state. Many ACFs had a heatwave plan or guideline as part of their ACF Plan or Emergency / Disaster Plan, particularly in South Australia where heatwave planning is a major focus of SA Health and SAFECOM (Safety Commission) however these were not consistent either across or between the states investigated. The majority of ACF staff were of the opinion that air-conditioning prevents heatwave illness in ACF residents, but many had not considered the strategies which would be required if power outages occurred during periods of extreme heat. In South Australia, ACFs were more likely, than in either NSW or Queensland, to have a back-up generator. Staff knowledge of the health effects of extreme heat, and the best ways to care for the elderly during very hot weather was variable and inconsistent in all states.

The ACF staff who participated in this study raised many issues critical for the ongoing care of Australian elderly. The issues raised in relation to clinical care in this group can be synthesised into four key messages; *cooling, hydration, monitoring and emergency planning*, which, at a practical level are essential to maintain the health of older people in very hot weather. Systemic issues, which are important to support and underpin the clinical strategies used by staff are just as critical and include; *adequate policy development and planning, education, training and communication, and infrastructure*. To do nothing is not an option. Continuous improvement strategies in both clinical and systemic processes are essential in order to adapt to the increasing demands of an elderly population in an increasingly hot climate.

In order for Australian ACFs to adapt to future extreme heat, to minimise risk and to provide a safe environment for residents and staff, the adaptive strategies highlighted should be considered and supported by high level ACF management. The adaptive strategies include the development of facility specific heatwave plans (as part of the ACF Emergency/Disaster Plan), in-service and educational training in heatwave preparedness, clinical protocols and assessment of adaptive capacity. These should be a routine part of ACF core business and continuous improvement strategies as these actions will ultimately have a positive impact on resident and workplace safety.

1. INTRODUCTION

There is a large body of evidence to confirm the increasing global frequency of heatwaves. Research shows that not only are periods of extreme heat more frequent, but more intense and of longer duration (Intergovernmental Panel on Climate Change, 2007). Heatwaves are associated with an increase in morbidity and mortality, particularly in the elderly. Excess morbidity and mortality is highest in those aged over 75 years, who have co-morbid illnesses or are frail (Basu, 2008; Bouchama, 2007; Vandentorren, 2006).

Much of the research investigating the effects of extreme heat on the elderly has, until recently, been conducted in the United Kingdom and Europe, where heatwaves are a relatively rare occurrence (Baccini, 2008; D'Ippoliti, 2010; Fouillet, 2006; Kovats, 2004). Detailed investigations into the circumstances of death in older people following the August 2003 heatwave in Europe show that those most vulnerable either lived alone, had limited mobility, were unable to keep cool, or lived in nursing homes (Fouillet, 2006; Mastrangelo, 2007; Vandentorren, 2006).

Research in the United States of America highlights the effects of heat on elderly populations in a range of differing geographical contexts (Naughton, 2002; Zanobetti, 2008). As early as 1978, American environmental researcher Michael Marmor published research on the efficacy of air-conditioning in reducing mortality and morbidity in nursing homes during heatwaves (Marmor, 1978).

Australia is a country with a predominantly hot, dry, climate. Since the 1950s, Australian annual daily temperatures have increased by approximately 0.9°C and are predicted to rise up to 4°C by the year 2100 (Australian Bureau of Meteorology, 2009; Intergovernmental Panel on Climate Change, 2007).

Australia's climate varies considerably between states. According to the Bureau of Meteorology, Queensland, due to its sheer size, exhibits significant diversity in climate across the state (Bureau of Meteorology, 2012). Most of Queensland experiences two weather seasons: a winter period of rather warm temperatures and minimal rainfall and a hot summer with higher levels of rainfall. Low rainfall and hot summers are typical for the inland west with a monsoon-type wet season experienced in the far north. The eastern coastal strip experiences warm, tropical conditions keeping the region free from very extreme temperatures. Similarly, South Australia is known for its hot but very dry climate, experiencing extreme temperatures often greater than 40°C during the summer season. New South Wales experiences a temperate climate, with milder temperatures along the eastern seaboard and warmer dry temperatures west of the Great Dividing Range. Since the late 1970s all Australian states have experienced an increase in average daily temperatures and an increased frequency of heatwave events (Bureau of Meteorology, 2012).

Australian heatwave research has focused predominantly on the health impacts of heatwaves in Brisbane, Sydney, Melbourne and Adelaide, all regions that regularly experience heatwaves during the summer months (Bi, 2008; Hansen, 2008a; Hansen, 2008b; McInnes, 2010; Vaneckova, 2008; Vaneckova, 2010).

These large cities are also home to a large number of older residents, who live in cities for ease of access to tertiary medical services, range of alternative care/ accommodation options and proximity to support services.

Increasingly, residential care options are taken up by people who are living longer, with more complex health issues and in a more frail condition. The percentage of the Australian population who are entering old age is increasing, with 27% of the population expected to be aged over 65 years by the year 2036 (Australian Bureau of Statistics, 2007). Increasingly,

older members of the Australian population use the services of aged care service providers; retiring to village style independent living, hostel care or aged care facilities (previously termed nursing homes), and often a stepped combination of these. In line with the ageing of the Australian population, the number of occupants in residential aged care places at 30 June each year has steadily increased from 132,655 in 1997, to 154,872 in 2006 (Australian Institute of Health and Welfare, 2007).

As this number increases, and the temperature increases, it is critical to ensure aged care facilities are prepared for, and can adapt to this change and ensure optimal care for residents during heatwaves.

1.1 Background

1.1.1 Heatwaves and the Elderly

There is a large body of research to suggest that older people are particularly sensitive to temperature extremes, especially increases in temperature (Astrom, 2011; Balbus, 2009; Flynn, 2005; Norfolk, 2000). Risk factors for heat-related illness in older people can be divided into four key areas:

- 1) physiological (Fox, 1973; Levine, 1969)
- 2) medical (Ellis, 1976; Hausfater, 2010; Havenith, 2005; Nordon, 2009)
- 3) social (Bouchama, 2007; Fox, 1973; Vandentorren, 2006) and
- 4) environmental (Bouchama, 2007; Fox, 1973; Klenk, 2010; Klineberg, 2002; Marmor, 1978).

Each of these risk classifications interacts with the others, and cannot be considered in isolation. Risk factors for heat-related morbidity and mortality are cumulative and increase with the number and type of risk.

Physiological and medical risk factors

Age-related physiological changes increase the risk of heat-related illness. As the body ages, thermoregulatory function declines and the ability accurately discriminate between heat and cold is reduced. This reduced ability affects whether people take action to reduce the likelihood of associated adverse effects (Levine, 1969). In addition, ageing alters perception of temperature and associated health risk (Abrahamson, 2009; Collins, 1981). Studies on perception of risk have been conducted in the UK, USA and in Victoria, Australia (Abrahamson, 2009; Ibrahim, 2011; Sheridan, 2007), and two more are currently underway in Adelaide and Sydney.

As the heart ages the heart muscles are less able to increase their workload to meet the demands of extreme heat (Ballester, 1999; Norfolk, 2000). A decline in cardiac reserve and a reduction in the flexibility and number of blood vessels decreases peripheral blood flow and reduce the efficiency with which heat can be dissipated. The ageing process causes alterations to the skin and supporting structures, including reduced number and efficiency of sweat glands (Caruso, 1985; Norfolk, 2000). Unless sweating occurs, body temperatures can rise to dangerous levels.

The ability to perspire is affected by many medications, some of which reduce sweating and others which reduce the amount of fluid available for perspiration to occur (Ballester, 1999; Timiras, 2003). Some medications and medication interactions can increase the likelihood of heat-related conditions. Sedatives, antidepressants and anti-psychotics can cause lethargy, altered cognition and memory impairment, leading to decreased mobility, increased sleep, reduced sweating and less desire to drink fluid (Norfolk, 2000). Limiting fluid intake either unconsciously, or for medical reasons, amplifies the impact of heat-stress in older

people. Beta-blockers and anticholinergic drugs cause reduced vasodilation and decrease sweat production, and ACE inhibitors reduce thirst (Department of Health Victoria, 2010). Vasodilators aggravate heat illness by exacerbating hypotension, and antipsychotics increase core body temperature.

Diminished fluid intake and subsequent dehydration in older people can lead to hyperkalaemia and subsequent life threatening cardiac arrhythmia. Dehydration can be caused directly by alcohol, excess caffeine and diuretic medications and increases heat-stress risk, particularly when patients take medications with a narrow therapeutic index in dehydration e.g. warfarin and digoxin (Department of Health Victoria, 2010; Worfolk, 2000). The elderly develop renal failure more quickly than the young, and exhibit diminished renal tubular conservation of sodium and water during periods of dehydration (Biswas, 1997; Flynn, 2005). Dehydration in these circumstances is often followed by hypernatraemia and hyperviscosity, with an associated increased risk of coronary and cerebral thrombosis and central nervous system dysfunction (Michenot, 2006; Nordon, 2009). Hyperkalaemia is more common in the aged even in the absence of renal disease, due to an age-related decline in glomerular filtration rate.

Poor mobility is one of the most important contributors to heat-related health risk as people are less likely to be able to 'move' to keep cool in the heat (Klenk, 2010). Early identification of people who have multiple risk factors is one strategy that may assist authorities in reducing heat-related illness and death (Hajat, 2010; Health Department of Victoria, 2009; Khogali, 2000).

