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## **Responses of Migrant Communities to Extreme Heat in South Australia: A Case study in the City of Port Adelaide Enfield**

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### **Abstract**

Extreme heat is already a threat to South Australians – especially to culturally and linguistically diverse (CALD) migrants who are overseas born and brought up. The IPCC and other Australian and international research evidences have predicted more frequent hot extremes in Southern Australia that could pose a serious health risk for the disadvantaged minority communities because of demographic, economic and socio-cultural factors. In this context, some CALD migrants (e.g. Bangladeshi, Bhutanese and Sudanese) are thought to be vulnerable to heat due to their previous demographic, social and cultural orientations. To reduce vulnerability and increase adaptive response capacity, it is important to study behaviours and responses of the CALD communities to heatwave. This paper focuses on their efforts to adapt to hostile climate. The key aim of the study is to appreciate response enablers and barriers of CALD migrants to extreme heat.

A preliminary qualitative study was conducted with CALD migrants in the City of Port Adelaide Enfield area involving one focus group discussion and two interviews including seven participants from three different communities. Using thematic analysis, the key barriers of CALD communities to heatwave are identified as lack of English proficiency, acclimatisation, power costs, poor quality housing, and lack of heat-friendly housing whereas the enablers are marked as their individual adaptive capacity and strong community networks. These early findings suggest introducing heatwave financial support and adopting heat-friendly culturally appropriate sustainable housing projects for the low-income members would assist in adaptation to heatwaves. It would be beneficial to continue this preliminary case study with additional interviewees to develop a multilingual heat-health warning system, and design a heatwave awareness programme.

### **Keywords**

heat; CALD communities; vulnerability; climate change; response and barriers; City of Port Adelaide Enfield

## **Introduction**

The length, frequency, and intensity of heat waves have increased globally, and will continue to increase (IPCC 2012, 2014). In this context, extreme heat is a threat to South Australian communities and it may impact on community-health and well-being at increased rate. Heatwaves have potential to kill more people annually on average than any other weather disasters yet public attention is less focused on the potential impacts of heat because of its less prominent impacts on the wider communities (Carlson, 2008). Fourth and Fifth assessment reports of the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2007, 2012 and 2014) have indicated that communities with limited adaptive capacity are particularly at risk from weather extremes, for instance, heatwaves as a consequence of unequal distribution of human, social, natural, physical and financial capital across the society. Besides, adaptive capacity of a particular community to heat can be decreased by demographic, economic, social, psychological and technological reasons (NCCARP, 2011). Moreover, adaptive capacity is affected by vulnerability which may be dependent on the local characteristics of communities and populations such as economic well-being and inequality, and other social factors (IPCC, 2012; Brooks *et al.* 2005). Furthermore, the degree of suffering depends on their cultural and social adaptive behaviours (O'Neill and Ebi, 2009). Exploring the responses and behaviours of communities during hot weather, many studies (e.g. Fothergill *et al.* 1999) in the US argue that particularly racial and ethnic communities are more vulnerable and at great risk to heat waves than the mainstream communities. Other evidence suggests that migrants and ethnic minorities are heat-related vulnerable populations (Cheng and Newbold, 2010). Other findings also suggest that groups with low socioeconomic status are increasingly at risks (Basu, 2009; Department of Health, Victoria 2011) as comfort during heatwaves depends on income, costs of utility and other economic factors (Semenza *et al.* 1999). For example, 72% of the victims of the 1999 Chicago heatwave had incomes below \$10,000 p.a. (Naughton *et al.* 2002), and in the catastrophic 1980 heatwave in Saint Louis and Kansas City, low-income groups suffered more than high income groups (Jones *et al.* 1982). Generally, renters, recent immigrants, residents dependent on state support, migrant workers, women, young children, and the elderly and non-English speaking people are considered vulnerable to climatic hazard (Enarson 2007).

The above evidences raise emerging concerns about CALD communities and their vulnerabilities to heat in South Australia who are mostly overseas born with non-English cultural background (Health Department of Western Australia, 2005), different health characteristics (Australian Institute of Health and Welfare, 2012), religious beliefs, socioeconomic challenges, social relationships, environmental factors and health perceptions as they include a range of ethnic groups, migrants,

new communities, refugees and asylum seekers (Emergency Management Australia 2007). It is evidenced that particularly new migrants in South Australia, under refugee-humanitarian category, have low incomes, high unemployment, low levels accommodation and are overrepresented among the disadvantaged population (Hugo *et al.* 2011). In this perspective, migrants in the CALD communities of South Australia may face many challenges in the increasing number of heatwaves which may cause additional social and economic stresses due to many reasons such as lack of local language and culture, inadequate knowledge of the available services and unfamiliarity with the local environment (Sevoyan *et al.* 2013). Obviously this issue is not only significant for South Australia, since heatwaves are believed to be the effects of climate change, it is both regional and global concern.

