Communicating about heatwaves

RISK PERCEPTION, MESSAGE FATIGUE, AND THREAT NORMALISATION

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Executive Summary

I remember years ago, wasn't it, in Queensland or somewhere there were big bushfires and we saw a huge amount of people dying, we never had that kind of mass tragedy because of the heatwaves. (Male participant, 18, Playford)

Amongst the extant suite of natural hazards active in Australia, heatwaves are unique. Characterised as unusually high maximum and minimum temperatures over three of more days for a particular location (BOM, 2019), their definition is highly dependent on complex meteorological measurement that accounts for historical, normative temperatures in a particular place. Unlike bushfires and earthquakes, whose existence and impact are perceived as explicit and violent, heatwaves are passive, declared once a thermal set of conditions have been met. Moreover, heatwaves, especially 'low intensity' iterations, are a common feature of the Australian summer that most of the exposed population cope with without significant adverse health consequences.

At the same time, heatwaves have been christened a 'silent killer', chiefly because extreme heat interacts with pre-existing health problems and socio-economic conditions that place further stress on vulnerable populations. Morbidity and mortality occasioned by heatwaves is far harder to determine than deaths arising from, for example, bushfire and flooding. Media reporting on heatwaves also mutes its risk to health. More deaths have been attributed to heatwaves than any other natural hazard, yet the media do not often report the very real and tragic impacts they incur. This means that when communicating to the public about heatwave risk, and promoting protective behaviours, messaging is likely to compete with a spectrum of socially accepted discourses, or 'logics', that may or may not undermine or mediate their intended effect. Indeed, how individuals perceive risk is one of the strongest predictors of whether they will take protective action to a natural hazard.

Methods

Considering the potential challenges that heatwave communicators face in effectively disseminating messages and influencing behaviour, we undertook three independent but

interrelated studies: a survey with the South Australian public (n=416), lay public focus groups and interviews (n=63), and a critical national TV-news analysis (n=22). The studies investigated the following:

- The public perception of heatwave risk and personal vulnerability.
- How heatwave messaging, notwithstanding their source, were accepted and responded to.
- If, and in what way, the phenomenon of 'message fatigue' (becoming tired of repeated messages) was impacting heatwave communication.
- How TV-news reported on heatwaves, and the implications for risk communication.

Findings

- A majority of survey respondents did not perceive significant personal risk from heatwaves.
- Heatwave risk was recurrently made sense of in relation to whether respondents were responsible for vulnerable groups, such as young children, older people, or people with pre-existing health problems.
- Heatwave risk was also framed in relation to social, spatial and economic contexts of individuals - which included: access to quality, well-insulated housing and air-conditioning, and finances to run air-conditioning.
- Perceived risk was attenuated (reduced) because heatwaves were deemed 'controllable' through adaptation actions such as the use of air-conditioning.
- A large majority of survey respondents agreed that heatwaves messages were important to help 'other people' keep safe.
- A large majority of survey respondents understood current messages as holding redundant (already known) information. Yet, heatwave messages were interpreted to 'trigger', or remind, people to change behaviour.
- There is potential for conflating heatwave *and* bushfire warnings and preparedness information to leverage the salience (relevance) of heatwave messages.
- Most participants believed they held the capacity to cope with heatwaves into the (undefined) future.

- There is little evidence of classical message fatigue impacting heatwave communication.
- The TV-news analysis found that heat-health warnings were competing with imagery of beaches, beachgoers and waterways signifying enjoyment and potentially normalising and attenuating risk perception.
- Bushfire and drowning risk narratives recurrently competed with heatwaves messages for airtime and salience in stories.
- Reports regularly featured short interviews ('vox pops') with outdoor workers and people exercising in the heat, employing these as opportunities to add 'entertainment value' as per media norms and values.
- TV-news analysis found a relative paucity of heat-health warnings, narratives, and advice coupled with compelling vision. Only a handful of stories attempted to link abnormally high temperatures with adverse health outcomes. This was in stark contrast with bushfire stories, which used dramatic and emotive imagery and emotive personal accounts.

Implications for communication practice

From the best of our knowledge, no Australian research has explored heatwave risk perception and communication in this comprehensive way. The implications derived from these findings have import for current and future communication thinking. First and foremost, findings suggest that heatwave messages need to be formulated to chime with pervasive public discourses, or logics, on heatwaves. *These studies suggest that people conceive risk from heat in context, considering their present or future social and economic conditions to make judgements about their capacity to cope*. If one has access to resources that can be deployed to mitigate risk, perceived risk and vulnerability will be rationalised as low. Likewise, as our focus group respondents spoke to, people are all too aware of their vulnerability when they recognise that adaptation resources such as well insulated housing and air-conditioning is unavailable.

Thus, a social marketing approach to communication means that hard decisions are required to identify, prioritise and target audience segments that will bear the greatest

benefit from a targeted campaign. Although age has been used as a key demographic to identify vulnerability, and segment target audiences, we suggest that this criterion is too blunt and may be missing households who struggle with multiple and interlaced social vulnerabilities, including poor quality housing, living in 'hot spot' suburbs (urban heat islands caused by lack of vegetation), low SES, and health problems. A thorough evaluation of current messaging is required. In particular, a *sharpening of segmentation strategy will overcome issues of information redundancy, affording those most vulnerable with much needed support and information.*

Our findings strongly suggest that for a majority of the public, message fatigue is not being perceived in relation to heatwave warnings and messages. However, heatwave information is construed as redundant - as 'already known' knowledge that is not adding anything new to how individuals understand heatwaves and their adaptation options. Messaging is 'triggering' habitual behaviours yet does not appear to be offering new perspectives on coping with heat or challenging well-worn discourses - many of which are propagated through channels including TV-news. This represents an opportunity for communicators to *refashion messages to account for redundancy and provide new message frames that offer behavioural choices for individuals themselves, or for supporting other, potentially more vulnerable members of the public.*

TV-news is a key and putatively powerful heatwave communication channel, which provides a range of mediated messaging to the public. For the most part, our findings showed messaging was framed in accord with media norms and values, that rendered information as *infotainment*. Our data suggest that TV-news reporting is most likely contributing to information being met with scepticism and irritation. Heatwave stories are seen as sensationalised and misrepresenting the gravity of heatwave risk. Government health and emergency service communicators are faced with the challenge of their messages being subverted and *must find a way to communicate with individuals directly, to circumvent the influence of some media reporting.*

Our findings suggest that in a changing climate, where heatwaves are becoming longer, more spatially widespread, and extreme – especially increasing overnight minimums - tried and tested adaptive strategies will gradually become less effective or more expensive. A clear finding from the survey and qualitative phases was that the community is pervasively confident that current adaptions will serve them into the future. Communication efforts will, if they are to remain relevant, adjust messaging to accord with the lived experiences of the public in a capricious social, economic and environmental climate.

Introduction

The trouble with heatwaves

Communicating to the lay public about heatwaves and their risk is not an unequivocal activity. In part, this is because how information and warnings are received, evaluated and responded to is largely contingent on what people already 'know' about the hazard, its risk, and their perceived adaptive capacity and vulnerability (Joffe, 2003). Adding to this complexity, it would be fair to say that heatwaves are not always viewed as belonging to the same class of natural hazards, or associated with the same risk as say, cyclones, floods, bushfires, tsunamis and earthquakes. Ostensibly, this may be because 'heat', the key ingredient of heatwave risk, is a common and often benign phenomenon across Australia in summer. Further, 'heat' can exist independently of a heatwave. Unlike, for instance, bushfires, the extent of heat (on a temperature scale) is not either simply present or absent - rather, it is represented and experienced *in degrees,* on a scale. Heat, then, is part of everyday life until, of course, it reaches a threshold where it is deemed a 'hazard'. Hence, heatwaves are not self-evident - they cannot be classified without careful, situated, meteorological measurement and then proclaimed by an official meteorology service. Other natural hazards and emergencies are far less reliant on scientific measurement - their existence is explicit, or 'common sense'. In this way, heatwave 'risk' is heavily reliant on social and scientific processes for its definition. This, we contend, renders heatwave communication as a 'wicked' communication problem.

Further, when contrasted with other natural hazards such as cyclone, bushfire and flood, heatwaves are directly experienced by a large percentage of the Australian population far more frequently. Humans are proficient at classifying and ordering perceived risks and determining their vulnerability. A large body of psychometric risk perception literature has shown that less frequent (probabilistic), yet dramatic risks, are more likely to be perceived as risky than hazards confronted on a regular basis,

such as driving a car (Slovic, 2016). One's sense of 'vulnerability' to a 'normalised' risk, one that has been experienced and adapted to over many years, will, putatively, be judged as presenting a lower risk than one that is extraordinary.

Adding to these many and significant problems of perception is the inherent challenge in fashioning compelling, emotive, and evocative 'representations' (systems of images, symbols, discourses, motifs) of heatwaves. Effective risk communication is partially dependent on using collectively shared representations to help people make sense of a hazard, its risk, and potential adaptations (Castorialdis, 1975). Meaning is gleaned through risk imagery we see on the news, as part of warnings, and through our language and conversations. Heatwaves, then, are problematic in so far as they are difficult to represent in a way that effectively communicates the potential threat they hold and, thus, the need for adaptive behaviour. Bushfires, on the other hand, are adeptly represented through imagery of fire and smoke and the trail of devastation they leave behind - the chief components of the hazard. In sum, communicating about heatwaves is made more difficult because it is inherently an *abstract risk*.

Although heatwaves may have claimed many more lives in Australia than any other natural hazard, they do not elicit the same kind of perception and response that bushfires and other comparatively more dramatic hazards do. The trouble with heatwaves, then, is in part a conceptual, cultural, and historical one. This hazard has been experienced by most Australians, and most people have, over many years, been able to adapt to its threat and manage its risk. Through these experiences, arguably, heatwaves have been rendered a 'normal' hazard. Indeed, Australians have long conceived long hot summers as *a climatic norm* and, of course, a facet of our culture, represented and sometimes celebrated in poetry, novels, film, and summer sports. Extreme heat and summers are interwoven and imbedded in the Australian consciousness, synonymous with Christmas school holidays, family road-trips, beaches, pools and rivers. Bushfires, conversely, are rarely signified in this way. They lend themselves to dramatization, which increases their memorability and therefore perceived risk (Kasperson et al., 1988).

Extreme heat is also a part of *place* (Williams et al., 2017). Place identity (Devine-Wright, 2013) refers to the positive, emotional and behavioural bonds between a person and a physical place, which can be linked to identity construction. Extreme heat, especially in rural and remote areas, is one constituent part of place identity, which has implications for risk perception and communication. So, unlike other natural hazards, extreme heat can function as a symboliser of identity and *positive experience*. This, we believe, represents an important sociocultural and psychological backdrop onto which heatwave warnings and messages land.