Social and environmental risk factors

Advanced age is the most significant factor in heat-related death in the U.S., however no similar research has been conducted in Australia (Bouchama, 2006). Older people are more likely to live alone, have reduced social contacts, experience co-existing chronic illness and have a lower socio-economic status with limited financial resources; all significant risk factors for heat-related effects (Klineberg, 2002).

A cool environment reduces the adverse health effects of extreme heat, but although home air-conditioning is optimal, lack of disposable income may mean many older people use fans instead (Semenza, 2008). Fans circulate air, but assist cooling only when there is a high level of humidity as they facilitate sweat evaporation (American Medical Association Council on Scientific Affairs, 1997). Ethnic minority groups and/or the elderly tend to live in less expensive, warmer neighbourhoods, with not only greater exposure to heat-stress, but less resources to cope with it (Harlan, 2006). City dwellers are exposed to additional factors associated with heat-related death including high-density housing, lack of green space and higher temperatures. Studies in France showed that some housing types, including high-rise, high-density, portable (aluminium) housing, or housing with poor ventilation, or no insulation, increase risk (Vandentorren, 2006).

Studies following the 2003 European heat-wave found significant increases in mortality in residents of nursing homes and institutions (Fouillet, 2006; Klenk, 2010). Although these studies focused on the lack of air-conditioning and its effects in nursing home residents, the results showed many variables, such as patient mobility and carer knowledge must be considered, not just temperature (Klenk, 2010).

1.1.2 Australian studies on heatwaves and the elderly

“Exposure to hot weather is not uncommon in most Australian cities, and these populations are accustomed to temperatures that would challenge those in Europe and North America” (Bi, 2010). Until recently, research into the health impacts of heatwaves was undertaken predominantly in the Northern Hemisphere where heatwaves are uncommon, and

consequently cause illness and death in a large percentage of the population who are unaccustomed to extreme heat (Bi, 2010).

Recent Australian research has shown the geographical distribution of heatwaves across the country, and mapped the impact on health using spatial analysis techniques (Loughnan, 2008; Loughnan, 2010; Vaneckova, 2010; Vaneckova, 2008). In their 2011 report on the effect of heatwaves on health, Price Waterhouse Coopers comment on the significant impact of heatwaves on the southern regions of Australia, compared to the more tropical north (Price Waterhouse Coopers and Commonwealth of Australia, 2011). The humid tropics tend to fare better during a heatwave because the humidity offsets the effects of heat on core temperature by increasing sweating, and hence the ability of the body to cool itself. However in extreme heat events, intense tropical heat has led to high levels of heat-related death (Tong, 2010).

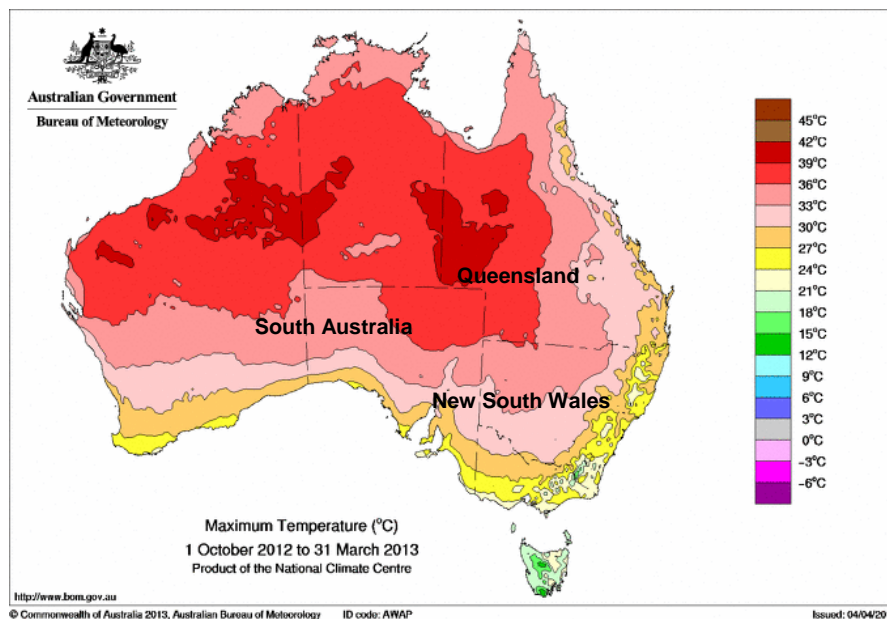


Figure 1: Map of the three states under study and temperatures in 2012/2013

Hansen and colleagues have conducted much research into the health impacts of heatwaves in the dry Adelaide region (Hansen, 2008). Similarly Nitschke has investigated the mortality impacts of hot weather in Adelaide (Nitschke, 2007; Nitschke, 2011), with Mayner and colleagues detailing the extreme impact on hospital emergency departments in Adelaide following the 2009 heatwave (Mayner, 2010).

In a 2010 study, Khalaj and colleagues highlighted the impact of heatwaves on health in 5 metropolitan regions of Sydney, NSW. In this study the contribution of underlying disease to the risk of heat related illness and death was highlighted, in particular cardiac illness and advancing age (75+)(Khalaj, 2010). While much attention is focused on mortality, it is important to recognise that the morbidity impacts of heat events can be significant – in terms of their physical and/or psychological toll and the strain that is placed on health and emergency services. This is particularly the case for hospital emergency departments (Dhainaut, 2004; Mayner, 2010) and health providers.

1.1.3 Heatwave Plans

Following the devastating heatwave of 2009 in southern Australia and the subsequent bushfires across Victoria, the need for heatwave planning has become a high priority. In Victoria, the Department of Human Services were swift in their production of a guide to

heatwave planning, in particular for Aged Care Facilities and those managing Institutional Care services and a Statewide Heatwave Plan (Department of Health: Victoria, 2009; Victorian Department of Health, 2009) .

Similar plans and policies have been rolled out across other Australian States including Queensland (Queensland Government, 2004), Western Australia (Government of Western Australia, 2010) and South Australia.

Whilst Victoria specifically produced a Heatwave Ready Resource for Aged Care Service providers, there is no mandated requirement for Aged Care Facilities across Australia to have a heatwave plan in place. Many Victorian Facilities have done this as a result of the requirement of Local Councils and Health Care organisations to develop a heatwave plan however the extent of individual facility planning is unknown.

Currently, NSW is developing a State heatwave health plan. As yet there are no details on whether Aged Care Facilities will be required to develop a heatwave health plan as part of the broader State-wide plan.

1.1.4 Ageing and Aged Care in Australia

In line with global population trends, Australia's population is ageing. It is estimated that by the year 2036 over one third of the population will be aged over 65 years (Australian Institute of Health and Welfare, 2007). However Australia's population is ageing not only numerically, but proportionately, due to an increased life expectancy and a declining fertility rate. Put simply, the number of older Australians is increasing, as is the proportion of the population that is over 65 years old (Brabsch, 2004). In the first half of the twentieth century life expectancy in Australia rose due to an increase in living standards, good sanitation and improved medical technology. At the same time fertility rates declined due to the wider availability of the contraceptive pill, changes to abortion laws, alterations to family size and more women in the workforce (Brabsch, 2004). Australia is also experiencing a global phenomenon: that of the ageing of the aged. The number and proportion of people aged over 85 years is growing at a rate not previously experienced. By 2051, it is projected that the proportion aged 85 years and over will have increased to 6-9% and by 2101 they will constitute between 7 and 11% of the population (Australian Bureau of Statistics, 2003).

The increasing proportion of the population aged 65 years and over has implications not only for health service delivery, but for government fiscal policy. Population ageing will lead to fewer taxpayers to fund health services, but also fewer informal carers of the aged (Australian Institute of Health and Welfare., 2008). Since the early 1990s, the Australian government have attempted to implement Aged Care Reform, led by the increasing cost of aged care services. The Australian government have focused on a 'whole-of-government' approach to population ageing. This includes systems which focus on superannuation and retirement income, options for health care and medical services, options for reduced cost transportation and other infrastructure subsidies (Commonwealth of Australia, 2004).

Increasingly, the older generation will require specialised care in either purpose built or appropriately modified accommodation. Whilst the Aged Care Reform agenda supports more elderly living in their own homes, Aged Care Facilities and residential villages will still be an integral part of aged care service provision, as ageing leads to an increase in dementia, a decline in physical health and thus, the ability to live independently (Australian Institute of Health and Welfare., 2008; Council of the Ageing (COTA), 2010; Productivity Commission, 2008).

1.1.5 Heatwave knowledge and perception

Limited studies have been conducted on perception of heatwaves, and those that have, focus mainly on the perception of heatwaves in community groups and the staff that care for them (Abrahamson, 2009; Ibrahim, 2011; Plotnikoff, 2004; Sheridan, 2007; Wilson, 2012). Perception of heatwave risk has never been studied in health professional groups who care for vulnerable populations, although studies in the Northern Hemisphere have shown that elderly residents of institutions and nursing homes are more vulnerable to heatwaves, exhibiting adverse health effects which can be directly attributed to extreme heat particularly where air-conditioning or adequate cooling systems are not available (Klenk, 2010; Marmor, 1978; Reid, 2009). Whilst there are no suggestions that Australian residents of Aged Care Facilities are more likely to die from extreme heat as a result of institutionalised living, an exploration of the level of ACF staff knowledge is warranted, in the knowledge that readiness for heatwaves in this vulnerable population group is critical.

1.2 Study purpose

The purpose of the Heat-Ready Study was to investigate the strategies used by staff and management to keep elderly residents well during periods of extreme heat, and to identify heatwave adaptive capacity across the Australian aged care facility community.