In these circumstances, it is important to know about responses and behaviours of migrants in the CALD communities to extreme heat for equity issues. Recent heatwave scenarios and events in South Australia and the impacts on communities set out the rationale and evidence for the research. Before developing a community-based planned adaptation process to heatwave, understanding the real barriers and enablers of the CALD communities and their associated responses is necessary because underlying vulnerability factors and causes of reduced capacity are important. Hence, research is needed to investigate the underlying socio-demographical, socio-economical and socio-cultural reasons behind their difficulties to respond to heatwave effectively.

The key aim of the study is to explore responses and behaviours of the CALD communities to extreme heat by using thematic approach. Aligned with the key aim, the objectives are to find the difficulties faced by the CALD communities, discover their awareness about preventive measures and examine their perceptions regarding climate change and its impacts on them.

After surveying the literature, the following research questions were adopted:

- (1) What are the factors that influence the CALD communities to coping with extreme heat?
- (2) What are the enablers and barriers responding to heatwave?
- (3) How they cope and interact with heatwave and
- (4) What support they need to adapt with extreme heat?

From our best of knowledge, this is the first study in a local council area to investigate the responses of 3 CALD communities to extreme heat events.

#### *Recent impacts of extreme heat in South Australia*

Recent heat waves in the South Australian capital city of Adelaide were severe during the period of 2008 and 2009. In 2008, Adelaide had 15 consecutive days of 35 ° C or more and 13 consecutive days of 37.8 ° C or above. In 2009, Adelaide

experienced the highest 45.7 °C and the warmest night on record only down to 33.9 °C. The daily maximum temperature was 12-15 °C above the normal (maximum 26.71 °C and minimum 12.20 °C which have been calculated from 30 year mean during the period 1961- 1990) over the consecutive five days of 27 -31 January 2009 (National Climate Centre 2008 & 2009). In Adelaide, these recent temperature trends which can be visualised from the following graph, have likely crossed limits of communities' coping capacity in general as evidenced by the fact that 33% increases in ischemic heart (Incidence Rate Ratio, 1.33; 95% confidence Interval, 0.99-1.80) and 37% increases in total mortality (Incidence Rate Ratio 1.37, 95% confidence Interval, 1.09-1.71) were seen in the 15-64 age groups during the 2009 heat wave whereas older age groups were unaffected (Nitschke *et al.* 2011).

Studies in the major cities of the United States and Europe show that the mortality rate is largely influenced by heat index (Basu and Samet , 2002) for instance in the United States, extreme heat accounts for the largest cause of mortality followed by hurricanes and tornadoes (NWS, 2013). In 2003, heatwaves claimed 15000 lives in France (Fouillet *et al.* 2006) and led to about 70,000 deaths in 16 European countries (Robine *et al.* 2008).

#### *Extreme heat and causes of vulnerabilities of CALD communities*

Some studies (e.g. Lindley *et al.* 2011) hint indicate that the effects of high temperature may not be the same on the different individuals or community groups for different conversion factors like personal, environmental and social conversion factors which determine how positive and negative events are converted into gains and losses in well-being. The key vulnerability factors including age, socio-economic status, ethnicity, English proficiency and relative acclimatisation to hot weather impact on the vulnerability of CALD groups in adapting to extreme heat (Luber&McGeehin 2008; Cheng and Newbold, 2010). Moreover, lack of access to adaptation options for lack of skills, may create vulnerability to migrant groups (Eriksen & Kelly, 2007). Heat impacts can reinforce existing vulnerabilities of migrants by creating new health risks (increased mortality) and reducing livelihood options (Christoplos *et al.* 2009). Within the CALD communities, many in new and emerging communities have high blood pressure, mental health problems including grief and loss issues, kidney problems, multiple chronic illnesses and nutritional deficiencies which may create some difficulties in sweating and regulating body temperature and may also affect an individual's ability to keep cool during extreme heat (Hansen *et al.* 2014, Semenza *et al.* 1999). Older people in the CALD communities who lack English proficiency skills may be doubly at risk because it can exacerbate isolation and deter them from accessing to useful preventive information. Lack of physiological and behavioural acclimatisation of humanitarian entrants and older migrants to local conditions can influence mortality risk (Knowlton *et al.* 2009) and can be a factor of heat-related deaths in Australia ( Green *et al.* 2001).