Heatwaves represent a unique and somewhat paradoxical Australian natural hazard. On one hand, extreme heat is associated with increased injury and illness (Varghese et al., 2018; Williams et al., 2017) and, driven by climate change, poses an ever-increasing threat to health and wellbeing in diverse communities, especially those already experiencing socioeconomic disadvantage and poor health (McMichael & Dear, 2010). Whilst, on the other hand, heatwaves can be represented in the media and in social discourse as opportunities for spending time at the beach, in pools and in rivers. Hence, they are often represented as a *contradictory natural hazard*, one that is both a risk, and for which adaptation can be enjoyable. Our research explores these contradictions and considers them crucial to understanding, and hence engaging, with collective beliefs about heatwaves with a view to tailoring heatwave messaging.

The purpose of this report

This report is written for government and non-government agencies and organisations with a stake, role or interest in public heatwave risk communication. The research findings shared here are displayed in a way that hopefully affords translation into communication practice, whilst stimulating critical reflection on current strategies. Overall, the aim of this report is to provide evidence to enhance the power of messages to increase protective action (behaviour) in heatwaves. What is presented here represents an important formative and substantive step in understanding some of the key social and psychological factors impinging on how messages are received and acted upon.

Literature and best-practice review

Risk communication - A definition

Although 'risk' (pre) and 'crisis' (during) communication can be described as occurring at different points in the disaster cycle, we adopt a holistic view that conceives risk communication as occurring on time scales well before an emergency or disaster, and up to and during a disaster (Steelman & McCaffrey, 2013). Hence, this report defined 'risk communication' to encompass both preparatory and crisis communication.

Heatwaves: The purpose of risk communication

Risk communication aims to inform people about potential harm arising from a hazard and offer adaptive choices to mitigate their risk (Seeger, 2006). Thus, the purpose of heatwave risk communication is to increase the quality of risk decisions and self-protective behaviours in order to avert loss of life and morbidity. Awareness raising campaigns, long before a heatwave, can alert people to the risk stemming from heat exposure and provide behavioural recommendations for mitigating risk. Warnings just before an event can function to 'trigger' knowledge and provide information on the current state of the event, including magnitude (minimum and maximum temperatures), immediacy (when will the heatwave hit), duration (how long will it last), and mediation (what can be done to limit impacts) (Seeger, Sellnow, & Ulmer, 2003). Such warnings are usually disseminated by emergency management (EM) and hazard leaders, and mediated through press conferences, websites, social media, TV, and radio.

The effectiveness of warnings is contingent upon the degree to which preparatory messages have been received, made sense of, and considered relevant (salient) by different publics. In the past, the definition provided above might have meant that heatwave communication could effectively use a one-way, linear dissemination of risk information. Yet, without accounting for public thinking, concern, or soliciting public understanding of a risk, risk messages are vulnerable to missing their mark and ignoring the social and discursive contexts in which messages operate. In any risk setting, multiple messages, concerns and knowledges compete for attention (Sellnow, Ulmer, Seeger & Littlefield, 2008) - this report employs this conceptualisation of risk communication. Thus, research on heatwave communication must consider the interactive nature of communication between EM agencies, the media, communities and other stakeholders when tailoring their messages. Communities and other stakeholders should be involved in a communication exchange involving dialogue, instead of being fed a monologue (Williams & Olaniran, 1998). The American National Research Council's (1989) Committee on Risk Perception and Communication advocates for an interactive approach, whilst recognising that risk communication is comprised of multiple, competing messages. This is a theme this report picks up on later when we discuss the role of social marketing in heatwave communication.

Risk communication is an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reaction to risk messages or to legal or institutional arrangements for risk management.

National Research Council p. 21.

'There is nothing as practical as a good theory' (Kurt Lewin): Theories of risk perception and communication

Kurt Lewin (1952), the godfather of 'action research', was keen to ensure the applicability of theories to finding solutions to real social problems. The applied social sciences use theories to organise their insights on an issue with a view to supporting practice. It should also be recognised that theories (and models) inevitably shape our view of social reality, and thus limit the kinds of solutions that might be applicable to address a problem. This has been especially true for the fields of risk perception and environmental risk communication.

Traditionally, the discipline of environmental risk communication focuses on understanding and narrowing the gap between promoted (expert) protective risk practices and behaviours, and those that are less effective (Steelman & McCaffrey, 2013). It explores questions, including: why do some people attempt to prepare for and protect themselves from environmental hazards, whilst others do not? Do people who ignore warnings simply lack the requisite knowledge to act in ways that could lower their risk and, how could risk communication efforts be designed to address and overcome factors that lead people to not carry our recommended actions in the face of a hazard?

Here, we review a predominant theoretical approach, historically informing environmental risk communication - *cognitive theories of risk*. We then describe and advocate for an *interactive approach to risk communication*. Our attention to the psychology of risk (and vulnerability) is germane to heatwave warning and information dissemination, largely because messages that aim to promote protective behaviours need to resonate with how people make sense of heatwaves in relation to their concerns, lived realities, values, socioeconomic context, and so forth.

Our review takes a critical approach to this body of research and proposes that risk communication interventions informed by a detailed understanding of a target audiences'

meaning systems, discourses, or 'logics', can afford greater success in promoting protective behaviours in heatwaves. In this way, we propose that heatwave messaging needs to 'meet people where they are' and use a sociocultural - as opposed to a cognitive-behaviourist - theoretical lens.

Cognitive approach to risk 'perception'

In the first instance, there are some problems with the term 'risk perception'. As Otway (1992) notes, 'risk' cannot be directly 'perceived'. Technically, perception refers to processing of sensory information, which can be quantified and measured (e.g., hearing, or sight). Risks associated with a natural hazard, on the other hand, cannot be directly perceived; they are mediated by, for instance, social beliefs, derived from social interaction.

However, the term 'risk perception' does have some utility when attempting to understand how heatwaves are understood as a hazard, the degree of threat they pose and, indeed, how communication interventions can be designed to engage with people's beliefs.

The risk perception field, a sub-discipline of mainstream psychology, had its beginnings responding to rapid technological advances, and especially, the proliferation of nuclear energy in the 1950s. These new technologies gave rise to public concern about how safe these new technologies were for the public. As Slovic (1987) contends, public perception of the risks associated with these developments, often communicated via the news media, were found to sharply contrast with 'objective' scientific risk assessments. Risk perception research, based on the quantitative models of risk assessment (Plough & Krimsky, 1987), seeks to better understand how people evaluate risk - informing communication strategy and predicting societal responses to hazards (Slovic, 1987). Risk perception research has been dominated by the psychometric paradigm that utilises quantitative scaling techniques to build representative 'cognitive maps' of risk attitudes (later on, sometimes called the 'mental models' approach). A core assumption of the psychometric paradigm is that if an individual perceives a significant threat, and this threat meets a number of criteria in terms of its 'risk characteristics', they will respond accordingly with mitigating behaviour, or will

support institutional actions that ameliorate the threat. Conversely, if a risk is not perceived in this fashion, for whatever reason, then the desirable behavioural responses cannot be expected.

In general terms, the psychometric approach, and its cousins in health behaviour (e.g. Health Belief Model), attempts to disentangle factors that influence risk perception, leading to the formulation of predictive models that "represent the relationship between perceptions, behaviour and the qualitative characteristics of these hazards" (Slovic, 2016, p. xxiv).

The empirical aim of understanding discrepancies between 'objective' (factual) risk assessments, usually derived from statistical quantification of hazard fatalities derived by experts, and how this hazard is 'perceived' by non-experts, measured by psychometric questionnaires, is well established in the multiple research domains, including psychology (Slovic, 2016). The psychometric paradigm attempts to build cognitive, socio-psychological and cultural models of subjective risk judgments that characterise hazards in terms of: a) how well the risk is understood; b) feelings of 'dread' associated with the hazard; c) 'catastrophic potential'; d) 'controllability'; e) 'voluntariness'; f) 'stigma' (imagery and associated affect associated with hazard) and; g) perceived risk vs. perceived benefit (Slovic, 2016). According to Slovic, when there is limited or missing 'empirical data' on a hazard, people generally make biased, probability estimations of risk, employing cognitive heuristics to make erroneous judgements. Lichtenstein, Slovic, Fischhoff, Layman & Combs' (1978) emblematic study of heuristic biases associated with judging the frequency of lethal events evidences how risk is conceptualised within the paradigm as a fundamentally cognitive phenomenon. These researchers found that participants systematically overestimated the frequency of fatalities attributable to events including tornados and botulism, but underestimated the frequency attributed to less dramatic modes of death, such as asthma - so-called, 'silent killers' (p. 575).

Heatwaves, can, and are, similarly described as 'silent killers', lacking the characteristics frequently associated with less probabilistic, yet sensationalised and memorable, causes or

morbidity and mortality e.g. terrorist threats, or Ebola. In this way, the risk perception literature tells us something important about the potential barriers to 'perceiving' heatwave as a serious risk necessitating special attention. Arguably, because heatwaves have been normalised and habituated as a typical attribute of the Australian summer, they may not elicit 'dread' emotions such as fear and apprehension, or notions that it cannot be controlled through adaptive behaviours (e.g., use of air-conditioning). Moreover, heatwaves are part-and-parcel of the Australian climate and thus are not likely to evoke negative stigmatic images, or feelings, related to death, foreboding and destruction. However, we would suggest the problem of 'perception' or misguided heuristics is less of a problem of faulty individual cognitive representations, but rather, a consequence of social interaction and communication.

Although the psychometric risk paradigm has evolved to include an increasing number of variables, including 'affect' (emotion) and 'worldviews' (beliefs about how the world works, or should work), it remains committed to the identification of 'predictor variables' to natural hazard preparedness, with a view to correcting identified deficits in recipient awareness and informing subsequent messaging as a corrective. Unfortunately, however, the provision of corrective information is not shown to reliably lead to action in those it targets (Fischhoff, 1995; Steelman & McCaffrey, 2013), and there are compelling reasons why it cannot.

Gaps in the cognitive approach

The chief problem with the cognitive approach and its utility in informing environmental risk communication is, simply, that the provision of information to the public simply does not, by itself, motivate people to behave in the recommended fashion. The identification of knowledge deficits, judgement errors, cognitive biases and faulty mental models upon which to construct corrective messages misses the key point that public discourses on risk are invariably dynamic and can only be understood with reference to their relevant, situated, contexts. The psychometric paradigm problematically sets itself the challenge of charting 'taxonomies for hazards' (Slovic, 1987), as if these threats constituted a static sets

of characteristics perceivers could simply 'read off' a natural hazard. Focusing analytical attention on how people discern and make judgments about 'risk characteristics' of a hazard assumes that people understand and respond to risk in a social vacuum, without casting an eye to how their understanding has been influenced by other factors, including ill health, wealth or poverty.

More recently, the risk perception literature has highlighted the role of dynamic sociocultural factors, augmenting perspectives that tightly focus on the study of mental and affective models (Dessai et al., 2004; Dunlap, 1998; Slovic, 2000; Peters & Slovic, 1996; McCright & Dunlap, 2011). According to Dessai et al., risk perception is determined by interactions between external, technical definitions of risk, such as those emanating from government research facilities (i.e., CSIRO), and 'internal variables', such as trust in the communicator, pre-existing personal worldviews, emotions (affect), personal experience, the media, and so forth. In other words, what constitutes dangerous risk is understood as not something that exists outside of the social – contrastingly, it is a value-linked perception, interacting with cultural, emotional and political processes, influencing the form and strength of how a risk is perceived (Kasperson et al., 1988).