The Heat-Ready study is a collaborative project between the University of Sydney and the University of Adelaide, with additional support provided through the James Cook University in Queensland. The project commenced in December 2011 and is funded by the National Climate Change Adaptation and Research Facility, based at Griffith University in Queensland. Conducted in three states (NSW, QLD and SA), the Heat-Ready study was approved by the Ethics committee of the University of Sydney, with reciprocal approval from the University of Adelaide and James Cook University.

This report presents the results of the Heat-Ready mixed methods study conducted across New South Wales, Queensland and South Australian aged care facilities between 15th December 2011 and 31st October 2012.

1.3 Study objectives

The objectives of the Heat-Ready study were to:

- Identify current policies, procedures, strategies, knowledge and environmental factors (such as building design and cooling equipment), used in ACFs in three Australian states, which may be adapted to prevent morbidity and mortality associated with extreme heat in elderly ACF residents.
- Investigate the capacity of aged care facilities to adapt to increasing periods of extreme heat and
- Provide strong research evidence on which policy and guidelines can be developed and implemented.

2. METHODS

Aged Care Facilities across NSW, QLD and SA were identified using Department of Health and Ageing (DoHA) databases, Internet searching and White Page directories. Initially a total of 1,860 ACFs were identified across the three states, however, with removal of duplicates and identification of merged or closed facilities the final number of facilities eligible for contact was 1561 (NSW=877, QLD=439, SA=235).

2.1 Recruitment

Each ACF was contacted by letter and invited to participate in the Heat-Ready study. Follow-up telephone calls were made to all facilities. All ACFs were contacted by telephone if no response to the initial invitation had been received after 4 weeks. Interested ACFs were sent a Study Information Sheet and an Informed Consent document either by mail or email. Participation in the study was voluntary. Aged Care Facilities who wished to participate in the study returned the consent form to the researchers either by email, post or facsimile. Involvement in the study required one administrative and one clinical staff member of each ACF to complete a 20 minute validated semi-structured interview by telephone. Upon receipt of signed consent documents ACFs were contacted by one of three interviewers. Suitable times were made to interview two staff in each ACF. Facilities were advised they could nominate the members of staff they wished to participate in the study interviews.

2.2 Interview tools

The Victorian Department of Health Aged Care Facility Heatwave Ready Resource (Vic Health, 2010) was used as the basis to develop an amended survey instrument. The instrument was piloted in six NSW ACFs prior to implementation across the broad study cohort. Alterations were made to questions as required, and repetitive questions were removed. Additional prompt questions were added to the survey to gain qualitative data from the ACF staff (Appendix 1). Purpose built Computer Assisted Telephone Interview (CATI) software was developed based on the amended survey instrument. Three interviewers were trained in interview technique and use of the CATI software. The software was loaded onto three computer stations, each with a unique database code for the interviewer using that computer. Interviewers entered data into the computer database in real time. Each individual computer database was backed up daily and the three interviewers' individual databases merged weekly.

2.3 Data capture

Quantitative data collected from the participants included, but were not limited to: role of interview respondent (clinical or admin), ACF size (number of beds), location (urban or rural), presence of an ACF Plan, presence of a current heat-wave plan, cooling status, building design (number of storeys), roof type, in-service training and whether there was a back-up power supply.

In addition, qualitative data were collected from each participant to assist the researchers to assess heatwave adaptive capacity in ACFs. In their own words, participants were asked to describe and discuss: 1) the strategies they use to care for elderly residents during heatwaves, and 2) how they felt their particular facility could be improved to cope with extreme temperatures. Participants were also asked to discuss any issues they felt had an impact on their capacity to keep elderly residents well during extremely hot weather. In NSW, participants were also asked whether they had seen or used the NSW Ministry of Health 'Beat the Heat' guidelines, currently available on the Ministry of Health website. Qualitative responses were recorded verbatim into the database.

2.4 Analysis

Data were entered into Statistical Package for the Social Sciences (SPSS) Version 20 software and descriptive analyses were conducted. Comparative analysis was conducted on responses from clinical and administrative staff and between rural and urban populations.

For the purposes of quantitative analysis questions on facility size, type and structural features were analysed for both clinical and administrative personnel. These responses were significantly correlated and so overall findings are presented. Responses for questions which investigate cooling strategies and care practices were examined in each group (clinical and administrative) and are reported individually where differences in responses exist.

Narrative data gathered using qualitative methods were coded into key themes and responses of both clinical and administrative staff were pooled. These results were then analysed using content and thematic analysis in both the rural and urban context.

3. RESULTS

Across the ACF cohort, 568 ACFs initially agreed to participate in the study. However even after repeated follow-up many aged care organisations did not provide consent after further consideration of the study, or later declined participation for other reasons, including 'too busy', 'already involved in research' or 'not interested as *heat does not affect us*'. At the close of study, consent forms and telephone interviews had been completed for 287 facilities (NSW=188, QLD=55, SA=44): a total of 562 responses.

Aged care facilities were spread across rural and urban areas of the three states. Facilities ranged in size from 12 to 283 beds, with a mixture of high and low dependency beds, and a median number of 60 beds. These facilities represented a total of 20,928 Australian residents.

3.1 Respondents

There were 168 rural and 119 urban ACFs enrolled in the study. In total, there were 278 clinical and 284 administrative responses, representing 287 facilities. Not all ACFs were able to provide a clinical and administrative staff member response. Reasons for this included: 'too busy' or 'no one available'. All responses were included in data analysis.

Across the three states, clinical staff participating in the study described themselves similarly; either as registered nurses (RNs), 'clinical staff' (care co-ordinators or personal care assistants) or assistants in nursing (AINs). Administrative respondents were selected by the facilities from a range of backgrounds including non-clinical or managerial staff, clerical staff, hospitality staff and maintenance and other staff. In some cases managerial staff also had a clinical background (i.e. Directors of Nursing in Managerial roles) and commented that they were answering the questions from a mixed perspective.

3.2 ACF Planning and policy

All respondents were asked whether the ACF in which they worked had an Aged Care Facility Plan or policy. This plan or policy could incorporate a disaster plan or similar crisis response plan. Clinical staff in almost all facilities (90%) across the three states reported that their facility had an Aged Care Facility Plan in place although not all of these included preparation for heat emergencies.

Heatwave policy and planning is an important component of aged care, particularly in view of the recent periods of extreme heat in NSW, Queensland and South Australia. The states differed in the way they approached policy and planning for extreme heat events. Comparison of the data on whether ACFs had a heatwave policy in place showed that between 41% and 77% of facilities (Queensland and SA respectively) had heatwave policies in place. Sixty percent (60%) of New South Wales ACFs had a heatwave policy.

When it came to heatwave planning, South Australia had the most planning in place, with ninety three percent (93%) of facilities reporting they had a heatwave plan to implement during extreme weather, irrespective of whether they had a heatwave policy. This is not a surprising finding, given the extremely hot temperatures experienced in South Australia, and the focus of heatwave planning at a governmental level, through SA Health and SAFECOM.

In Queensland, 77% of staff reported that they had an informal plan which was put into place during very warm weather to keep residents safe, well and hydrated.

Twenty per cent (20%) of Queensland clinical staff said they had no heatwave plan in place but were keen to formulate a heatwave policy which included regular updates and education for staff. A number of staff in Queensland mentioned however, they were so 'used' to working in and living in higher temperatures, they felt basic nursing care and a common sense approach kept them and their residents safe and well in the heat, and felt a documented policy was unnecessary.

In NSW, heatwave planning was variable and inconsistent. Around half (48%) of the ACFs who participated in the study in NSW said they had some form of formal or informal plan in place which was implemented in very hot weather. The majority of these plans were incorporated into the ACF emergency plan, with very few facilities stating they had a dedicated heatwave plan.

3.3 Facility size and location

Aged care facilities were categorised into size based on the number of beds in each facility using the categories outlined in the Profile of Aged Care report. In NSW rural ACFs made up over half (63%) of all facilities enrolled, whilst in Queensland and South Australia the proportion of rural and urban facilities was similar. In general, urban facilities tended to be larger, with an average of 88 beds compared to rural facilities with an average of 65 beds, although analysis showed that only South Australia had a statistically significant difference in bed size between urban and rural facilities ($p < 0.001$, 95%CI 61.12 – 82.93). This finding is probably due to the remote location of many South Australian rural facilities.

3.4 Facility and building type

The facilities enrolled in the study ranged from single to 8 storeys high. In NSW, around half of the facilities enrolled were single storey buildings, while in Queensland and South Australia 75% were one storey only. The tallest facility (8 storeys) was in NSW, with buildings up to 4 storeys high in Queensland and 6 storeys high in South Australia. In NSW, urban facilities were statistically significantly more likely to have multiple storeys ($\chi^2=41.9$, 2df, $p<0.0001$), which is not an unexpected finding, given the cost and availability of land in urban areas compared to rural settings. Similar findings in Queensland and South Australia reflect the high cost of metropolitan land, and the availability of rural facilities to build single storey dwellings.

In all states, the majority of facilities had windows which were able to be opened (NSW=96%, QLD=92%, SA=91%). In South Australia 7% of facilities commented that they had a mixture of fixed and opening windows. Facilities with fixed windows may indicate dementia specific centres, although this was not investigated in the survey.

Respondents were asked to describe the roof type of the facility, as this may have an impact on the internal temperature of the building. Roofing fell into two main categories: tiled or aluminium/steel roofing. Roof type varied by state, with the majority of roofs in NSW made of tile, unlike Queensland and South Australia where aluminium or steel roofing was more common (Figure 2).