Some of the CALD community members' homes are old without any air conditioning and insulation that may limit their adaptive capacity to heatwave compared to mainstream community. Besides, social factors like low socio-economic status, unemployment, financial hardship, lack of driving skills may be responsible for social exclusion of some CALD group members particularly asylum seekers and new arrivals and this social exclusion may increase their social vulnerability as well as reduce adaptive capacity to the impact of extreme weather (Hansen *et al.* 2014, Sevoyan *et al.* 2013).

## **Methodology**

A qualitative methodology was chosen because of its ability to describe and explain a person's experiences, behaviours, interactions within the context of social, cultural and political factors in the issue (Strauss and Corbin 1990; National Health and Medical Research Council 1995). Qualitative methods are participant-friendly (Popay *et al.* 1998) and flexible and can help the researcher to attain insight to the person's subjective meaning, actions and context with respect to any suitable theme related to the research questions, as well as uncovering any new theme. As the interactions and the responses of the CALD communities to heat are multi-dimensional, thematic analysis was used to discover the subtle barriers and drivers that can influence individual and community vulnerability and resilience respectively. Different themes were selected to capture these ideas in relation to the research questions. The central theme was the response issues (the enablers and barriers) of the three different CALD communities and the other peripheral themes which were demographic, socio-economic and environmental factors.

### *Framework of the qualitative study*

Two-fold strategic targets were addressed such as setting a way of reaching the target communities and developing an interview topic guide. Community organisations and some secondary contacts were used to enlist the participants. An interview topic guide was developed in keeping with the aims of the study. The qualitative research approach comprised of interviewing, analysing, synthesising and report writing. Interviewing included sampling and organising the participants and preparing the interview guide. Transcript preparation and recorded data analysis were part of the analysing phase.

### *Sampling*

Snowball sampling was used in this study as it was difficult to access or approach the target groups. A convenient (with time and availability) sample of CALD group members was selected as the participants of the focus group discussion and interviews. Three different communities were chosen: Bangladeshi, Bhutanese and Sudanese. Five Bangladeshi community members took part in the focus group discussion. One Bhutanese and one Sudanese community members participated in

individual interviews. Respondents were from different backgrounds such as skilled migrants, refugees and long-time resident in South Australia as shown in Table- 1. The residential period of the participants varied from 1.5 to 40 years in South Australia.

Participants were sampled from the City of Port Adelaide Enfield due to its socio-cultural and socio-economically diverse population (City of Port Adelaide Enfield 2011). A high proportion of CALD groups with refugee and humanitarian backgrounds live in Port Adelaide Enfield with 26.2% of its residents being overseas born, while 29% speak languages other than English at home; 4% higher than the national average (City of Port Adelaide Enfield 2011 and 2008, Australian Institute of Health and Welfare 2010) . The Bangladeshi community participants were approached through community organisations. The organisations conveyed the message to their members and interested persons communicated directly to participate voluntarily. The Bhutanese and Sudanese community participants were recruited through a secondary contact. All respondents were assured of confidentiality and anonymity.

Table 1: Participants' characteristics

<b>Name of the community</b>	<b>Number of participants</b>	<b>Male</b>	<b>Female</b>	<b>Background</b>	<b>Type of conversation</b>
Bangladeshi community	5	3 1	- 1	Skilled migrants  Long-time residents in South Australia	Focus group
Bhutanese community	1	1	-	Refugee	Individual interview
Sudanese community	1	1	-	Refugee	Individual interview

### *Data collection and analysis*

Data were collected during the period of August 2012 to September 2012. Three meetings were held in three different places. A focus group discussion of 50 minutes was held in the meeting room of the Port Adelaide Enfield City Council library. One interview of 25 minutes was held at a respondent's workplace and one at the School of Public Health, University of Adelaide, for 40 minutes. Before starting the discussion and interview, every participant was informed about the research objectives and provided written consent. The interviews consistently followed the interview topic guide which included open-ended simple questions.

Next, the participants were encouraged to explore their perceptions relevant to the research topic. They were given ample time to discuss their points of interest with clarity. The respondents revealed their perceptions about climate change and extreme climatic events spontaneously. The focus group discussion and the interviews were recorded digitally and transcribed verbatim into text and the speakers are de-identified. The transcribed data were compared to their audio part carefully to ensure accuracy. Note-taking and field-notes were also maintained for appropriate analysis.