Yet, we hold that when considering heatwave risk perception and communication, different theoretical strands of the cognitive risk model lack insight into why some people - even though they might hold the required knowledge to act - still do not take up recommended protective behaviours. As Joffe (2002) points out, accepting that one is at risk is only one formative factor leading to protective behaviour:

> *It is widely recognised that although knowledge concerning risk is a necessary condition for adopting health-protective behaviour (for example, one has to know that the exchange of body fluids can transmit HIV in order to use a condom to prevent this), it is not a sufficient condition. The space between the necessary and the sufficient is one that continues to occupy health professionals.*
>
> Joffe, 2002. p. 154

It is within this gap - the cleft between risk knowledge and subsequent behaviour – that the cognitive model tends to overlook. Exploring correlations between predictor variables and

(planned) behaviour, fundamentally overlooks the more deeply held sociocultural beliefs, concerns, and values associated with a risk, including potential *benefits* associated with risky behaviour (Graham, 1987), and degree of *trust* in institutional communicators. Complex meanings (and identities) associated with heatwave risk and associated behaviours cannot be adequately understood with the traditional data collection tools of the psychometric approach: survey scales. Rather, understanding and engaging with complex systems of meanings requires a collection of methods - qualitative and quantitative - that together, account for the subtleties, ambiguities and contradictions that replete thinking on environmental risks.

In response to the growing appreciation that the psychometric model was limited in understanding risk perception and communication processes, and that social and cultural processes play a crucial role to play in constructing opinions on risk, another theoretical framework was proposed to integrate divergent approaches: the Social Amplification of Risk Framework (Kasperson et al., 1988; Kasperson & Kasperson, 1996).

Social Amplification of Risk Framework

The Social Amplification of Risk Framework (SARF) (Kasperson et al., 1988; Kasperson & Kasperson, 1996) is useful in understanding heatwave communication insofar as it attempts to integrate fragmented risk perception literatures and introduces a greater focus on the role of cultural processes in attenuating (lowering) or amplifying (heightening) risk perception. Renn (1991) defines the framework this way:

> *The main thesis of the social amplification concept is that events pertaining to hazards interact with psychological, social, institutional, and cultural processes in ways that can heighten or attenuate public perceptions of risk and shape risk behavior.*
>
> p. 287

Put simply, the SARF describes the dynamic social and communication processes that leads to some hazards being considered more dangerous than others, independent of their

'probabilistic risk'. Risk perceptions associated with 'risk events' such as an airline crash or tsunami are always portrayed through 'risk signals' (symbols, images) that interact with a suite of social, cultural, psychological and institutional facets of society. These interactions ultimately impact the construction of risk and its perceived intensity. Risks that are likely to be attenuated are more commonly related to 'everyday' behaviours, like driving an automobile or, for some, drinking alcohol. Conversely, amplified risks are typically dramatic and less frequent events that have received heavy media attention leading to their sensationalisation. For example, risk amplification can be observed in the recent strawberry tampering case, where needles were intentionally inserted into strawberries and other fruit causing widespread public concern, and damage to the strawberry industry. Indeed, imagery of needles maliciously hidden in fruit, and the potential health consequences arising from coming in contact with tampered fruit, most likely functioned to *stigmatise* strawberries, eliciting strong feelings of 'dread' and 'uncontrollability' (key attributes associated with increased perception of risk). Further, in response to this episode, mass media, social media, and government actors were blamed for spreading 'hysteria' (Claughton, 2018) about the threat, which further amplified the risk. The probability of finding a needle in a sabotaged strawberry was statistically miniscule - nonetheless, the product had been stigmatised, and millions of dollars of strawberries were dumped by producers. This case illustrates the power of imagery to amplify risk perception and alter behaviour.

The SARF is most valuable mainly because it provides an optic through which to understand how a physical risk (e.g., heatwave) is inevitably *constructed* via various risk sources, transmitters and receivers. The diagram below neatly sums up the processes in which a hazard might be represented, attenuated or amplified.
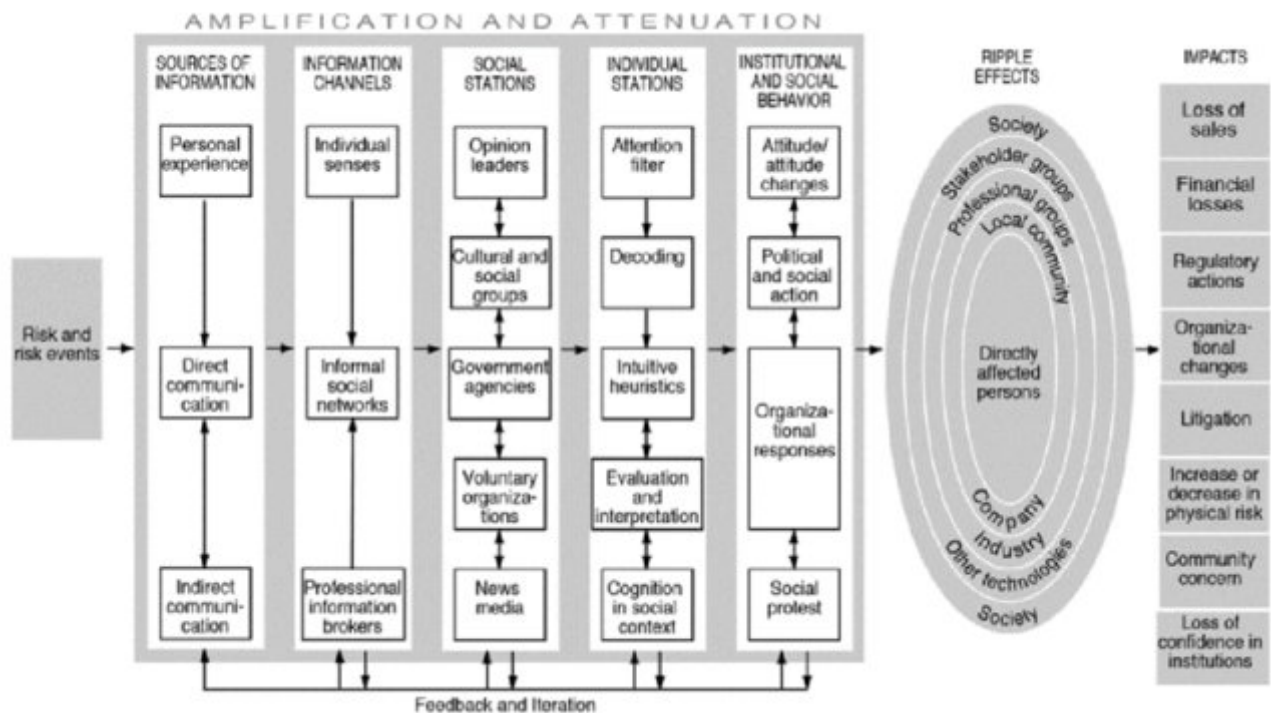
Figure 1. Social amplification of risk framework. Kasperson (2012).

The SARF is also useful because it emphasises that messages are not communicated in a unidirectional, top-down, process. Rather, information *cycles* in a constant feedback loop (Breakwell, 2000). In the so-called 'information society', the source of risk information may come from multiple sources, including emergency management and health agencies, the science community, and via people who are directly experiencing an event through social mediums such as Twitter and Facebook. These messages are further disseminated and re-framed via 'transmitters', including the media and institutions who have a role in protecting their constituents or clients. Information is then passed onto community audiences. It is important to note that this is a dynamic model of information communication; all phases influence each other through feedback loops that consistently change the framing of risk messages.

The SARF holds particular utility in understanding how heatwaves are portrayed in public discourse, and how these discourses can sustain beliefs about its risk and vulnerability. In

particular, the SARF argues that some hazards have become highly attenuated risks, or 'hidden risks' (Kasperson & Kasperson, 1991). These risks are hidden because of the nature of the hazard itself, and the nature of the societies in which they operate. Hidden risks can lead to muted risk perception (representation) when society underplays the consequences of the hazard and exalts associated benefits of exposure (e.g., sunbathing at the beach on a hot day). Heatwaves are a good example of such a hazard. As we have discussed, heat and extreme heat are positively, and at times, sentimentally rendered in the Australian culture, a constituent part of the iconography of Australian summer holidays and leisure and represented as a perennial feature of the historical climate. Heatwaves could be classified as 'hidden' because their representation is 'ideological' (Kasperson & Kasperson, 1991); that is, deeply embedded (and thus normalised) in the cultural lexicon, and where its risk is traded off against the co-benefits it offers (e.g., swimming at beaches). Hidden risks have been associated with adverse environmental consequences and delayed societal responses in numerous regions around the world (Kasperson et al., 1996). Climate change, in particular, has been difficult to communicate about because of its 'hidden' nature.

In summary, the SARF tells us something important about the cultural context in which heatwave information and warnings are received, made sense of and responded to. In this light, it may be no surprise that warnings and messages about heatwaves are not always heeded. Moreover, the framework raises important questions about heatwave messaging, its persuasiveness, and the prospect of repeated messages incurring what has been coined 'message fatigue'.

Message Fatigue

Everyday life is replete with messages and warnings about diverse topics, including the dangers of alcohol, terrorism, obesity, smoking, unprotected sex, climate change, and sugar. The idea that repeated warnings and messages about an impending danger, or risk, which may or may not materialise, will lead to an audience 'switching off' and thus disregarding the risk, has been with us since Classical times in the form of Aesop's fable, *The boy that cried wolf.* However, the fable has been distorted over time, and one key moral, altered (Mackie, 2013). The accepted version of the folkloric tale paints the shepherd boy as a serial liar, who repeatedly warns about a fabricated wolf who is threating his sheep. After repeated warnings, the townsfolk become sceptical and dismiss the risk of the wolf digesting the sheep. The boy's lies erode the trust of the townsfolk, and he pays dearly. However, the alternate version is yet more interesting and telling. The boy indeed warns about the actual presence of a wolf loitering with intent near his sheep, but the villagers' make too much noise upon their approach and scare off the predator. After iterations of the boy's warnings and the villagers' (noisy) response, the villagers become weary of the warnings, sceptical of the boy's motivations, and eventually stop coming to investigate. Of course, the sheep are then taken by the wolf. The allegory of message fatigue is clear (Mackie, 2013).