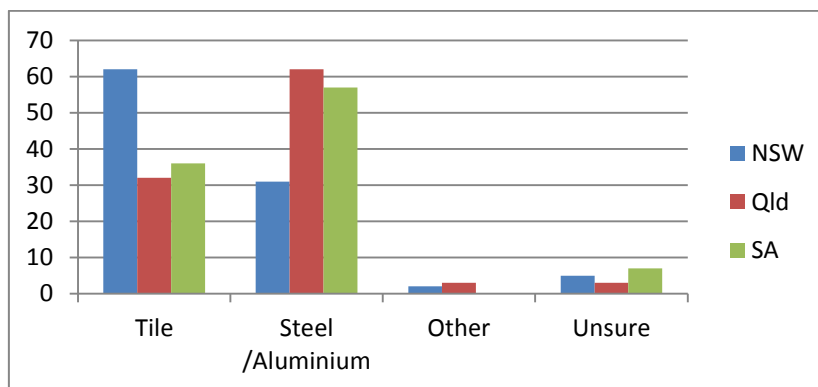


Figure 2: Roof type (%) in ACFs across NSW, Queensland and South Australia

Many respondents were unsure of the roofing material in their facility or said it was made of another substance. Rural facilities in all states were statistically significantly more likely to have pitched steel/aluminium roofs than urban centres ($\chi^2= 16.95$, 3df, $p<0.001$). These results may indicate older buildings in rural centres, but are also more typical of single storey developments.

Reflective paint is thought to reduce temperature under the roof surface, and for this reason we asked respondents whether their facility had reflective paint on the roof. The majority of respondents said they did not have, or were not aware whether there was reflective paint on the facility roof however, in NSW 12% of each rural and urban and in Queensland 7% of all facilities said their roof did have reflective paint. South Australian staff were not aware of the use of reflective paint on their roof.

Solar panels are a cost effective, carbon friendly, sustainable mechanism of energy production which can be used to run cooling equipment in extremely hot weather. Solar panels located on facility roofs to generate electricity were reported in 33% of NSW urban facilities compared to 12% of NSW rural facilities. This may indicate high urban power costs and increased reliance on air-conditioning in multi-storey urban centres. In South Australia solar panels were not a prominent feature in ACFs where only 14% of facilities had installed solar panels; similarly in Queensland solar roof panels to generate electricity were reported in 13% of facilities, with slightly more in use in rural areas. There were no statistically significant differences in solar panel installation between urban and rural facilities ($\chi^2=1.155$, $df=2$, $p=0.561$).

The use of shading materials on windows and doors is a common strategy to reflect heat and keep ACFs cool. When asked about the shading of the windows, 98% of ACF staff reported that windows could be shaded on the inside of the building, through items such as 'blinds' and 'curtains'. In South Australia, 52% of facilities noted that all windows could be shaded on the outside of the building through the use of 'awnings' or 'tinted windows'. A number of South Australian facilities noted that only the west facing windows could be shaded on the outside. Many Queensland ACF staff commented that shutters or louvered windows were used on the outside of buildings to reflect heat and to assist airflow through the building.

3.5 Aged care and heatwave risk

Much has been written about the health effects of extreme heat on elderly people, especially those who are chronically ill, taking multiple medications, have limited mobility or who are cognitively impaired (Astrom, 2011; Bouchama, 2007; Beggs. 2000)

Almost all of these criteria apply to residents of ACFs, either singly or in combination. Aged care facility clinical staff was asked whether they identify residents who are potentially at increased risk of heat-related morbidity prior to heatwave events. In NSW, 90% of rural and 93% of urban facilities said they do identify 'at risk' residents during a heatwave. This includes the assessment of medications, cognitive impairment and additional healthcare requirements. In South Australia and Queensland, 81% of clinical staff reported identifying at risk residents during extreme heat.

3.6 Monitoring temperature

All clinical and administrative participants were asked whether the facility monitored internal temperature routinely. In NSW and Queensland 78% and 77% of facilities respectively monitored internal facility temperature on a daily basis, however only 41% of SA ACFs said this was routine practice.

Notifications of forecast extreme weather may assist in planning for hot days and the prevention of ill health in residents and staff. When extreme weather is forecast, planning can be put into place to monitor residents who are at risk and keep the facility cool. The majority of NSW urban facilities (87%) reported that the facility management broadcast extreme weather warnings to staff on days when the weather was forecast to reach extreme temperatures. In contrast, only 75% of rural facilities reported that they undertook this practice. In South Australia, 82% of facilities reported that staff were notified of extreme weather forecasts. The remaining 11% of facilities did not notify staff and 7% of participants were not sure if this happened in their facility. Similarly in Queensland, 83% of facilities notified staff of extreme heat forecasts, however 15% of facilities said they did not notify staff members.

Warning family members of increased heat risk is important, particularly if they intend to take their resident relative outside the ACF on a hot day. In NSW, 10% of urban and 7% of rural facilities said they would warn families about the risks to their family member on extremely hot days. In Queensland, 81% of facilities said they notify residents' families on very hot days, and in South Australia, 75% of facilities enrolled in the study had a dedicated protocol/method of notifying residents' families of extreme weather forecasts.

3.7 Cooling strategies

There are many cooling strategies used by aged care staff to keep elderly residents cool during periods of extreme heat. Respondents were asked they type of cooling used most frequently by their facility when the weather is unusually warm. Responses to this question fell into five categories; full air conditioning, partial air conditioning, fans, combination of air conditioning and fans, or other (evaporative cooling, under floor cooling, ventilation from windows).

The amount of air conditioned ACFs varied substantially between states. In South Australia almost all facilities (98%) were fully air conditioned with the remainder (2%) partially air conditioned. Similarly in Queensland, 98% of facilities said they were either fully or partially air conditioned. In NSW, only 65% of ACFs had full or partial air-conditioning. The remainder said they used fans (ceiling and pedestal), evaporative coolers, under floor cooling, opening windows or a combination of these strategies to help keep elderly residents cool on very hot days.

Where air-conditioning was in place, almost all NSW facilities (92%) had additional fans (ceiling and pedestal fans). When asked whether they knew the limitations of fans, and that these could be dangerous to elderly people in dry, hot weather 88% of clinical staff said they were not aware of these dangers. This was not the case in South Australia, however, where

only 39% of staff said they did not know the dangers of fans. A number of South Australian facilities reported using fans on a regular basis (68%) in addition to air conditioning; however, a further 30% reported that their facility did not use fans, noting the dangers associated with fan usage in an aged care setting. This is a particularly interesting but not unexpected finding, as fans are much less useful in a dry climate, such as that experienced in South Australia. Moreover, 61% of facilities reported that residents do not have fans in their rooms for a similar reason.

The majority of facilities in Queensland used fans (91%) in addition to air conditioning. The type of fans used varied and included; pedestal, ceiling, wall mounted and evaporative coolers. When staff members were asked about the limitation of fans during periods of extreme hot weather, 85% of staff members were aware that fan usage could be dangerous to the elderly during dry, hot weather. Rural staff members (49%) were more aware of the limitation of fans than urban staff members (36%), however, this difference was not significant ($\chi^2=1.161$, $df=2$, $p=0.560$).

Across the states, 95% of clinical staff felt that the current cooling strategies used in their facility were sufficient to keep staff and residents cool during periods of hot weather. Only 90% of administrative staff thought current cooling strategies were sufficient.

3.8 Staffing and training

There is a well recognised shortage of aged care nursing staff across the industry, and we investigated whether staff felt there was a shortage of staff in their facility, which, if faced with extreme weather could impact on patient care.

Whilst all NSW facilities reported that their facility utilised the skills of agency staff, 75% of current staff reported that orientation to the facility for agency staff did not include care procedures to be implemented in very hot weather.

Clinical in-service training for staff on a regular basis was conducted in 98% of NSW and Queensland and 100% of South Australian ACFs. In NSW, only 34% of staff said they had ever had in-service training that had covered heat-related illness and caring for the elderly in very hot weather, while in South Australia 50%, and in Queensland 57%, of staff had experienced such training.

3.9 Adaptive measures

Many facilities raised the heatwave adaptive measures they have already undertaken, either individually, or as part of a broader organisational quality improvement strategy. These include measures such as using reflective paint on the roof of the building, increasing the quality of window coverings (such as thicker curtains, tinted windows and using shutters), actively being involved in new facility design, and rearranging furniture and rooms to take best advantage of the natural sunlight and cooling breezes.

Many facilities were encouraged to implement new strategies as a result of our CATI interview, with a number of respondents commenting that strategies such as family education, transfer packs, emergency planning kits and more heatwave focused in-service training would all be beneficial to future heatwave adaptation.

3.10 Qualitative analysis

Open-ended responses were extracted from the database and entered onto coding sheets. Each of the open-ended responses was reviewed and key words and sentences were identified and coded into key themes. Data coding and identified themes were reviewed by two members of the research team to ensure the context and accuracy of data was

maintained. Thematic analysis was undertaken on each of the open-ended question responses, and key themes distilled from the data (See Figure 3).

Participants were asked to discuss, in their own words, the strategies they used to care for elderly ACF residents during periods of extreme heat. The responses were similar across the three states from both clinical and administrative participants although, as expected, fewer administrative participants knew about the clinical measures taken to protect elderly residents from extreme heat.

The strategies used by clinical staff to keep the ACF residents comfortable and well in the heat fell into three key thematic areas, with an additional area raised by South Australian participants that was not mentioned by participants in NSW or Queensland (Figure 3).