## Results

In analysing the data set, four themes emerge, in accord with the research questions and the broader assumptions of the socio-demographic and socio-cultural differences from the mainstream of CALD community members. These themes are: (1) personal conversion factors (a variety of biological factors and associated factors like age, premedical conditions, and years lived in South Australia, local language proficiency, mobility and adaptive capacity), (2) socio-economic factors, (3) environmental factors and (4) response issues. The codes that are associated with the themes are shown in Table 2. The content of the codes is subjective and may often interlink and/or sometimes overlap with the identified themes.

Table 2. Identified codes with four main themes

<b>Personal conversion factors</b>	<b>Socio-economic factors</b>	<b>Environmental factors</b>	<b>Response issues</b>
Age	Poor quality housing	Housing characteristics	Enablers: community networks, heat-type, cold water supply, beach, adequate weather information, cool-built environment adaptive behaviour and community steps
Particular health condition	Income	Green space	
Years lived in South Australia	Price of electricity	Unfamiliar weather	Barriers: income, language, cultural factors, cool foods, shopping centre as cooling place, housing design, financial issues, solar rebate, community housing/ government housing, warning message barrier, community speakers on TV
English language	Financial issues	Elevation of residential building	
Preventive awareness	Socio-economic status		
Mobility	Poor communication		
Outdoor workplace	Community isolation		
Adaptive capacity			

## *Personal Conversion Factors*

Eight key personal conversion factors were identified as stated in the Table 2 which may impact on CALD migrants. Its impacts are described under 4 subthemes as follows:

### 1. Age and particular health condition

Children and aged people in the CALD groups are vulnerable to heat due to age factors which might limit their heat regulating mechanisms, and mobility compared to other age groups people. Besides, pregnant women and people with pre-medical conditions such as diabetes, hyper tension and other long term illnesses are also labelled as vulnerable for their reduced ability to keep cool during hot weather period. One respondent added *"I think, the effect of extreme heat... in the new country is basically borne by aged people..."* (Bhutanese community member) to highlight the degree of adversity experienced by older people in the migrant groups at extreme heat.

### 2. Length of stay in South Australia

Length of time as a resident in South Australia was appreciated as one of coping factors to get adapted with the highest maximum temperature like 43 ° C. A participant from Bangladeshi community expressed that although he felt too much hot when he first arrived in South Australia but after residing 3 years here, he has learned to cope with 40 ° C or more. Another CALD group member spoke of importance of residential time in South Australia in this way: *"... length of time is a factor, because we are still adapted where we come from, so we are on the process of adapting to the situation..."* (Sudanese community member).

### 3. English language proficiency

Lack of English proficiency, another personal conversion factor, can be a barrier for some CALD members to face hostile hot weather by limiting communication with neighbours and wider communities and barring access to any heat-related warnings and services. Sometimes the people having poor English proficiency do not show their interest in going to the cooled spaces like shopping centres to keep them cooler which may increase risks of mortality and morbidity. One respondent emphasised the language barrier with *"Language is the factor that doesn't encourage them to come out of the house"* (Bhutanese community member).

### 4. Adaptive capacity

Individual adaptive capacity of the CALD members depends on some factors like mobility, awareness of preventive actions and job types. Some community members particularly newly migrants had limited mobility as they did not own a car or lack driving skills that reduced their adaptive capacity to extreme heat. Referring this, one



respondent noted that some community members cannot go to cool places due to lack of driving skill. Unawareness of preventive actions that can protect heat adversity, for example, fluid intake to keep hydrated during hot weather, creates health issues including kidney stone, headaches and constipation to some community members. One participant described community ignorance about preventive actions: *“Our communities not, not all of them are fully aware of what needs to be done. For example, drinking adequate amount of water is very important in very hot weather and our people are not much very used to that one. So, that has been one issue, basically awareness thing...”* (Bhutanese community member).

The discussions also revealed that some outdoor strenuous jobs such as fruit and vegetable picking and road construction works during extra hot weather add extra heat- discomfort to the workers who are mostly from CALD backgrounds. Expressing feelings from personal experience, a participant supplemented, *“...when I work in the outdoor in the summer 41/42 degree temperature ... I feel very uncomfortable still”* (Bangladeshi community member).

### *Socio-Economic Factors*

Six key factors were identified under this theme which are interlinked with the increase of vulnerability of the CALD communities during hot spells. These include housing quality, income, power costs, financial issues, low socio-economic status and social isolation. The influences of these factors to CALD members which limit their adaptation strength to settle in South Australia are presented under 3 subthemes:

#### 1. Low socio-economic status, electricity costs and housing

Narratives revealed that people from migrant groups particularly from refugee and humanitarian streams are often unable to gain employment due to poor educational attainment that creates financial disadvantage and curbs their capacity to face heatwave. A respondent from refugee background stated *“...many people are not educated... they don’t go out for jobs or schools, they stay at home because they don’t have enough money ...”* (Bhutanese community member).