Francis Barlow, De Pastris Puero Et Agricolis, 1687

The phenomenon of warning fatigue has received some attention from disaster management and health communication scholars since the 1980s, yet there remains a paucity of evidence on the effects of prolonged, real-life, repeated messages that share similar meanings (Cho & Salmon, 2007). Although definitions vary, message fatigue is generally considered 'an aversive motivational state of being exhausted and bored by overexposure to similar, redundant messages over an extended period of time' (So, Kim & Cohen, 2017). Research suggests that message fatigue is a 'motivational state', mainly because it leads to *disengagement* (inattention, avoidance) and *resistance* to the message being advocated. Put another way, message fatigue describes how people become 'tired' or 'over-warned' when they are exposed to repeated information about an impending emergency, disaster or potential risk that may or may not case significant harm. Akin to the villagers in Aesop's fable, those exposed to ubiquitous warnings grow weary of messages that, at their heart, are telling the same story. They are presumed to suffer 'burnout', are 'worn out' by the message, lose interest in it and the corresponding protective behaviours being promoted.

Theorisation and research on message fatigue proposes that it involves four dimensions: (1) *perceived overexposure* (where an individual feels as though they have received too many messages of the same 'type'); (2) *perceived redundancy* (where individuals perceive that the messages are repetitive, and are not communicating new information; (3) *exhaustion* (feeling burnt out) and (4), *tedium* (lack of enthusiasm) (Frew et al., 2013; Gorn & Goldberg, 1980; Kinnick, Krugman, & Cameron, 1996; Schumann & Clemons, 1989; So et al., 2017). These dimensions are thought to operate together to characterise the experience of message fatigue.

Existing research denotes two types of message fatigue: acute and chronic. Distinguishing between the two is important, especially when considering how the phenomenon might influence the efficacy of heatwave messaging and attenuate risk perception (So et al., 2017). Acute message fatigue is thought to occur over a relatively short period of time when identical messages are communicated. Acute message fatigue has been studied in relation

to mediated messages (e.g., advertisements). Chronic message fatigue relates to both mediated and interpersonal messages, received through the media and social interaction such as conversations with friends and family. A 'message' in this case can be defined as non-identical 'classes' of messages that communicate similar key information, which can be disseminated via multiple channels i.e. media sources such as TV, radio, social media, and newspapers. Chronic message fatigue can manifest through an accumulation over years of exposure to 'like-kind' messages such as, in the case of heatwave messaging, 'drink more water' or 'stay out of the sun' during extreme heat events.

Heatwave communication may be particularly prone to perceptions of overexposure and redundancy. To our knowledge, no research has attempted to explore potential effects of message fatigue on heatwave messaging. Much of the empirical research conducted on message fatigue has explored health hazards, such as HIV prevention messages (Herbst et al., 2007) and safe sex (Frew et al., 2013). Brenda Mackie has conducted research on how 'warning fatigue' applies to bushfire communication (Mackie, 2013). Conceptually, warning fatigue may differ substantially to message fatigue, which encompasses both preparatory and warnings communication. Nevertheless, her unique findings provide important insights into how warnings about bushfires over the fire season are mediated by levels of trust and credibility (in the warning sender), false alarms, over-warning, scepticism, and helplessness. Most tellingly, Mackie's research found that non-official 'warnings'[1] – disseminated via the media - about the upcoming bushfire threat during winter functioned to 'fatigue' the public before official warnings had been deployed.

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[1] It is arguable that these messages are not 'warnings' *per se*, as they were communicated in winter. It is probable that they acted as *preparatory* messages about the upcoming fire season.

An interactive model of heatwave communication

The theories and frameworks discussed up to now underscore the growing recognition within the risk communication field that 'risk' associated with a hazard is bound up in complex psychological, social and cultural processes. Because of this, our view is that risk communication research and practice must take an *interactive approach* (Chess, 2001; Frewer, Scholderer, & Bredhl., 2003; Heath, 1995; Heath & Palenchar, 2000; National Research Council, 1989; Sellnow et al., 2009; Williams & Olaniran, 1998). Indeed, a move away from linear risk communication is now considered best practice in some Australian warning and information communication guidelines and policy documents, including the *National Review of Warnings and Information* (EMV, 2014).

Although definitions of the interactive approach differ, most interactive communication scholars appear to agree that risk communication should account for 'expert' *and* public understanding of a risk issue. When an interactive emphasis is applied to risk communication, all stakeholders are actively involved in dialogue on risk with an objective of consensus building and conflict resolution (Sellnow et al., 2009). This model gives voice to public frustrations, values, concerns and fears associated with a hazard and its risk. Both technical information and lay views are treated as 'interacting arguments', (Sellnow et al., 2009). Where other paradigms including the cognitive or mental models approach seek to identify common, generalizable trends in how individuals miscalculate risk, the interactive model is focused on *messages*. And here is the nub of our approach to the current research and to translating our findings into communication practice: message development must start with how the public, or publics, make sense of heatwaves and their risk, enabling a 'message centred' approach to tailoring official information and warnings that can harmonize with public thinking and facilitate behaviour change.
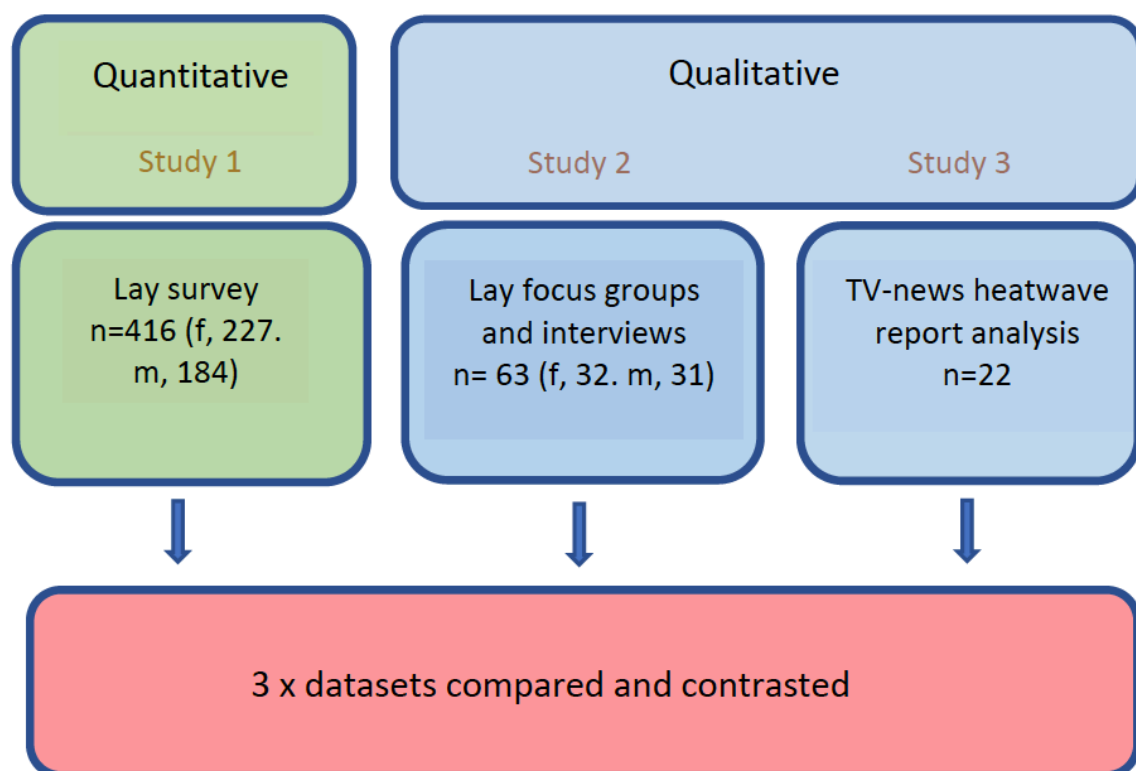
Complementing the interactive approach is the idea that heatwave messages are not disseminated into a vacuum - an empty public realm. Rather, they enter a frantically 'noisy' domain and necessarily have to 'compete' with a throng of other alternative messages, interests, information and discourses. The approach we take is similar to that of *social marketing*. Social marketing provides us with a lens to look at how heatwave messages may or may not be reinforcing or changing behaviour. It helps us understand that our recommendations around staying safe in the heat are up against tough competition from alternative messages and imagery that might tempt us to expose ourselves to heat, not drink enough water, or not use air-conditioning. Some alternative messages may offer more appealing, enjoyable or cost-saving opportunities than those proffered by official messages. The point here is if we do not understand the appeal of the competition to official heatwave messages, then we are not in a great position to affect behaviour. As we will see throughout the analysis, people do sometimes preference behaviours that are not ideal for protecting their health; but nonetheless, it is important to approach these *as choices (not as misjudgements about risk) that are serving achievement of a positive goal*. We do not view these choices as *nonadherence*, or as cognitive biases, but simply as choices that are perusing a more attractive outcome that those promulgated in a heatwave message. The challenge, then, is to engage with the thinking behind these choices and offer benefits that can compete with seemingly more attractive alternatives.

> *…the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behavior of target audiences in order to improve their personal welfare and that of their society (Andreasen, 1995 p. 2)*

> *If well-meaning health educators dwell only on promoting what is 'good for us,' without consideration of what mediates the behavior, both the message and the targeted behavior are likely to be lost in the struggle (McDermott, McCormack-Brown & Thackeray, 2011)*

Research Design

Three separate but interrelated studies comprise this research. Informed by the literature and best practice review described above, the present research takes a mixed-methods approach to explore public perceptions of heatwave risk and communication. The decision to employ a pluralist research design, using qualitative and quantitative methodologies, allows for a more multifaceted exploration into heatwave communication and understanding (Teddlie & Tashakkori, 2003). It is our view that a mixed-methods approach can generate complementary, divergent or discrete findings, affording a more holistic picture of the phenomenon under examination. Below is a schematic representation of the research design.

Figure 2. Research design

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[2] Lay survey, gender: f=227. m=184. Gender variant/nonconforming=3. Prefer not to answer=2

Findings

Study 1: Survey

What we did

A 27-item survey instrument (Appendix B) was designed and informed by the literature review. The survey was composed to explore: a) heatwave risk and vulnerability perceptions; b) perceived message fatigue; c) air-conditioning behaviours and c) heatwave message sources and channels.

The survey was hosted on *SurveyMonkey©*, a 'cloud-based' survey software tool. Adult (18 years and over) respondents were recruited through *Facebook* and a snowball method. A total of 422 South Australians completed the survey. The survey sample was broadly representative of the South Australian population.

In particular, a heatwave message fatigue scale was adapted from So et al. (2017) to examine if, and in what way, messaging might be perceived as repetitive, redundant, tiring. The message fatigue subscale included the following survey items, measured on a 5-point Likert-like scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree):

1) I have heard enough about how important it is to stay safe in heatwaves (*overexposure*)

2) In summer, there are too many messages about how to keep safe in heatwaves (*exhaustion*)

3) Heatwave information rarely provides me with new information (*redundancy*)

4) Information about what to do in heatwaves is 'common sense', so I don't need to listen to it (*redundancy*)

5) Messages about heatwaves seem repetitive (*redundancy*)

6) I am tired of hearing about what I should and shouldn't do in a heatwave (*exhaustion*)

7) Messages about staying safe in heatwaves are tedious (*tedium*)

8) I wish I knew more about how to prepare for heatwaves (*information seeking*)

To test the reliability (internal consistency) of the message fatigue subscale; that is whether question items were actually measuring the same 'construct' (message fatigue), and how closely related the items are functioned as a group toward this end, a Cronbach's Alpha reliability test was conducted. The test showed the subscale to have high internal reliability (8 items; α=.779).