The three states all raised issues which fell into categories of:

- *cooling,*
- *hydrating and*
- *monitoring*

South Australia raised issues that fell into the category of

- *emergency planning*

	Care strategies NSW	Care strategies SA	Care strategies QLD
Cool	Close curtains Close windows Open windows Air conditioning (23°C) Fans	Air conditioning (22°C) Close blinds Open windows 'Close facility up' Fans	Curtains closed Windows open AC on (23°C - 24°C) Fans
Hydrate	Encourage fluids Ice Jelly Ice blocks	Increase fluids Jelly Juice Ice blocks	Encourage fluids Ice blocks
Monitor	Monitor for changes in behaviour Monitor fluid output Monitor temperature	Monitor residents Monitor temperature of facility Monitor fluid intake Monitor clothing	Monitor residents Monitor fluid balance Monitor temperature
		Alert staff to forecast Check CFS updates	

Figure 3: Key care strategy themes distilled through thematic analysis comparison by state

In all states, the main strategies used for *cooling* ACF buildings and residents included air-conditioning, fans (both ceiling and pedestal fans), evaporative coolers, open windows and heavy curtains. Responses were not consistent between facilities, with many using contradicting strategies to keep buildings cool, such as “*opening windows to let air through*”, or “*closing windows to keep the hot air out*”.

In South Australia and Queensland almost all ACFs were air conditioned, however many did not have air-conditioning throughout the whole facility. In NSW, the provision of air conditioning was patchy to say the least. In some ACFs, air-conditioning was confined to communal areas, whilst in others individual patient rooms were also air-conditioned. Some facilities commented that resident common areas were air-conditioned but this was not the case in staff areas and corridors. Some facilities commented on the air-conditioning temperature setting used (22°C in SA; 23°C in NSW; 23 - 24°C in QLD).

Other cooling strategies mentioned were; “wearing appropriate clothing”, “providing cool wash cloths to residents” and “minimising activities”. Participants commented:

“We make sure curtains are closed (ensuring there is enough light so it’s safe), doors and windows are closed, air-con on at a comfortable, constant temperature in common areas, internal doors are open, fans on, and residents encouraged to stay indoors in communal areas and increase their fluids”.

(Queensland Registered Nurse)

“The air conditioner is on at 22 degrees, extra fluids, ice cream and ice blocks are given to the residents and the staff are aware of the heat. The facility conducts food and nutrition assessments during hot weather and the South Australia health department alerts are posted around the facility. Bus trips are also cancelled automatically when the temperature rises above 34°C.”

(SA Urban Care Manager)

The second theme raised by the ACF staff was that of *hydration* of residents. Almost all facility staff, commented on the need to “push fluids”, with alternative fluid measures mentioned (jelly, icy poles, ice and extra cool drinks). Two administrative participants commented on the need to withhold drinks such as tea and coffee that act as a diuretic, however this was not mentioned by any clinical staff interviewed.

The third key theme identified as part of the question on how to care for elderly residents in the heat was that of *monitoring*. Although monitoring is a critical part of caring for the elderly during extreme heat, it was not routinely mentioned by participants. Around one third of clinical staff used the term “monitoring” in their responses, indicating that they were aware of the potential for the health of elderly residents to deteriorate quickly in the heat. Monitoring residents’ behaviour, fluid balance and the ACF response to the heat was clearly described by one participant:

“We notify staff of the increase in temperature and through the clinical IT system. Drink and ice block rounds are increased, we monitor for signs of dehydration and educate staff of the symptoms in memos, we monitor medication intake and reactions, report troubles with air-con and cooling immediately. If there is a heatwave – we have daily meetings for strategies.”

(Rural Director of Nursing)

In South Australia one clinical staff member noted the use of fluid charts:

‘... we use fluid balance charts to monitor [fluid] intake and output’.

(SA aged care coordinator)

One urban care manager also mentioned monitoring staff members during periods of extremely hot weather:

‘... senior staff do audits and spot checks on staff to see if they are giving enough water to residents and if they are doing the right thing’.

(SA aged care coordinator)

The fourth key theme was *emergency planning* and was only identified by South Australian participants. This is not surprising given the focus on heatwave planning and preparation developed by SA Health and SAFECOM. Due to the hotter and drier climates in SA, there is an increased risk of bushfires. Two facilities reported that they use the '*Country Fire Service (CFS) website... to check for updates and fire dangers*'. Another facility reported that during periods of extreme heat the '*grounds are checked for combustible items*'. Other emergency planning procedures reported included; '*the fridge and equipment is checked each day*', '*put up notices around the facility*', '*the staff are told during changeover*' and '*making sure that the staff are able to get to work, as the facility is in a fire zone*'. One clinical staff member clearly described their emergency planning procedures during extreme heat;

"The staff are alerted and one senior staff member is responsible for checking up on what the temperature will be. A battery powered radio and landline telephones are used so that they facility can still have phone use and can keep up with updates when the power goes down."

(SA Rural Director of Care)

The second open-ended question invited participants to discuss "how their facility could be improved to be better prepared for high temperatures and the effects of extreme heat". Detailed narrative analysis of the clinical and administrative responses highlighted four distinct themes emerging from the data (Figure 4). These were the same for all states and were:

- *Do nothing*
- *Infrastructure*
- *Planning and policy*
- *Education, training and communication*

The first theme identified in all states was '*nothing needed*' with almost half of the clinical participants commenting that there was no need for improvement in the way they (as clinicians) or the ACF could be better prepared for high temperatures. Interestingly, only one third of administrative staff felt this was the case.

The second theme, and most highly discussed was that of '*infrastructure*'. Key components of this theme were comments on the importance of full air-conditioning in the facility, back-up generators for when power supplies were unstable, access to water coolers, roller shutters on windows that face the sun and additional external shade. Many participants raised facility design and the (older) age of the building as a risk factor when attempting to keep residents (and staff) cool. A number of participants suggested new facilities, purpose-built as ACFs, and whose design takes into consideration local temperatures and conditions are badly needed.

	ACF improvements NSW	ACF improvements SA	ACF improvements QLD
Do nothing	None needed Doing OK at present	Pretty good at the moment Not sure what improvements are needed	None needed
Infrastructure	Purpose built building Newer facility Back-up generator Transfer packs	Building upgrades Upgrading air conditioning Backup generator Increase number of water coolers	New buildings Back-up generator
Planning and policy	Need policies and guidelines Continuous improvement and planning Heat audit – rooms and environment (thermometers)	Clear specific hot weather policy required	Heatwave policy
Education, training and Communication	Family communication Staff communication	Increasing staff awareness to the effects of heat Formal education process	Communication Staff Education

Figure 4: Key ACF improvement strategy themes distilled through thematic analysis: comparison by state

‘*Planning and policies*’ for extreme heat and any potential implications of heat-waves was the third theme highlighted by participants. Components of planning included development of heatwave plans and policies, monitoring the temperature in residents’ rooms on hot days, developing a heatwave specific component of the ACF disaster plan, developing and implementing an extreme heatwave kit in case of emergency power loss or the need to evacuate and conducting a regular environmental audit at the commencement of summer each year.

“We need a review of disaster planning, develop a heat wave policy, and to make sure that all measures are in place. It would be good to do an environmental audit at the beginning of each summer and, train staff and educate them”.

(NSW Rural Facility GM)

“A crystal clear heat policy would be ideal, and education for staff.”

(Queensland Urban Facility Care Manager)

“More information is required from the health department and from researchers and more talk about heat readiness and the integration of the findings of Heat-Ready into procedures and policy”

(SA Rural Services Manager)

Staffing was raised as an issue during extreme heat, with many clinical participants commenting that planning for additional staff to be ‘rostered on’ to conduct additional drink rounds, monitor residents for heat related effects and assist with toileting is critical.

“It would be good to have transfer packs (for travelling and emergencies) and more education prior to summer and winter (they don't drink enough when they are out)”.

(Rural Registered Nurse)

The fourth theme identified was *education and training for staff members*. One quarter of clinical staff members reported that increasing staff awareness of heat related issues and maintaining education was a priority during extreme heat. Interestingly, a similar number of non-clinical staff members suggested that improvements in staff training were required. One clinical staff member noted that a more *‘formal education process’* was required, whilst another clinical staff member suggested that the training in regards to dehydration should not only be undertaken by clinical staff members but also the kitchen and domestic staff members. One clinical staff member suggested that;

“Posters about the importance of nutrition and hydration could be put up in the facility”

(Urban Care Manager)

Clinical and administrative participants in all states commented on the need for ongoing training and in-service on ways to: 1) care for the elderly during hot weather, and 2) communicate to staff and residents’ families the importance of risk management in extreme heat. One facility manager commented on the need to ensure families were informed if they were taking family members out for the day.

“There is a need for clearer policy and education ... there is a lot of informal policy but not formal policy and not enough auditing”

(Urban Director of Care)

A number of participants commented that the interview had raised points that they had not previously considered, but would consider implementing in the future in their ACF.

4. DISCUSSION

This study, conducted in three Australian states highlighted the strategies ACF staff use during periods of extreme heat, and investigated the ways these staff could improve the care of elderly residents during very hot weather. Participants were broadly placed into two categories – clinical and administrative, and although these are quite separate in terms of service delivery in ACFs, responses on the whole were similar in each state. As expected, clinical staff were more up to date with the practical aspects of patient care, whilst administrative staff provided more commentary on policy and management issues.