Low socio-economic status can be linked with low income and low income is associated with poor housing. Low income earners also may not be able to pay extra electricity bills for air conditioning over an extended period of time during heat wave. One respondent spoke of their poor income which is *too less to manage the cost of air condition plus other expenses*. High cost of electricity consumption, again related to financial ability, was raised as a major barrier to air conditioner usage. The effect of electricity price was stated: *“...Now the electricity price is going too high and every night if we turn on our air conditioner, we have to think... to cut down air condition timing.”* (Bangladeshi Community member). Families with low- income in

the CALD groups are likely to be over-represented in the low-quality rental housing having *no fan, and no air conditioner*. Most respondents mentioned that tenants of houses with poor ventilation and little investment in energy efficiency are likely to be the most affected by the warming climate.

## 2. Social exclusion

It was revealed that strong social and family connections prevail in the CALD communities, however, poor English, financial issues, mobility and other related factors can lead to individuals or families becoming socially excluded. One participant expressed his views about isolation, “... *they have no language, and they can't go out and go to the shade, and go to the park.t. So they have to stay indoors...*” (Bhutanese community member). Moving to cool places during heatwave might be associated with costing such as fuel cost and transport fare, and this costing may discourage the community members with economic exclusion. In the context of older people, one respondent expressed his confidence that clustered living of CALD communities may reduce their (older people's) vulnerability to hot weather periods by sharing feelings with intra-community neighbours and was pleased: “*I think...at least the older people now have some access to another older person with clustered living in small scale.*” (Bhutanese Community member).

## 3. Environmental Factors

Respondents discussed the issues including housing characteristics, physical attributes of the neighbourhood such as amount of green space, and unfamiliarity with South Australian heat under this theme. The 3 subthemes under Environmental factors are described as follows:

### 4. Housing characteristics

The location, type and quality of housing can influence extreme heat impacts on general as well as CALD community members. Housing near the beach may be comparatively cooler with respect to other locations but it is beyond the affordability of most of the CALD members for their low socio- economic status. One respondent pointed out about reducing heat impacts: “*it depends on where you live to get a cool breeze that takes the temperature down at least by 10....*” (Bangladeshi community member).

The building materials have influence on extreme temperature controlling such as “*solid brick houses, double brick houses, they keep much cooler in summer than modern brick big houses.*” Identifying the shortcomings of the present building design principles which are not mostly hot weather-friendly, one participant suggested, “*...the way the houses are built, they need to put some sort of things that will protect heat...*” (Sudanese Community member).

Elevation of residential buildings may cause increased vulnerability to heat as top floor of the building gets warmer than that of the ground floor. Regarding this, one participant suggested, the authority needs to take steps for the people who live on the top floor of the building because *“if heat gets straight into the room and then there is no way can go”* (Sudanese community member).

#### 5. Green space

The discussion explored that green space in front of the houses can reduce the temperature gradient between inside and outside during extreme heat. One respondent described his own experience about natural cooling, *“ ... if you have a very large tree, couple of trees in front of your house..., it keeps ...,the temperature down at least by 10”*. (Bangladeshi Community member).

#### 6. Unfamiliar heat

Most respondents agreed that the type of heat in South Australia is somehow different from that of their country of origin, because of *“dry heat”*, they do not sweat and feel thirsty which creates health sufferings, for example, *“urine infection*. Particularly newly arrived migrants face this heat acutely due to unfamiliarity as *“... the heat, the type of heat in Australia, in South Australia is quite different from the heat in Nepal and Bhutan...”* (Bhutanese Community member). In contrast, one respondent expressed his good feelings with this dry heat: *“Actually I feel better than my country..., here I don’t sweat... it is very comfortable”* (Bangladeshi community member) which is just an individual physiological difference.

#### Response Issues

Issues raised through the CALD community members can be divided into two groups: enablers and barriers, as shown in Table 2. Enablers may include community network, cold water supply, beach access, adequate weather information, cool built environment and adaptable behavioural pattern. On the other hand, key barriers may include low income, lack of English proficiency, poor rental housing, cultural factors and lack of access to heat warning services. The enabler and barriers of the CALD communities to heatwave and some suggestions from the respondents are described in the following Tables 3, 4 & 5:

Table 3. Key enablers contributing to increase adaptive capacity to extreme heat in South Australia

Issues	Impacts on CALD communities
Community network	Most participants spoke of well-connected strong community networks in CALD communities which may be helpful to deal with heat as <i>“it’s easier for us to create awareness among community...”</i> (Bhutanese Community member).