Finding 1. Perceived risk and personal vulnerability to heatwaves

Most modern models of health-protective behaviour assert that perceived vulnerability to a risk is a key determinant of protective behaviours (Gerrard, Gibbons, & Bushman, 1996). Feeling threatened by a hazard motivates us to attend to, think about, and enact behaviours that, we hope, will reduce the risk associated with a hazard. Hence, the survey asked participants questions related to personal perceptions of risk and vulnerability to heatwaves. In many instances, their responses not only provided insights into how they felt about their own sense of vulnerability, but how they conceived others' comparative vulnerability.

With this idea that perceived vulnerability might influence beliefs about heatwaves, we asked respondents, in different words, how they understood their risk and vulnerability to heatwaves, and how this personal vulnerability compared to other people - young children and older people, demographic groups targeted in warnings and information, and represented as vulnerable.

What's the risk?

These results present a prosaic picture of how heatwaves are perceived as a risk in the public mind. Firstly, less than 37% of respondents cumulatively agreed and strongly agreed that they were personally at risk from heatwaves (Fig. 3). This is telling, yet, understandable, especially when accounting for previous experience of, and familiarity with heatwaves, that has most likely led individuals to normalise this potential risk and view it as a hazard that can be controlled with the use of air-conditioning and other adaptations.
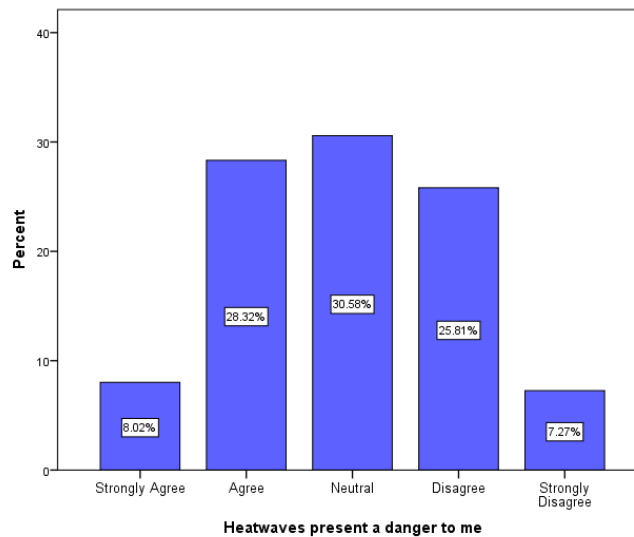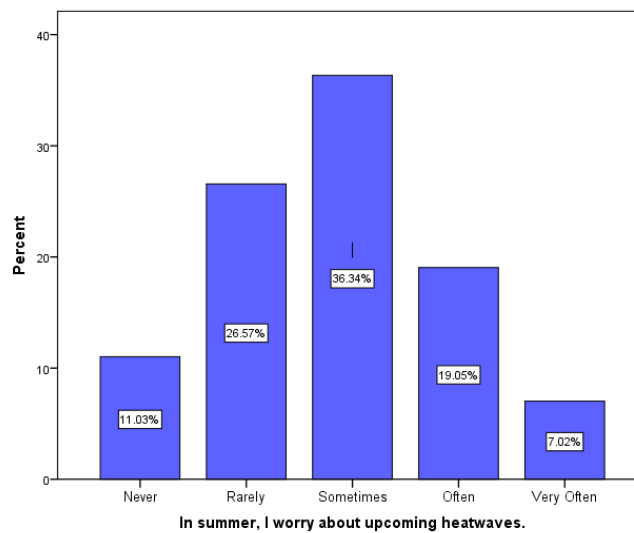
Figure 3.

Figure 4.

When considering individuals' vulnerability beliefs, it is important to keep in mind that research consistently shows that people pervasively *underestimate* their vulnerability to negative health events and consider themselves less at risks than others in the same situation (Weinstein, 1980, 1989). Importantly, these so-called *optimism biases* are believed to be greater for certain kinds of risk - in particular, risks deemed to be 'controllable' by taking personal action to reduce the threat (Slovic, 2000; Weinstein, 1989). In other words, confidence that one has the capacity to adapt to a hazard will render a person overly optimistic and reduce one's sense of vulnerability. Heatwaves may very well fit this bill, as a controllable natural hazard that can be easily adapted to.

The relatively high 'neutral' response may confer a number of things. In the methodology literature (i.e., Garland, 1991) the inclusion of a 'neutral' point in a Likert item is contested. Our view is that a neutral response option reduces the risk that respondents feel 'forced' to provide an opinion if they do not hold one, or if they have not really considered this question before. The high neutral response may also indicate that the question is not easily answered on a 5-point response scale; perhaps the concept of 'risk' is potentially too ambiguous and context dependant (e.g., 'it's a risk to me if I'm outside, but not when I am inside under air-conditioning'). Hence, people select a neutral response as a 'best option'.

When respondents were asked if they were 'worried about heatwaves' (Fig. 4), thirty-six per cent (36%) responded 'sometimes', whilst 26% and 17% reported 'rarely' or 'never'. Contrastingly, 19% and 7%, respectively reported they 'often' and 'very often' worried about heatwaves in summer. The question term 'worry' functions as a proxy for perceived personal vulnerability, yet it does not allow for the articulation of where their 'worry' is located. 'Worry' may be associated with their own health status, personal discomfort, health of their gardens, families, children and older people. It could even be linked to quite common concerns about the excess electricity costs associated with cooling their houses during extreme heat.

Overall, this finding suggests that the degree of worry associated with heatwave is not particularly acute for a large proportion of the community. This finding may also be attributable to seasonal effects, in that the emotional response of 'worry' cannot be easily recalled after the last experienced heatwave, or difficult to preconceive in a future event. Most Australians have had previous experience with heatwaves, and most have used adaptation techniques that can significantly reduce their exposure to heat, rendering heatwaves as predictable, normal and natural events. Moreover, these results may contribute to the argument that risk perception is mediated by a fairly rational set of judgments that, based on previous experience, involve a consideration of what resources are presently available to reduce a known threat, and whether these adaptations will be sufficient in doing so.

To further examine the question of perceived adaptation capacity into the future, we asked whether respondents believed they were 'well prepared for heatwaves in the future' (Fig.5). We did not define what we meant by 'future' so as to encapsulate all potential timeframes that people use when thinking about heatwave risk.
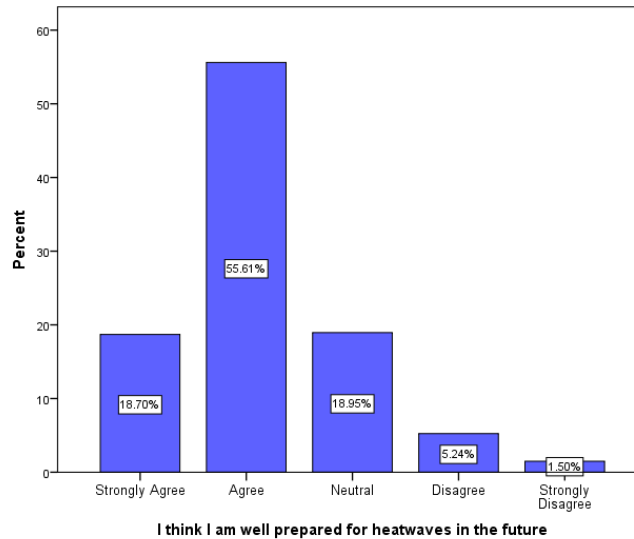
Figure 5.

A large majority of participants agreed they were well prepared for future extreme heat events, even though the timeframe and severity were not defined. What we can take from this finding is that current and future threat is presumed as manageable with current resources. Extrapolating from this result, we can argue that if heatwave risk is perceived as manageable or controllable, now and into the future, then this hazard would not induce a particularly strong risk perception.

Who's at risk?

Interestingly, when participants were asked to consider whether heatwaves present a greater risk to other groups (young children and older people, Fig. 6), a majority either responded 'strongly agree' (17%) or 'agree' (44%) with this proposition.
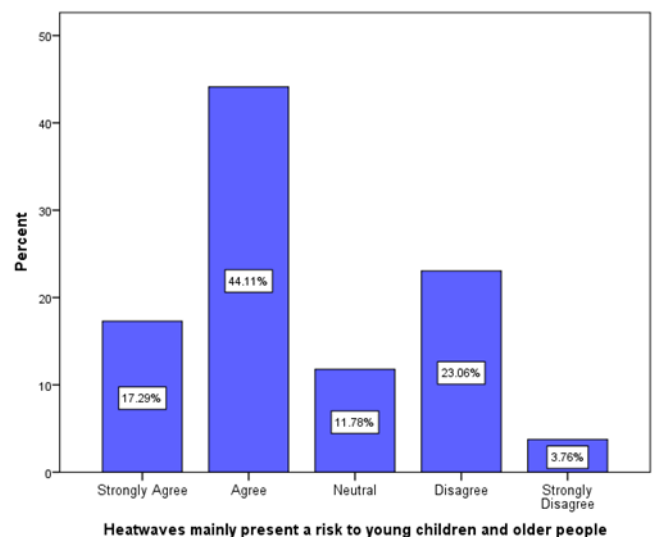

Figure 6.

This result may indicate that public health messaging targeting older people and young children (and their families) as requiring specific health advice due to their comparative vulnerability, has been taken up by the lay public. The segmentation of messages for targeted audiences is an accepted social marketing technique - yet in some circumstances, it may be less than effective. For example, research from the UK (Abrahamson et al., 2008) found that older people (72-92) did not identify as 'old' or personally vulnerable to heatwaves, although many did suffer chronic illnesses that made them susceptible. However, they *did* consider that chronic diseases were a risk factor in the heat for *others.* Thus, the targeting and segmentation of messages to 'vulnerable' groups such as 'older people' may not be always accepted, as those groups may not self-identify with the category term 'older people', and all that that term connotes. The implications for messaging to highly vulnerable groups who do not wish to describe themselves as vulnerable is a deeply challenging dimension of health and risk communication and speaks to complex psychological issues of 'cultural identity' (Carvalho, Block, Sivaramakrishnan, Manchanda, & Mitakakis 2008; Douglas & Wildavsky, 1982) and 'identity-protection' (Kahan, Braman, Gastil, Slovic, & Mertz, 2007). These theories argue that some individuals will reject risk messages if they threaten or undermine their own, or their social groups', deeply-held beliefs about their respective competencies in managing risk. We take up this communication dilemma again in the qualitative section (Study 2), where these kinds of logics can be observed in closer detail.