The study response rate was much lower than anticipated, in spite of repeated follow-up and intensive recruitment strategies. This is a limitation of the study and suggests that there may be many ACFs who are not ‘Heat-Ready’ and who were not prepared to be embarrassed or exposed by participating in the study. There was also a clear reliance by ACFs on air-conditioning to reduce the health related impact of heat-waves, often without consideration for the consequences of power failure. South Australian ACFs were more likely to have back-up generators than facilities in either NSW or Queensland. Overall, the results of this study provide an indication as to where future policy and educational strategies should be focussed, although the results are difficult to generalise across the entire ACF community and should be viewed with caution.

Although not a planned outcome of the study, involvement in the study did raise awareness and interest in heatwave health in those who participated in the study. Many of the respondents commented that they could identify ways to enhance their procedures or practices and would follow-this through in a practical way. In view of the record high temperatures that Australia experienced during the summer following this study, it is hoped that heatwave awareness was increased as a result of this project.

4.1 Policy and planning

There was a difference in the heat-wave policies, plans, and guidelines for staff to use in periods of extreme heat across the three states. Almost all facilities surveyed had an Aged Care Facility Plan – which was designed to address functional issues including emergency and disaster management. However not all of the ACF plans included extreme heat as an emergency, nor had they developed any contingency planning to implement in such an event.

Dedicated heatwave plans were not a common finding in NSW ACFs. In the other warmer states, and where heatwave plans have been directed by government, many facilities had dedicated heatwave plans in place (Government of South Australia, 2012; Queensland Health 2004). This was particularly evident in South Australia where almost all facilities (93%) had a heatwave plan, and in Queensland where almost half (41%) of ACFs had a dedicated heatwave plan. The questions raised by the CATI survey led to many participants commenting on the need for a comprehensive and consistent heatwave policy and plan for aged care service providers, particularly in view of the evidence for the increasing likelihood of heatwave events.

4.2 Infrastructure

Some facilities, particularly those in rural areas still struggle with outdated buildings and inadequate infrastructure which has the potential to place residents at risk of adverse health effects in the heat. Rural facilities in all states were more likely to have aluminium or steel roofs, which unless well insulated, can lead to high internal temperatures. Some of these roofs were painted with reflective paint, a cost-effective

way of reducing the impact of extreme heat on the internal building temperature. Building design and building age was raised by participants in all states as an important factor when managing the effects of heat in the elderly. Although many facilities are of an older design or not purpose-built for aged care provision, there are many options for retro-fitting or heatwave adaptation. Retro-fitting older style buildings is costly and often inefficient, however subsidising these alterations may lead to more power efficiency and reduced healthcare costs in the longer term. Some ACF managers raised the rising costs of power as a barrier to full air conditioning in the facility, however fewer facilities than expected had solar panels on the roof, which can offset the high costs of running cooling equipment during periods of extreme heat.

4.3 Cooling mechanisms

Unlike South Australia and Queensland, only 66% of ACFs in NSW were fully air-conditioned, with air-conditioning generally only available in either patient rooms or common areas in those who were partially air-conditioned. This is of concern in extremely hot rural areas, as overseas studies have highlighted positive contribution of air-conditioning to health in an institutional setting. Almost all facilities in each state commented that fans were used as a supplement to air conditioning, both in common areas and in resident rooms to assist with cooling. Research suggests that in cool or hot dry air (when humidity is low) fans may be detrimental to the health of older people, particularly in very hot weather (Grynspan 2003). Staff in South Australia were more aware of the detrimental nature of using fans in the elderly population, possibly because of the hot, dry climate experienced in South Australia, whereas less staff in Queensland and New South Wales were familiar with the limitations of fan use.

4.4 Staff knowledge of heatwave risk minimisation

Overall, staff in each state were knowledgeable about ways to minimise patient risk in the heat, and relied on a number of strategies and systems to ensure elderly patients were cared for appropriately.

Although research outlining the effects of extreme heat has been conducted in the three states enrolled in this study (Khalaj, 2010; Beggs, 2000, 2008; Vaneckova, 2008, 2010; Tong, 2010; Nitschke, 2007; Hansen, 2008a; Hansen, 2008b) ACF staff knowledge of ways to minimise patient risk in the heat was variable and inconsistent, and was not influenced by state, size or location of facility. South Australian staff were generally more conversant about the effects of heat on elderly residents, however few staff in each state commented on the interaction of multiple medications and dehydration, or the importance of assessing residents for altered mental states such as confusion or disorientation (which are associated with dehydration) in very hot weather.

Many staff in each state commented on the need for a consistent message on heat-related health risk, not just in residents but in ACF staff. Clinical staff were from a variety of backgrounds (Registered Nurse (RN), Enrolled Nurse (EN), Assistant In Nursing (AIN) or untrained assistants), and the level of clinical knowledge about the physical manifestations of heat stress were variable. These comments led on to the importance of improved education and training on heat-related health risk for all aged care staff.

4.5 Education, training and communication

Although most ACFs said they had some form of in-service education, the regularity of these sessions was variable and the majority did not include and information or education on caring for the elderly in extreme heat.

Overall the staff in all states (both clinical and administrative) who participated in the study commented that updated, consistent training on ways to minimise heat-related health risk, both to residents and staff in ACFs was badly needed.

South Australian facilities were more likely to receive heatwave warnings through the SAFECOM or SA Health, with fewer facilities in NSW and Queensland commenting that notifications directly aimed at aged care service providers were received prior to an extreme weather event. This highlights the need for a dedicated communication strategy to be developed in each state, driven by the lead agency (Health or Emergency services), which can be disseminated prior to an anticipated heatwave event.

Communication was highlighted as a major factor in minimising heatwave risk. Although many participants commented that communication about heatwave protection strategies within ACFs could be improved, communication with residents' families was raised as a particular issue. The investigation of this area is outside the scope of this data collection, but is an area for future research.

4.6 Planning

All states commented on the need for appropriate planning for heatwave events. Only South Australia commented that this was one of their current strategies for management of heat-related health risk. Strategies such as identification of residents at heat-related health risk, development of hot-day transfer packs, continuing in-service for staff, regular environmental audits and temperature monitoring are novel strategies which can be easily implemented but have the potential for minimisation of heat-wave risk in ACF residents.

4.7 Adaptive capacity

While many of the facilities who participated in this study felt there was nothing more they need to do to prepare for the likelihood of increasing periods of extreme heat, the majority of facilities raised ways their particular facility could improve and adapt.

Strategies such as adding roller shutters to westerly facing windows, consistent and regular temperature monitoring and improved education and knowledge were some of the varied ways staff saw their facility as able to adapt. Other strategies included, painting reflective paint on the roof, adding solar panels to reduce power costs, installation of back-up generators (in the case of power failure from grid overload) and the development of resident transfer packs for use in an emergency.

4.8 Strengths and limitations

This study is the first of its kind to investigate the strategies ACF staff use to care for aged nursing home residents in the Australian context.

The response rate in all states is lower than anticipated and is a limitation of this study. The final number of ACFs who participated in this study represented only 18% of those who were contacted and invited to participate across three Australian States. There are many possible reasons for the low response rate as outlined below:

- 1) Finding time to complete a telephone interview whilst conducting daily clinical and administrative tasks can be difficult, and may be reflective of the current workload of ACF staff

- 2) The exact focus of the study (Heat-Ready), was provided in the original contact information provided to Aged Care Facilities (as requested by the Ethics Review Committee) however this may have frightened-off ACFs that were not Heat-Ready
- 3) perhaps through fear of embarrassment or exposure or biased the responses in terms of respondents telling the interviewers what they thought they wanted to hear.
- 4) Many facilities believed that because they were air-conditioned they were “Heat-Ready” and thus did not need to spend the time participating in the study.

Each state who participated in this study was chosen because of their differing climate and geography. Each state varies in its current development of a Heat Health Plan. South Australia has a clearly defined Heatwave Plan administered by SA Health and SAFECOM (under the State Emergency Plan), whilst Queensland has incorporated the state heatwave plan into the State Emergency Plan (but does not clearly define heatwave response). At present New South Wales does not have a State-wide Heatwave Plan, but is currently developing a Heat Health Warning System. As such, the results of this study may not be generalised to other Australian States where Heatwave Plans and Policies are already in place.

5. CONCLUSIONS

Until now, limited research has been conducted into ways ACF staff care for elderly residents during periods of extreme heat, with studies focusing primarily on heat-related excess mortality in residents of aged care facilities and institutions (Marmor, 1978, Klenk, 2010). In the Australian context, research has focused on a broad range of health providers, with a focus on publicly funded aged care service providers (Ibrahim, 2012).

Although the Australian rural population is far less than the urban population, the proportion of residents aged 65 and older is far greater in rural towns than in major cities. The limited aged care options for rural residents mean that they will almost certainly be older, sicker and frailer by the time they need to enter an aged care facility. This in itself makes this group the most vulnerable of the vulnerable when it comes to experiencing the effects of extreme heat.

Although the sample size included in this study is small, the ACF staff who did participate in this study raised many issues critical for the ongoing care of Australian elderly. The issues raised in relation to clinical care in this group can be synthesised into four key messages; *cooling, hydration, monitoring and emergency planning* which, at a practical level are essential to maintain the health of older people in very hot weather. One of the key benefits of the study, although not implicit in the original proposal was the increased awareness and interest in heatwave health in ACF staff as a result of study participation.

Systemic issues, which are important to support and underpin the clinical strategies used by staff are just as critical and include; *adequate policy development and planning, education, training and communication, and infrastructure*. To do nothing is not an option. Continuous improvement strategies in both clinical and systemic processes are essential in order to adapt to the increasing demands of an elderly population in an increasingly hot climate.