Cold water supply and beach access	Availability of cold water supply in the houses and beaches in South Australia are supportive to reduce heat impacts in this way: <i>“When we feel very hot, then we just feel like having more water or fluid at the same time, getting two -three times bath in a day that becomes us happy...”</i> (Bangladeshi Community member).
Adequate weather information	Respondents spoke of adequate weather information regarding heat warning messages from the Australian media which helps them to take preparation against heatwave even getting <i>“every individual suburb’s climate update, every hour basis”</i>
Highly adaptable behaviour	Strong commitment to settle in South Australia makes most CALD members highly adaptable to hostile heat: <i>“We have made the choice to come to Australia and we have to live with it...”</i> (Bhutanese Community member).
Initiatives	<i>“We are planning to reduce the heat of our houses by making our investment slowly, like – we put the solar panel, so that we can use more fans frequently.”</i> (Bhutanese Community member).

Table 4. Key barriers contributing to increase vulnerability to extreme heat in South Australia

Issues	Barriers
Low income	A barrier to pay electricity bill, rent heat-friendly housing, install air conditioning in living places and pay cost of fluids that may decrease response capacity of the CALD community to heat. <i>“If you can’t actually turn on your air conditioner, how you can cope?”</i> (Bangladeshi community member).
Language barriers and low literacy	Most respondents spoke of language barrier that lacks some community members’ access to warning information on extreme weather events from the media, including TV and Radio news. They have to depend on their children for understanding of warning messages.
Cultural factors	Cultural factors such as sleeping patterns, mealtimes, foods and dresses are seen as barriers for families adjusting to heatwaves: <i>“My wife and then my baby, they can’t sleep in standard hour; ... In our country most of the lady, everybody, is used to very covering dresses and then head covers and the full sleeves...”</i> (Bangladeshi Community member).  Some CALD communities believe half-shorts are poor people’s dress that are commonly used for summer dress. Lack of cultural practices like <i>“in Sudan, we use shadows and open places to keep cool but here if you don’t have some facilities, it becomes problem...”</i> (Sudanese

	community member).
Housing design	Design and size of houses may be barriers to respond heatwave as most of the renting houses are designed for 3 bed rooms which may not be sufficient for big families as some CALD community members are blessed with 5 or more children. <i>“... In our country the houses are very big and wide and most of the rooms have very wide ventilation!”</i> (Bangladeshi community member).
Unavailability of cool foods	Unavailability of some foods like tropical fruits and vegetables that may have potential to influence body temperature during hot weather period is recognised as response barrier to heat. <i>“...I try to search the cool food but that’s not like our country, that’s a problem to cope”</i> (Bangladeshi community member).

Table 5. Key suggestions from CALD community members contributing to address response barriers to extreme heat in South Australia

Issues	Suggestions
Reviewing housing design	<i>“...any accommodation, the housing has to be reviewed, ... the government has to put more investigation of houses that people are living in, whether they are heat-friendly for the people to live in”</i> (Sudanese Community member).
Subsidised electricity bills	Respondents suggested subsidised electricity bills for the low-income families to afford air conditioning during heatwave. <i>“Low income earners should get some subsidy in their electricity bill particularly”</i> (Bangladeshi community member). Rebates also need to install solar panel as well for affordability.
Newly arrived migrants	<i>“..If any migrants come in Australia in summer time, definitely should have it, they have (been) provided three to four months government housing which is fully equipped ...”</i> (Bangladeshi community member).
Community media	Community TVs and Radios can convey heat warning messages in different community languages along with English. Main stream media like ABC ( Australian Broadcasting Corporation) and SBS ( Special Broadcasting Service, Australia) can also engage community presenters to broadcast heat warning bulletins: <i>“...message go across but if you say that we have to stick to the mainstream language, we don’t know English, bad luck, I think”</i> (Sudanese community member).

## Discussion

All participants belong to CALD communities who are the residents of the City of Port Adelaide Enfield in South Australia. They entered Australia via different routes including skilled migration process, on humanitarian grounds or as postgraduate students. This qualitative study has flagged some new insights into response issues relating to housing characteristics, the adaptive capacity of the CALD group members and their strong community support links. The implications of extreme heat on the various CALD communities and their responses are accommodated within four broad-based themes. Many factors are subjective and overlap within the different themes, though the dimensions differ.