So, what do these findings mean for heatwaves communication practice? As we will go on to argue, it may *not* be worthwhile to directly challenge assumptions about the magnitude of heatwave risk, chiefly because many in the community do have access to adaptation resources that can alleviate much of their potential risk. Rather, heatwave communication interventions using targeted messaging that concentrates on preparation advice - segmented to different audiences - contingent upon what adaptation resources they have available to them in extreme heat may prove more successful than universal messages.

These messages may also be framed, as they currently are, in relation to the 3 'heatwave severity' classes used by the Bureau of Meteorology: low - intensity heatwave, severe heatwave, and extreme heatwave. The segmentation of messages based on dimensions of heatwave severity and different communities' degree of adaptation capacity could be less vulnerable to clashing with existing risk perceptions, and more likely to build upon and resonate with prior experiences and knowledge.

Finding 2. Message fatigue

As discussed earlier, message fatigue refers to a psychological state whereby individuals become disengaged with messaging due to feeling 'tired' or 'exhausted' by prolonged exposure to 'classes' of messages with a common theme e.g. 'drink enough water in heatwaves' (So et al., 2017). The survey included a 'heatwave message fatigue scale' (adapted from Frew et al., 2013; Niederdeppe et al., 2007; So et al., 2017) that included items that measured the five dimensions of message fatigue: a) perceived redundancy, b) overexposure, c) exhaustion, d) tedium and, e) information seeking.

Presented below are results from individual message fatigue items. As a whole, the histogram's do not provide consistent and compelling evidence that heatwave warnings and messages elicit perceived message fatigue. Although a majority of respondents believe they have 'heard enough' (Fig. 7) (overexposure) about how to stay safe in heatwaves, and that messages rarely provided them with new information (Fig. 9) (redundancy), this did not align with perceptions of 'exhaustion' (Fig. 8 & 13), or 'tedium' (Fig. 14), which are core conceptual dimensions of message fatigue. When asked if information contained in heatwave messages was 'common sense' (redundancy) (Fig.10), a mixed response was recorded. When we asked respondents if they

wished they knew more about how to stay safe in heatwaves (information seeking) (Fig. 15), a majority answered either 'neutral' or 'disagree'. What can be gleaned from these results is that although the majority of participants may perceive they hold the requisite knowledge to stay safe in heatwaves, and that they do not see the need to search for more information, they still appraise messages as important. Most notably, these data strongly connote that messaging is not being met with perceptions of exhaustion and tedium. These results bode well for future communication efforts. There is potential scope for heatwave warnings and messages to be delivered without being received with scepticism and other 'fatigue like' responses.
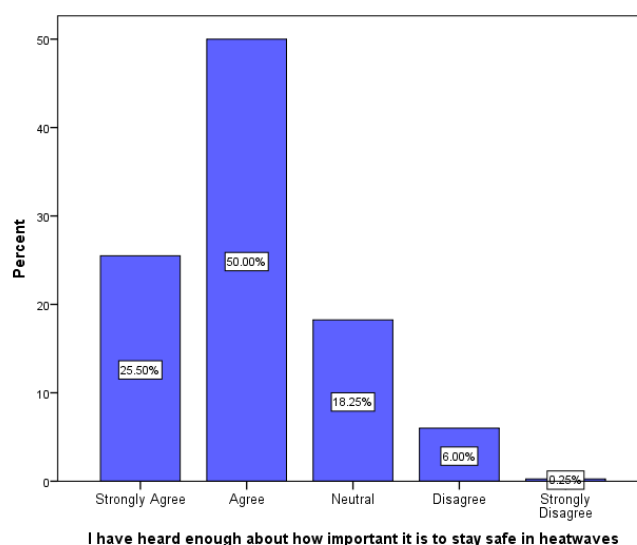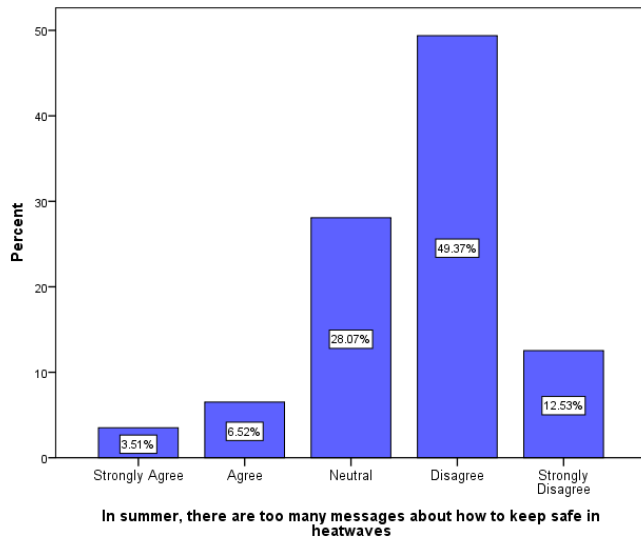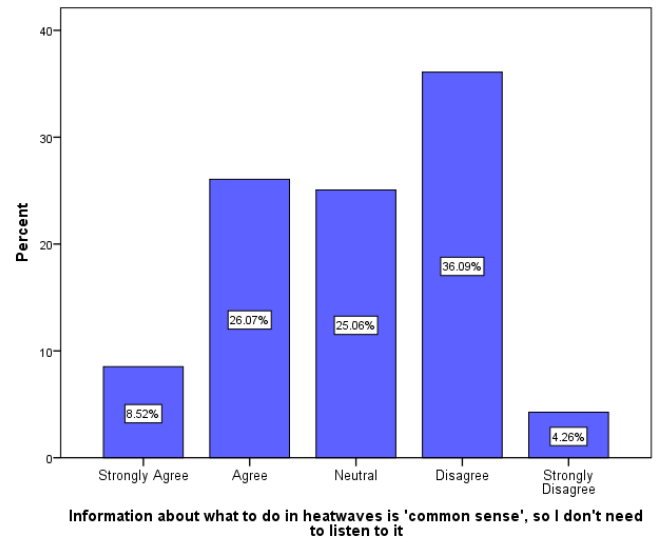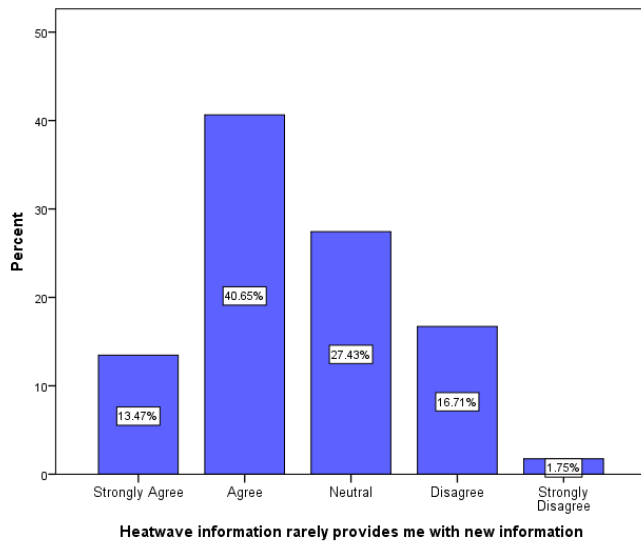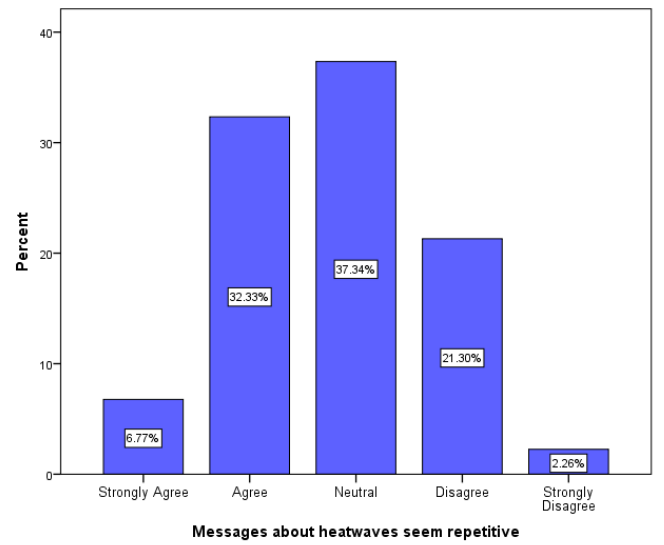

Figure 7.

Figure 8.
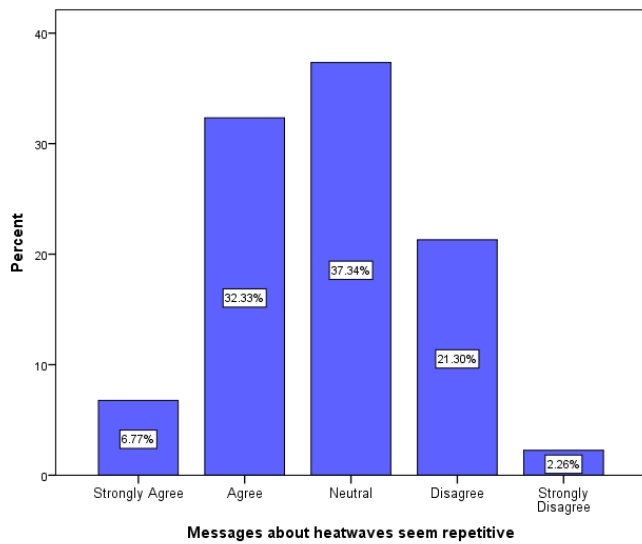

Figure 10.