In order for ACFs to adapt to future increases in extreme heat, minimise risk and provide a safe environment for residents and staff the adaptive strategies highlighted should be considered and supported by high level management. The development of facility specific heatwave plans (either alone or as part of the ACF Emergency / Disaster Plan), heatwave transfer packs, regular temperature audits of patient rooms and environmental contributors to heat should be a routine part of patient safety and continuous improvement strategies.

Future research should focus on the identification of specific risk factors in ACFs with poor infrastructure, cost benefit analyses of heatwave health improvement strategies and the development of tools to educate staff in ACFs about heatwave risk.

6. RECOMMENDATIONS

There is substantial evidence to support the increasing likelihood of extreme heatwaves in New South Wales, Queensland and South Australia. In conjunction with the increasingly aged population who are known to be at risk, extreme heat may lead to an increase in morbidity and mortality in this group. Recommendations have been divided into five key areas which address the key deliverables of this research project. Based on the small sample size of this study these recommendations may not be generalised to all ACFs in Australia however the following recommendations are made for consideration as a result of the findings of this research study.

6.1 Policy

- A consistent policy for the management of aged care facility residents during periods of extreme heat should be developed in collaboration with aged care service providers, DoHA and the Aged Care Association of Australia.
- Continuous monitoring and review of response to extreme heat should be part of regular continuous improvement strategy.
- Policy guidelines on emergency management may be beneficial in assisting in the development of heatwave planning guidelines and could be considered in the development of heatwave policy.
- Disaster / Emergency planning which includes heatwave response should be a part of Aged Care Facility Accreditation Standards.

6.2 Education, training and communication

- Up-skilling staff on the importance of caring for the elderly in periods of extreme heat should be a part of regular in-service for all aged care facility staff. This training should be made mandatory prior to each summer season.
- An educational resource for aged care staff and service providers which focuses on maintaining wellness in the heat needs to be developed.
- A communication strategy (driven by the State lead agency) should be developed for aged care service providers and disseminated prior to expected extreme weather events.
- An aged care heatwave awareness campaign needs to be conducted prior to the summer season.

6.3 Heatwave preparedness

- Aged care facilities should have a heatwave plan in place, and be prepared for an extreme heat event.
- A pre-summer checklist of heatwave preparedness should be considered and where possible developed and implemented.
- ACFs need to have a strategy outlining how and where to move residents safely and efficiently should ACF power failure occur,
- ACFs need to have a defined strategy for the provision of additional fluids during extreme heat (volunteers, additional staff)
- ACFs need to have a register of residents who take medications which may potentially be affected by extreme heat / dehydration or over-hydration.
- Where possible the development and maintenance of transfer packs for residents should be considered.

- Thermometers which monitor internal facility temperatures should be mandatory and located in various parts of the facility, particularly in multi-storey facilities. These thermometers should be separate from the temperature display on air conditioning units.
- Regular maintenance of cooling equipment is critical.

6.4 Clinical care

- Clinical care should follow the three key themes highlighted by clinical staff: cool, hydrate and monitor.
- Clinical staff need to be aware of the importance of caring for the elderly in periods of extreme heat – **even when air-conditioning is available and functional.**
- Clinical staff need to be aware of the signs of heat exhaustion in elderly residents – disorientation, confusion, lethargy.
- Strategies for the addition of extra staff for fluid rounds in very hot weather should be considered (volunteers, additional staff).

6.5 Adaptive capacity

- Incorporation of heatwave preparedness strategies into current ACF plans, policies or emergency planning will assist in adaptation to extreme heat.
- Raising awareness and knowledge of the effects of extreme heat will assist in the adaptation to heatwaves and minimise morbidity in older residents.
- Where possible sustainable options for cooling should be investigated. E.g. solar power, reflective paint, adequate ventilation.
- Back-up power generation is an effective way of minimising the impact of power failure during critical power load periods.
- Government subsidy of solar power and back-up power sources, and retro-fitting of ACF buildings would alleviate the costs to ACF providers, assist in maintain wellness to residents and reduce long term overall power load.

7. STUDY PUBLICATIONS

1. Wilson LA, Veitch C, Black DA, Hansen A, Ballesty A, Ng F. Caring for the elderly during heat-waves: A study of Aged Care Facilities in rural New South Wales, Australia Full paper accepted Rural Health Alliance Conference Adelaide (7 – 11th April 2013)
2. Ballesty A, Ng F, Wilson LA, Black DA, Veitch C, Hansen A. Computer Assisted Telephone Interviewing (CATI) in Healthcare Research: Benefits and Challenges (Submitted under review)
3. Black DA, Wilson LA, Veitch C, Hansen A. Caring for the elderly during heat-waves: A study of Aged Care Facilities in three Australian states (in final stages of preparation) (Submitted under review).

8. EVALUATION OF THE RESEARCH IMPACT



8.1 Interviews

The project has had an impact on heatwave awareness in aged care. The telephone interviews raised a number of issues for both clinical and administrative staff. Following the initial CATI interview many staff asked where they could obtain a copy of the ACF heatwave readiness assessment guidelines (Vic Health), so that they could be implemented in the ACF. Staff commented that they could think of ways additional adaptive strategies could be implemented in their ACF. In addition, some ACF staff highlighted potential weaknesses in their current systems and planning policies.

8.2 Publications

The publications that have eventuated from this project will have an impact on the aged care sector, and highlight the importance of heatwave knowledge, preparedness, planning and adaptation in an Australian, institutional aged care setting. The papers also highlight the differences between rural and urban sectors, and the challenges and difficulties faced by aged care service providers.

The publication that focuses on the benefits and challenges associated with CATI interviewing is a contribution to the methodological literature and as such provides a broad overview and detailed investigation into the process of CATI interviewing. This technique is increasingly used for healthcare research and is integral in large scale geographically dispersed data collection settings.

8.3 Project Benefit

Benefits associated with the project can be categorised as short term and long term. Short-term benefits include the local increase in heatwave awareness, particularly as we are now moving into a summer season.

Longer-term benefits include the development of a consistent State-wide (or potentially Nationwide) ACF Heatwave Policy /Guideline/Protocol which will assist in maintaining wellness in an elderly population who reside in ACFs. Additional long-term benefits include the development of an educational resource for aged care service providers and staff, heightened awareness of sustainable options for power delivery and building design and positive impact on ACF resident wellness and staff workplace safety.

9. GAPS AND FUTURE RESEARCH DIRECTIONS

This research has highlighted the gaps in heatwave knowledge and policy in the aged care sector in three Australian states. Conversely, the research study has also highlighted the considerable strategies and planning for heatwaves already in place in some states and in some aged care facilities.

Of note, many of the ACFs enrolled in the study wanted more information following participation in the study survey, and commented that participation had raised their awareness of strategies they could plan and implement. It is possible that this would be the case for those ACFs who did not respond because they felt they were not in a position to respond favourably to such a survey on Heat-Readiness.

One of the gaps most evident was that of consistent heatwave knowledge in aged care provider staff. Based on this finding, and the importance of the consistency of clinical care during periods of extreme heat future research should focus on the collaborative development, implementation and evaluation of an National Aged Care Provider HeatReady educational resource. Based on the research findings that communication with families of aged care residents is an issue, future collaborative research should focus on ways to identify the best methods of communicating heatwave risk to staff and families of aged care residents.

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APPENDICES

Appendix 1 CATI Interview Questions

HEATWAVE CHECKLIST FOR AGED CARE FACILITIES

Name of Organisation: _____ Facility Code _____
Person Conducting Questionnaire: _____ Number of Beds _____
Staff Questionnaire: _____ Care Level _____ HD _____ LD _____
Date: _____ Location _____ Suburb _____ State _____
(Metro/Rural)

Policies, procedures and protocols

- 1) Does your service have a heatwave policy in place?
Yes No
- 2) If yes are the policies available to staff?
Yes No
- 3) Does your ACF have a plan to implement during a heatwave?
Yes No
- 4) Has your service ever completed a self assessment to check key organisational processes related to managing extreme heat are in place?
Yes No
- 5) Do you have annual in-service training?
Yes No
- 6) If yes, does it include care of residents and staff during periods of extreme heat?
Yes No
- 7) Are there processes in place for communicating the policies and procedures to all staff, residents and their families?
Yes No
- 8) Does your service have monitoring processes in place during the warmer weather to confirm procedures are being implemented?
Yes No

COMMUNICATION

- 1) Does your service have a plan for communicating the details of an extreme hot weather forecast to all staff?
Yes No
- 2) Does your service have a plan for communicating the details of an extreme hot weather forecast to residents and their families?
Yes No

RESIDENTS CARE NEEDS

- 1) Do you assess individual patients for risk of heat related illnesses?
Yes No
- 2) Does the healthcare assessment process include consideration of the risks and prevention of dehydration?
Yes No
- 3) Does service have protocols to monitor and provide additional care and support for residents identified at most risk of heat related effects?
Yes No
- 4) Do residents care plans include instructions on what to do if they become unwell if they have been identified at risk of heat effects?
Yes No

- 5) Does your service have processes in place to consult with general practitioners and pharmacists regarding the use of resident's medication during periods of extreme hot weather?

Yes No

COMMUNICATION

- 1) Does your service have processes in place to ensure preparations and requirements for planning and responding to periods of extreme heat are effectively communicated between the management, nursing and care staff, residents and their families?

Yes No

- 2) Are the communication processes between management and care staff adequate to explain what is needed when additional actions are needed?

Yes No

FOOD AND DRINKS

- 1) Does your service have processes in place for increased availability of cool drinks for residents and staff during periods of extreme heat?

Yes No

ACTIVITIES

- 1) Is the activities programme adjusted for hot weather events particularly outdoor events?