The responses validate previous research findings that age can influence heat-vulnerability, e.g. Flynn *et al.* (2005), while Kovats *et al.* (2004) found older people and small children may be more vulnerable to heat due to their comparatively weak thermoregulatory systems. Another evidence is, during the 1995 Chicago heatwave, 73% of the victims were over the age of 65 (Touleman and Barbieri, 2005) which supports age factor. It is suggested that the language barrier may be a significant barrier to coping with extreme weather events (McGeehin and Mirabelli, 2001) and similarly in the present study, it is apparent that due to limited English some CALD members did not receive warning messages from media during heatwaves.

Schuman (1972) pointed out that poor quality housing may increase morbidity and mortality during heatwaves. The present study finds that factors like housing characteristics, income, rising cost of electricity, poor access to air conditioning systems and socio-economic status influence the CALD community members' coping capacity. ARUP (2008) note that when residential buildings are not adapted to extreme weather conditions, heatwaves may cause discomfort and lead to disrupted sleep and loss of productivity (ARUP 2008). Other studies also have found that ventilation and window systems may cause heat-vulnerability (Vandentorren *et al.* 2006), while tree shading reduces surface temperature by 15-20 °C and the air temperature by 5-7 °C and can significantly improve human comfort (Ennos 2011). In Adelaide, South Australia, it has been observed that trees cool the ambient temperature by up to 10 °C.

Many studies show that residential air conditioning can be a strong protective factor against heat-related deaths (Son *et al.* 2012; Naughton *et al.* 2002). Inability to pay air-conditioning bills, low income and high energy costs reported by the South Australian CALD interviewees may reduce their adaptive capacity, as in the Chicago heatwave study when many of low socioeconomic status preferred enduring heat to incurring large bills for air conditioning (Klinenberg, 2003) leaving them at higher risk.

It is observed that people who live on the top floor of buildings are more vulnerable to heat because heat is easily transferred through thin roofs (McGeehin and Mirabelli 2001, Semenza *et al.* 1999). The South Australian findings concur with Lara *et al.* 2010 that people who work outdoors are commonly more exposed to heat and as a result, their vulnerability may increase. The research findings suggest that change of housing design can reduce present heat-vulnerability of the CALD groups. Incorporating the new design, houses can be protected from overheating by reducing heat gain through windows and through warming of external surfaces (ARUP 2008; CSE 2011; Porritt *et al.* 2010).

Apart from housing design, social and cultural contexts also play a significant role in perceiving and responding to heatwave (Tillett, 2011). The interviews and discussions with the participants suggest there is good communication within and between the Adelaide CALD communities of different nationalities. The results suggest that unfamiliar weather pattern and delayed acclimatisation can be a major barrier to adaptation to their new surroundings supporting the findings of Kalkstein (1993). Several participants proposed subsidised electricity bills for newly migrated low-income community members. This recommendation endorses policy that exists in some states of the United States: in 2007, 16 states initiated cooling related energy assistance programs (LIHEAP, 2008).

The language barrier is identified as a key barrier to adaptation to extreme heat for the Bhutanese and Sudanese community members, because most of them are settled here on humanitarian grounds and did not have the opportunity to learn English. A participant has suggested that community leaders or representatives could be invited onto community TV programs to convey the warning messages to their respective communities in their own language. This issue does not affect the Bangladeshi community as much, because most Bangladeshi community members migrate to Australia within the skilled migration process and studentship. Acclimatisation to the unfamiliar seasonal weather pattern in Southern Australia is the main issue for the Bangladeshi community, since they are habituated to a succession of six different seasons particularly a long rainy season and are unaccustomed to the dryness of the long hot South Australian summer...

The strength of this study is that the participants have been able to provide clear information about their personal experience regarding the research topic as well as they could articulate their perspectives on relevant issues (Morgan 1997, Krueger and Casey 2000). The sample, though small, recognises the distinct national, cultural and socioeconomic characteristics of the CALD communities interviewed in Adelaide. They are keen to contribute ideas to remedy a major difficulty they unexpectedly encountered upon arrival in their adopted home - the difficulties of coping with extreme heat. Along with the mainstream media, community leaders or representatives from a community could be invited by community TV programs to convey the warning messages to their respective communities in their own language.

One of the main limitations is that the study has been conducted in the month of August and September when it was mostly cool weather. As a heatwave may be unpleasant and hence a less than memorable event, it may recede quickly from the participants' collective memory (Carlson 2008). The study season may then affect the data input and conclusions - this view is reflected in many other studies, such as Banwell *et al.* (2012) and Abrahamson and Raine (2009). Another limitation is the time constraint, in this case 14 weeks. If more time would be available a larger number of CALD communities could be engaged for interviews and focus groups.