Figure 9.
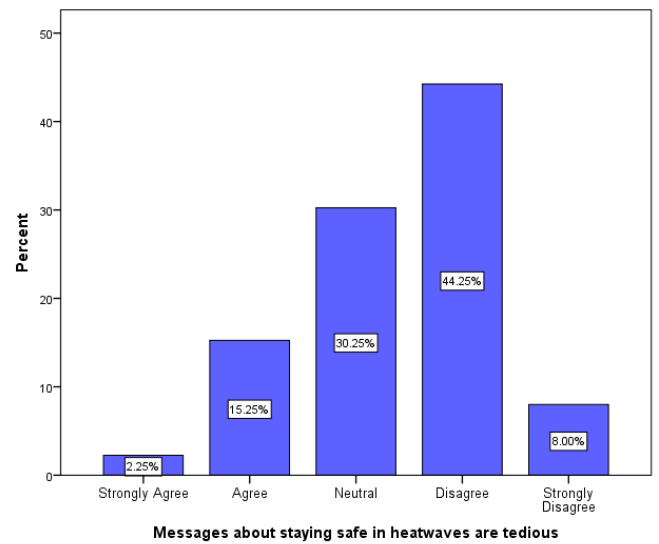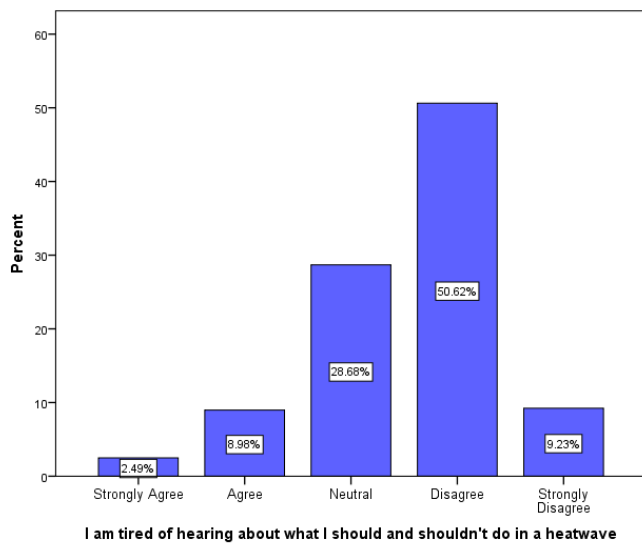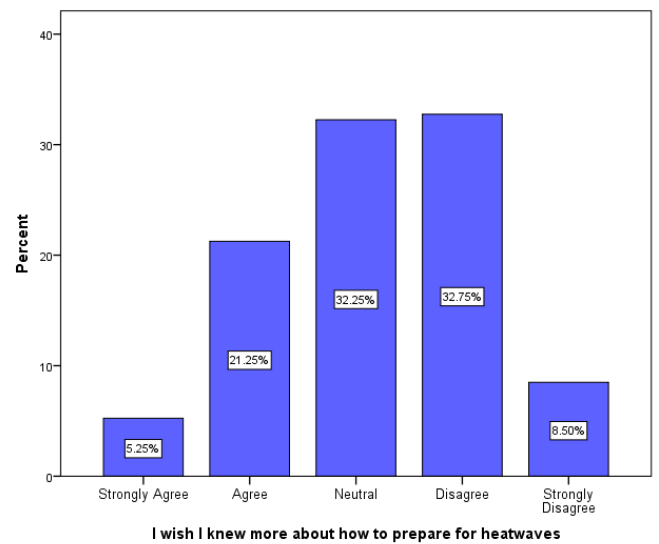

Figure 11.

Figure 12.

Figure 13.

Figure 14.

Figure 15.

A potential caveat should be noted when interpreting these results. Our findings could be partially attributed to the irregularity and seasonality of warnings and messages about heatwaves. Heatwaves, most obviously, are not a year-round hazard, and South Australia has not experienced an 'extreme heatwave' since 2014 (although the cumulative exposure to information about heatwaves from other Australian states (e.g., NSW) and around the world, could feasibly contribute to 'chronic' message fatigue). Thus, the South Australian public have not been exposed to multiple local warnings for at least 3 years, and this may have reduced the strength of perceived message fatigue to heatwave warnings and messages.

Further to the message fatigue scale, the survey asked participants to what degree they endorsed the statement, 'heatwave messages remind me to change my behaviour to stay safe' (Fig. 16). This question item was included in the survey after the discourse regularly arose in focus groups and interviews. Notably, a majority (62%) of participants either agreed or strongly agreed with this statement. This result adds weight to our claim that message fatigue is not strongly associated with heatwave messaging in the South Australian community. Heatwave messages, via whatever channel they are being received, appear to be functioning as a preparedness 'trigger' for adaptation behaviours to be deployed.

Figure 16.

In summary

- A large majority of respondents do not perceive themselves at risk from heatwaves; yet similarly, a large majority of respondents agree that heatwaves messages remain important to help 'people' (others) keep safe.
- Heatwave messages are interpreted to 'trigger', or remind, people to change behaviour.

- Most participants believed they held the capacity to cope with heatwaves into the (undefined) future.

- A large majority of respondents understand current messages as holding redundant information (already known).

- There is little evidence of classical 'message fatigue' impacting heatwave communication.

- A Chi Square statistical test (not shown) found that a very large majority of respondents who indicated that they had all the heatwave information they needed, also agreed that messages were important to 'keep people safe'.

Study 2. Focus groups and Interviews

What we did

The semi-structured focus groups and interviews aimed to delve deeper into social thinking on heatwaves, their risk, and how messages are being received and used to inform behaviour. Focus groups were held across South Australia in the communities of: Mount Gambier (2), Port Augusta, Onkaparinga, Whyalla, Davoren Park, and Elizabeth. Participants were recruited through the project's *Facebook* page (*Is it hot, yet?*) and a snowball sampling method. A total of 57 individuals (Female: 31; Male: 26) attended the focus groups, ranging in ages from 18 to 78. Focus groups were audio-recorded and fully transcribed for analysis. Focus groups on average ran for 60-80 minutes.

Seventeen semi-structured interviews were conducted over the phone, recorded, and transcribed verbatim. The Interview sample was composed of 10 females and 7 males, ranging in age from 18 to 83, and from rural and metropolitan regions of South Australia. Interviews ran for between 20 and 45 minutes.

The interview schedule was similar for focus groups and interviews yet functioned to only guide interaction. It was not uncommon, especially in the focus groups, for participants to lead the conversation and raise questions related to heatwaves and other related topics.

Transcripts were analysed using Thematic Analysis (Braun & Clarke, 2006). An iterative process of close-reading and rereading of transcripts generated the initial coding frame. The coded extracts were sorted into overarching thematic categories and subcategories. The aim was not to provide a description of the whole data set; instead, analysis focused on a restricted selection of salient themes that could inform heatwave messaging.

The qualitative themes are theorized as providing insight into public thinking on heatwaves and, in accord with the *interactive approach* (Sellnow et al., 2007) and *social marketing* described earlier, we treat identified themes as social discourses currently operating in the

social environment, that communicators can employ to meaningfully engage in dialogue with communities on heatwave communication, evaluate their current messaging, and build new interventions on. The extracts shown here are exemplars of the recurrent themes that the analysis identified.

Themes

Normalising heatwave risk: contexts and comparisons

To analyse social thinking on heatwave risk and vulnerability, interview participants and focus groups were asked about their views on whether heatwaves presented a danger, or elicited concern or worry. For many participants, heatwaves were deemed a routine, normative climatic feature of the Australian summer. In other words, perceived heatwave risk was attenuated through a process that represented it as a normative climatic event that, while inconvenient, uncomfortable, and requiring some adaptation, did not confer 'dread like' (fear, apprehension, worry) feelings that other hazards can arouse. When risk to health was discussed, it was recurrently framed as a potential risk for others, including the elderly and young children. The following extracts exemplify this theme.

1. Scott: *Would you say that you think about heatwaves much before summer or during summer?*

   P: *Not particularly. I know in summer where I've been in Melbourne it always gets really hot and I've grown up with it so I know it's always going to happen and when it does I always try and get near the beach or stay in a cool place. I don't really worry too much about it because I know it's probably going to happen. (F, 18, Adelaide)*

2. Scott: *Would you say you worry about the potential for heatwaves during summer?*

   P: *No, it's just a given. It's part of life really. I don't worry about it, no. I prepare for it and I obviously keep an eye on the weather to see when they're coming so that I can be as prepared as possible, but apart from that it's not something I particularly worry about. Thankfully my elderly family members are all pretty comfortable, they've got their air conditioning and whatnot, so I don't worry about anybody in my family so much. (F,38, Adelaide)*

These extracts resonate with the survey finding that heatwaves are not generally perceived as high-risk events that evoke feelings of worry or threat. It was very common to hear in the focus groups and interviews that extreme heat over 3-5 days was a hazard that could be easily met with adaptations like finding a cool environment such as the beach or shopping centre or staying out of the heat at home in air-conditioning. The spectre of heatwaves rarely elicited responses that signified fear or other 'dread like' feelings sometimes associated with less common, 'out of the ordinary' risks e.g. terrorist attacks or bushfire. Previous experience ('common sense') with the hazard was commonly drawn upon to justify why heatwaves were 'just a given'.

Moreover, learnings from lived experience of heatwaves often accentuated the importance of ensuring that older people were safe, whilst, for others, their concerns surrounded the safety of their children. The following 3 extracts exemplify this discourse.

3. *Scott:* *Would you say you worry about the heat?*

    P: *I do with my line of work. I work at the nursing home and I care for 14 residents. Seeing them, it's affected them this year as well, not wanting to get out of bed, not wanting to eat anything, not wanting to drink any water, always having to turn the air conditioner on all the time. Then they get too cold and it gets too hot. It has affected them a fair bit this year with all of them because a lot of them are in their 70s to 90s so it's quite a big change this year compared to last year. (F, 23, Adelaide)*

4. *Scott:* *Are heatwaves something you worry about in summer?*

    P: *I worry about my kids in it, yeah, and we travel each day back and forward to Port Augusta for their schooling, so it can be in the hottest part of the afternoon that we have to. (F, 28, Quorn)*

5. *Scott:* *What worries you about heatwaves now?*

    P: *Other people, old people and that, myself out in it. You get caught in it and you don't think it will catch up with what you're doing, you don't think to come inside when you get too hot.*

    Scott: *Being out in it for too long?*

    P: *Yeah. (Male, 54, Quorn)*

6. *Scott:* *Would you say you worry about heatwaves in summer or not?*

P: *Not at all, no way. I worry for elderly people, I worry for bushfires, but apart from that I don't worry for myself because I love it. (F, 74, Adelaide).*

Of course, older people and young children can be particularly vulnerable to the effects of heat-related illnesses, and this is reflected in current heat-health messaging and was a common point of discussion in the qualitative phase. As the above extracts highlight, and the survey findings corroborate, concern or worry about heatwaves is most often consigned to those who have been targeted in warnings and heat-health messages as 'vulnerable'. As discussed earlier in Study 1, assumptions about segmentation and targeting of messages to broadly-classed 'vulnerable' audiences such as 'older people' can be problematic for a number of reasons. Chief amongst these is that the broad category, 'older people', may not by accepted by the target group, and they will either ignore, or underplay the relevance of the message for themselves. As Abrahamson et al. (2008) found in their study of heatwave risk perception amongst 'older people' in the UK, many of whom had chronic illnesses that made them particularly susceptible to extreme heat, is that despite their age, they did not consider themselves vulnerable to heatwaves, and rejected the category 'old'. The upshot from this study and others (e.g. Hughes et al., 2008) is that messages that target older people may be more effective if they provide pragmatic *enabling advice*, instead of messages that can be perceived as constraining independence. For example, information incorporating ideas on how to tend to one's garden in the heat without being exposed to significant risk to health.

Another potential problem with grossly categorised and targeted heatwave messages is that they tacitly communicate to groups not generally targeted in the intervention (e.g., young adults) that they are less vulnerable to the effects of extreme heat. This sense-making is conspicuous in the extracts above. A large psychological literature (Kirscht, Haefner, Kegeles, & Rosenstock, 1966; Klein & Weinstein, 1997; Weinstein, 1980, 1989) evidences that people's *comparative risk judgements* are overly optimistic; that is, people will often underestimate their personal susceptibility to risk in comparison with their peers. Given that a discourse marking out older people and young children as particularly susceptible to heat appears widespread, it is possible that this logic is influencing comparative judgments of risk and is thus being employed to diminish a personal sense of vulnerability to extreme heat.