Yes No

STAFF

- 1) Does your service undertake a training needs analysis and provide relevant training so that staff are well prepared to manage and respond during periods of extreme heat?

Yes No

- 2) Have you undertaken a training needs analysis?

Yes No

- 3) Does your service training plan include cyclical seasonal needs?

Yes No

- 4) Does your service have plans in place to ensure sufficient staff are available during periods of extreme heat?

Yes No

- 5) Does your orientation for agency/temporary staff include heat management?

Yes No

- 6) Have all staff attended training so they are skilled to perform their duties in extreme heat?

Yes No

- 7) Are all staff in the facility orientated to facility policies regarding hydrating the residents?

Yes No

- 8) Are all staff orientated to local policies and procedures regarding cooling?

Yes No

- 9) Are all staff orientated to the facility policies regarding relocation and emergency evacuation preparedness?

Yes No

- 10) Are all staff orientated to the facility policies regarding operation of equipment including air conditioners, fans refrigerators and room thermometers?

Yes No

ENVIRONMENT

- 1) Have you ever completed an environmental assessment of the facility that considers shade, air conditioning, power supply and generation, water-cooling and insulation?
Yes No
- 2) How many storeys in your building?
- 3) Is the facility designed to provide a cool environment in the residents' rooms and communal rooms?
Yes No
- 4) Can all windows be shaded on the inside of the building?
Yes No
- 5) Can all windows be shaded on the outside of the building?
Yes No
- 6) Can all windows be opened?
Yes No
- 7) Do you have solar panels?
Yes No
- 8) What type of roof do you have?
Tiles Steel/Aluminium Other
- 9) Is it flat or pitched?
Flat Pitched
- 10) Do you have reflective paint on your roof?
Yes No

TEMPERATURE PROFILE

- 1) Has an assessment of the temperature profile of the facility been conducted, with particular attention paid to identifying the parts of the building that are cooler or warmer?
Yes No
- 2) Have you ever tested the temperature in different parts of the building?
Yes No
- 3) Has a cool part of the facility been identified that could be used as a cool shelter in the event of power failure and or loss of air-conditioning?
Yes No

AIR CONDITIONING

- 1) Do you have air conditioning?
Yes No
- 2) If not what cooling processes do you use?
- 3) Are there sufficient air conditioning units to properly provide a cool environment in all parts of the facility, including common rooms and bedrooms?
Yes No
- 4) Is there a maintenance programme in place to maintain the air-conditioning equipment?
Yes No
- 5) Is all air-conditioning equipment currently operating effectively?
Yes No
- 6) When the air-conditioning operates at full capacity does it provide sufficient cooling?
Yes No
- 7) If additional air-conditioning is being purchased or upgraded will it be ready in time for summer?

- 8) Yes No
- 9) Are all staff familiar with and able to use the air-conditioning equipment?
Yes No
- 10) Are there emergency provisions and back-up systems in case of air-conditioning equipment failure?
Yes No
- 11) In the event of equipment failure what action would you take?
- 12) Are the air-conditioning equipment displays and controls working properly?
Yes No

FANS

- 1) Are any fans used during periods of hot weather in the facility?
Yes No
If yes- (I) What types?
(II) Do staff know where they are and how to operate them?
Yes No
- 2) Do residents have fans in their rooms?
Yes No
- 3) If yes, are they regularly tested/ maintained?
Yes No
- 4) Are staff aware and do they understand the limitations of fans during hot weather?
Yes No

REFRIGERATORS AND FREEZERS

- 1) Is there a daily check record of temperatures in food and medication refrigerators?
Yes No
- 2) If the refrigerators and freezers were required to operate at full capacity during very hot weather would they be able to keep all the required items at an appropriate temperature including medications, drinks and food for residents and staff?
Yes No
- 3) Are there emergency provisions and back up systems in place in case of refrigeration failure?
Yes No
If so, what are they?
- 4) Are all the refrigerator and freezer displays and controls working properly?
Yes No

THERMOMETERS

- 1) Are reliable easy to read thermometers placed in locations within the facility to allow regular monitoring of the temperature of areas inhabited by residents and staff?
Yes No

SUPPLIES

- 1) Has an inventory of essential and emergency supplies been completed for food, drinks linen, residents care and hygiene requirements prior to summer?
Yes No
- 2) Do you have transfer packs with supplies in the event of an emergency?
Yes No
- 3) On very hot days (above 31 Degrees Celsius) what actions do you take?
- 4) Can you tell me why the elderly are higher risk in periods of extreme temperatures?

- 5) How do you think you could improve things for residents and staff in your facility?
- 6) Do you know how to contact technical support/services if you needed them during a period of extreme heat?
Yes No

Thank You.....

ADDITIONAL QUESTIONS

- Have you ever noticed any changes in the physical symptoms or the condition of patients during periods of extreme heat?
 - If yes, please describe
- In your own words can you describe how extreme heat affects the health of older people
- What do you think is the most effective strategy to keep older people cool in extremely hot weather
- Speaking personally, how do you keep cool during extremely hot weather
- The NSW Health department recently released a new information booklet called 'Beat the Heat – Health tips for a safe season' have you sighted this yet

Appendix 2: Paper 1

Caring for the elderly during heat-waves: A study of Aged Care Facilities in rural New South Wales, Australia.

Wilson LA, Veitch C, Black DA, Hansen A, Ballesty A, Ng F.

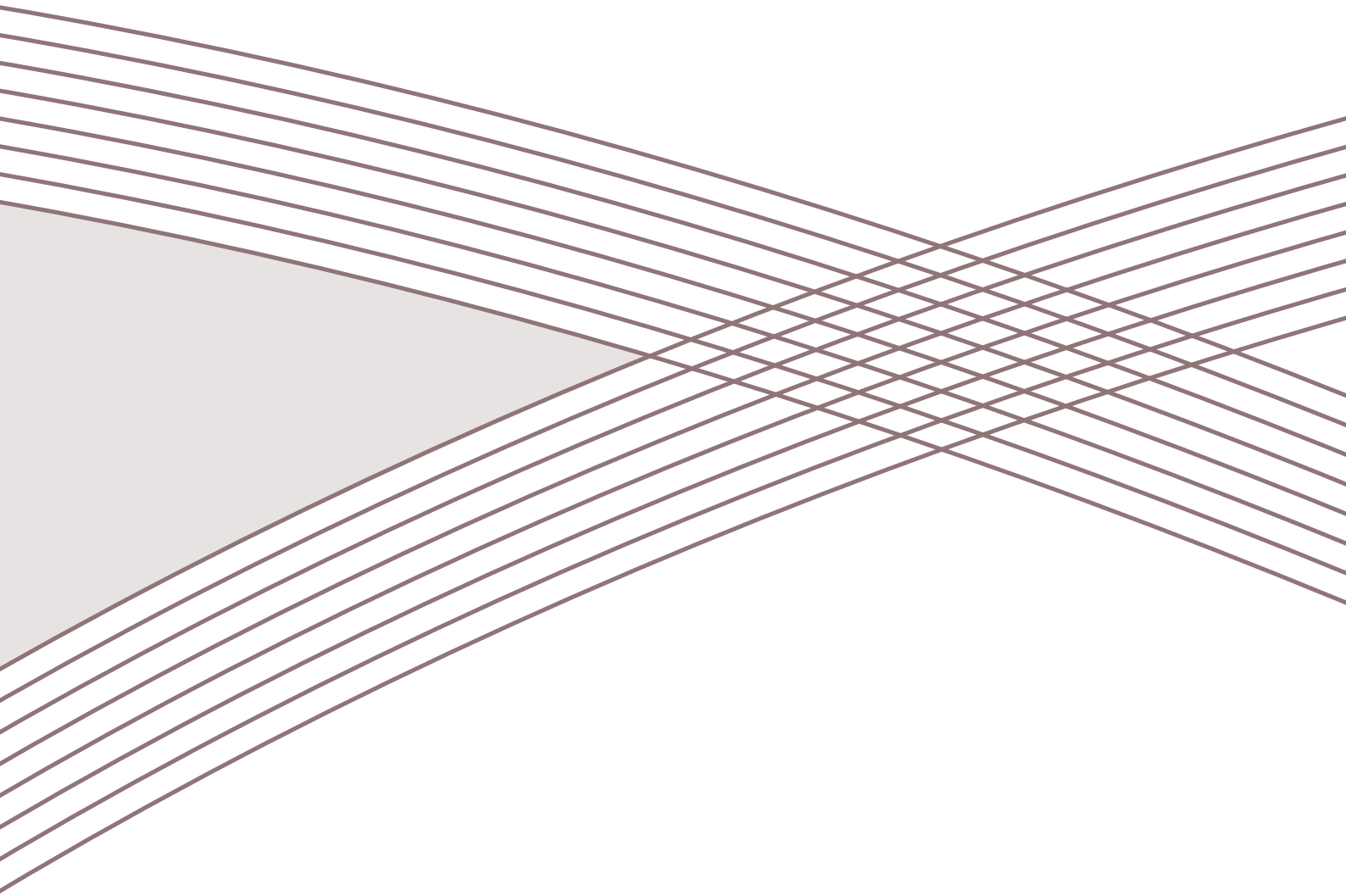
Published in the Proceedings of the Australian Rural Health Alliance Conference Adelaide 2013

Appendix 3: Paper 2

Computer Assisted Telephone Interviewing (CATI) in Healthcare Research: Benefits and Challenges.

Ballesty A, Ng F, Wilson LA, Black DA, Veitch C, Hansen A.

(Submitted under review)



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