Availability of interested respondents is another constraint. Diversity restricts understanding the views precisely because sometimes it is difficult to recognise a range of English accents or dialects (Small *et al.* 1999). Snowball sampling process may have different drawbacks like bias sampling because of its non-random and non-heterogeneous characteristics and may influence the findings of the study. Thematic analysis is carried on with subjective meaning of the data; it may have various interpretations depending on the expectations of the researchers. The number of community respondents may be considered a limitation of the study. Three communities and seven participants may not be sufficient for generalisation of CALD communities in South Australia. A minimum three to four focus groups (Morgan 1997, Krueger and Casey 2000) with optimally five to ten individuals in each group (Krueger and Casey 2000) are recommended, -however useful indications can be obtained with fewer participants (McInnes and Ibrahim 2010)

The findings are important in many ways as it indicate useful indication for sustainable social adaptation planning and CALD community adaptation planning. This study attempted to understand the adaptation process of CALD communities to extreme heat. The results may help state and local authorities to explore the problems. Additionally, it can be the basis of conducting further research. This research has been conducted within limited range because of time constraint and unavailability of interested participants. To further explore the perceptions of new migrant communities, an optimal number of focus group discussions and interviews with increased size of samples would be needed.

## **Conclusions and recommendations**

Using a qualitative approach, this preliminary study has identified and explored some aspects of response enablers and barriers through discussions and interviews with a small number of representatives of three CALD communities to extreme heat events in the City of Port Adelaide Enfield, South Australia. The strong adaptive capacity of individuals and intra-community networks are seen as enablers, while the identified barriers are lack of English language, acclimatisation problems and the unaffordable costs of electricity. Some members of the CALD communities, particularly from refugee backgrounds, experience a language barrier to their access to heatwave information. Most newly arrived migrants experience suffering during heatwaves. The soaring price of electricity is a barrier for low-income members to maintain more



acceptable air conditions. Due to low socio-economic status some migrants have to live in cheap renting houses with poor ventilation, low ceilings, inefficient and ineffective insulation and window systems which may not be heat-friendly. This study has gathered some knowledge, perceptions and emotional responses of the respondent communities regarding their reactions to extreme heat events and climate change. Some proposals are recommended, such as introducing financial support for low-income members to meet extra costs of electricity and fluids, adopting culturally appropriate heat-friendly housing design and developing a heatwave health awareness programme. The findings are completely consistent with other national and international studies, but an expanded study with more participants from these and other culturally and socially diverse countries would possibly tap into additional and innovative strategies.

More comprehensive efforts are needed to gather response characteristics of other CALD communities to address extreme heat events effectively and efficiently. By taking some short- and long-term strategies, vulnerability of the CALD communities can be reduced.

In the light of the findings, we recommend the following some short- and long-term strategies to assist CALD communities to adapt to extreme heat (Table 6):

Table 6. Recommendations for the governments at different levels

<b>Type of strategies</b>	<b>Issues to be addressed</b>	<b>Implementing authority</b>
Short-term	Heatwave allowance to assist low-income CALD group members for gaining access to air conditioning and purchasing fluids	Federal government and State government (for concession power payments specifically during heatwave).
	Community media for broadcasting heat health warning messages in different community languages	State government & Federal government and Australian National Media with the help of CALD Community organisations
	'Cool Homes' initiative such as City of Melbourne (City of Melbourne 2012)	Local Government
	Culturally appropriate Education and Outreach programs for building awareness about heatwave preventive actions	State government and Local government
	Temporary heat-friendly accommodation for newly arrived migrants	Local government
Long-term	Initiating energy-efficient, weather-friendly, culturally appropriate	Local government with the financial assistance of Federal government

	<p>sustainable housing projects for the low-income CALD group members. Surrounded by green spaces, houses would be facilitated with solar panel, micro wind turbine and biogas for renewable energy generation. Besides, both mechanical and natural cooling systems with improved solar control ventilation, ground, evaporative and radiant cooling options might be incorporated. This would help to save energy costs, reduce carbon emissions and improve local microclimate.</p>	<p>and State government.</p>
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Effective engagement with the CALD communities to enhance their understanding of heatwave impacts and its preventive actions is required as part of both short and long term strategies. Community members can then learn to make their own heatwave plans and become more resilient and well-adapted to the climate of their new environment.

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