Indeed, in our study, 'older people' themselves sometimes made it plain that extreme heat did not bother them, and instead, that they found it rather enjoyable. In northern regional areas such as Port Augusta and Whyalla, it was not uncommon to hear individuals in their late 60s and 70s reject the category 'old' and talk about heat as a panacea for their physical ailments. Take the following extract, for example.

7.   P: *Yeah, well, I don't class myself as old, I don't take any notice of it because there's nothing you can do about it. If it's going to be 40 degrees, great, I'll feel good because my aches and pains won't be so noticeable. If it's going to 50 I'll feel exceptionally good. If it's going to be 30, I'll be worried, I'll be in pain. But that's just the way it is (M, 67, Port Augusta).*

Again, our point here is that for some 'older' audiences, messaging that employs an age-related 'vulnerability' discourse will not be effective, chiefly because it will not be compatible with the audience's identity and will threaten beliefs about, for instance, their sense of independence and how the heat reduces arthritis pain.

As the above extract shows, extreme heat was often represented with a language of fatalism and acceptance – as a hazard that naturally and frequently occurred, and thus could not be avoided (i.e., 'there's nothing you can do about it'). The framing of heatwaves as normal, unexceptional facets of life is at odds with natural hazards such as bushfire and flood. Indeed, it would be hard to sensibly suggest that nothing could be done to avoid bushfires. It may not be worthwhile to refashion risk posed by extreme heat in the public discourse or use fear-based messages to raise perceptions of 'dread', chiefly because such efforts will come up against a well-established, normative and historical logics that portray heatwaves as fundamentally 'controllable' and relatively benign.

Heatwaves and bushfires

Another discourse of interest contrasted and conflated heatwave and bushfire risk (this conflation is also a clear feature of TV-news reporting on heatwaves discussed in the next section). Heatwave conditions in South Australia are also the climatic determinants of high bushfire danger, and so it is understandable that these dual hazards are interlinked in the public mind. What is interesting, though, is how these hazards are differentially treated in terms of the risks they present. The following extracts bear this out and say something important about the potential for conflating heatwave *and* bushfire warnings and preparedness information to leverage the salience (relevance) of heatwave messages.

8.   P: *You know what the worst part about a hot day is? If you have a bloody bushfire you've got to get home bloody quick, or else you're not allowed to get home. Then you're locked up at home because you're not allowed to get out, if you get out you can't go fuckin' back (M, 65, Davoren Park)*

9.   Scott: *When you think about a heatwave what are the kinds of images or thoughts that come to mind?*

      P: *Fire mainly, particularly being up here in the hills, so that's probably the biggest concern. (71, M, Davoren Park, M)*

Extreme heat days, 'dry' heatwave events, and high bushfire danger days regularly coincide, and our data suggest that 'worry 'about the danger of heatwaves is far less acute than that associated with bushfire. In the interviews and focus groups, we asked participants to 'rate' how 'scary' (fear, or dread) heatwaves and bushfires were on a verbal scale where 1 was not at all scary, and where 10 was very frightening. The responses are telling. A large majority of participants rated heatwaves between 3-5 on the scale, and bushfires between 7-10, even if people were not in a bushfire zone. However, some respondents with a health issue that was severely exacerbated by the heat rated heatwave higher than the mean.

When asked to explain why they feared bushfires more than heatwaves, participants' responses were often similar: heatwaves are 'controllable', yet bushfires are erratic, uncontrollable and cause more catastrophic damage. In the following extract, the participant judged heatwaves as '4' on the scale, and bushfires at '10'.

10. *Scott:* *Why '4' (on the scale) for heatwaves?*

   P: *…I just thought to myself, I'm smart enough to know it won't not affect me. I don't think I would have problems in a heatwave, like I have common sense and look after myself, but I guess on thinking about it in the fire sense, yeah it would definitely be higher up. (F, 31, Mount Gambier)*

11. *Scott:* *And bushfires are a little bit more scary because they..?*

   P: *Just because they're normally out of control and they always seem impossible to stop. (F, 31, Mount Gambier)*

At the core of this logic is the assumption that adaptation measures can successfully be employed to mitigate the threat of extreme heat, yet bushfire is comparatively more dangerous because mitigation is 'impossible'. It may not be feasible to raise the perception of risk associated with heat to that of bushfire, but heatwave messaging and warnings could benefit from being linked to bushfire communication so as to provide communities with a more contextual, multi-hazard view of their risk. In practice, target audience testing could examine if messaging that addresses both hazards raises the salience of heatwave messages via association with bushfire.

Socio-economic contexts

Some participants were highly conscious of their vulnerability to heat, and this was often associated with an adverse personal experience of extreme heat, and the very real socio-economic constraints they experienced (or still face) which limited their capacity to take protective action. The following extract is from an interview with a man who had been homeless for a number of years and was living in his car. His experience of living through a heatwave with no access to housing, air-conditioning, running water, social supports, and with a medical condition that made him particularly prone to heat, paints a vivid picture of the socio-economic conditions necessary to feel resilient in heatwaves or extreme heat events.

12. *Scott:* *From your recollection did you used to worry a lot about the heat? It sounds like you did when you were homeless.*

> *P: Absolutely, yeah, because if I passed out in the car no-one would know. I would just be there, there'd be no-one around to help. I was concerned, yep. Mainly because you're homeless, if you go into unconsciousness nobody knows. It's not like you've got neighbours here where they all look out for each other or maybe you live with a family or something. There was times when I felt really faint, but I managed to get through it. It makes you feel uneasy just thinking about it, but I want to talk about it, but it makes me feel really uneasy. You go through that – you sort of re-live that feeling. (M, 74, Adelaide).*

Although this man's 'perception' of heatwave risk, or personal vulnerability in this context was a necessary condition for him to take actions to protect himself in this very difficult situation (which he did to the best of his ability), it was patently *not* sufficient for him to take *all* the necessary adaptation actions to mitigate his risk. In other words, while he very well understood the grave health threat that heat posed to him, because of his homelessness and social isolation, he could not, for example, access air-conditioning nor seek the medical support so fundamental to his safety.

Stable and safe housing is a foundational determinant of health and active participation in society. Homelessness, poor quality and badly insulated housing, and living on a low income are often associated. Research (Nichols, McCann, Strengers, & Bosomworth, 2017) shows that vulnerable households will limit the use of their air-conditioning - if they have one - because of affordability concerns. The following extract is drawn from a focus group with young adults, most of whom were living on a low income and in public housing or private rental accommodation. Perception of heatwave risk was seen through a lens of their current housing arrangements and access to air-conditioning.

13. *Scott: Would you say you worry about heatwaves?*

> *P: When I was working outside, yeah I did, because it wasn't good. Now I do as well because my house isn't air conditioned so I don't look forward to that..*
> *Yeah, I also worry for my animals as well…I have cats (F, 23, Adelaide).*

There is growing evidence that heatwaves discriminate against those who do not have access to, or cannot afford, good quality housing and effective air-conditioning (Nichols et at., 2017). Access to these adaptation resources are fundamental to staying safe in heatwaves, especially when other adaptation behaviours such as leaving the house to find somewhere cool are not safe or practicable. Other vulnerabilities such as old age combined

with poor health compound the importance of air-conditioning, as the following extract suggests.

14. *P:* *If it's hot, it's hot, it's cold it's cold, it doesn't really – we're all right at the moment, trouble is as you get a bit older it's going to affect you a bit more, it's going to slow you down or you're going to suffer, those that don't have air conditioning or heating depending on the time of the year you're going to suffer. At the moment it doesn't worry me but down the track it may because you've got to sell the house and you've got no air conditioning, what are you going to do, sleep out in a tent outside? (M, 72, Elizabeth)*

The design of heatwave messaging must consider the socio-economic constraints that erode the capacity of some households to take adaptation measures, such as using air-conditioning. For many people in our community, air-conditioning is a key cooling mechanism in heatwaves. Study 1 found that over 82% of our sample used air-conditioning as one of their primary adaptations in heatwaves. Yet, these extracts suggest that there is a need for segmented and targeted messages that recognise socio-economic barriers to adaptation and provide targeted audiences with behavioural choices that consider how constraints, such as the cost of electricity, can be addressed. For example, that following extract highlights how heatwaves are often thought about in terms as a financial risk:

15. *P1:* *They warn you a couple of days before. Even today my wife said to me, "It's going to be 35 today and tomorrow and it's going to be 20".*

P2: *The first thing that comes to my mind is "Ooh, how much is it going to cost for electricity?"*

P1: *That's right, and that's what I was saying, is that when you hear that is it dollar signs in going "This is going to cost me"? So, there's an added anxiety that's put on with getting that warning. (Males, 60-74, Davoren Park)*

It is critically important to recognise the financial and associated psychological burden that heatwaves bring to bear, and the potential health risks that arise when households do not use their air-conditioning because of concerns around power costs. For audience segments that have access to air-conditioning yet are reticent to turn it on because of concerns about power prices (a 'fear based' discourse, salient in political and media domains), access to

information about per-hour running costs[3] may be an effective resource to inform decision-making. Indeed, our survey asked respondents if they limited their use of air-conditioning during heatwaves, and 26% answered in the affirmative. When they were asked why they limited their usage, 68% of participants agreed with the statement that 'electricity prices were too high'. Patently, the effectiveness of communication interventions is limited by structural, political and economic forces that, together, set the conditions affecting access to decision-making on air-conditioning use. However, there is scope for tailoring messages that engage with 'cost' discourses that are affecting behavioural choices, and potentially limiting the adaptation capacity of households who would greatly benefit from air-conditioning.

Message fatigue

Earlier, we characterised message fatigue as a communication and psychological phenomenon whereby people became 'tired' of messages that communicated redundant, repetitive, and tedious information, leading people to 'tune out' to messages, and potentially becoming complacent in heatwaves. The survey findings suggested that a large majority of the sample believed they were well equipped with requisite knowledge to stay safe in heatwaves, and that messages rarely provided new information, suggesting a degree of 'redundancy' of risk messages. However, this did not translate into classic message fatigue as characterised by So et al. (2017). That is, although heatwave information and messaging were understood by respondents as introducing no new information, they nonetheless rejected the idea that they were 'tired' of hearing such messages, and that there were 'too many' messages about keeping safe.

The qualitative phase of the project drilled down into this logic. The following extracts underscore that although heatwave messaging and warnings may be repeating 'common sense' information, such efforts are serving a number of important communication and behavioural functions. Key to these was that messages 'triggered' pre-existing adaptation knowledge and behaviour.

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[3] The South Australian government's 'Using and Saving Energy' webpage is a good example:
https://www.sa.gov.au/topics/energy-and-environment/using-saving-energy/calculate-running-costs

16. *Scott:*   *Are repeated messages annoying to you?*

    P: *I kind of filter what I'm hearing anyway, so if it looks like something that I already know about I will just bypass it. I won't look into it anymore. Whatever comes through seems to be enough. The repeated messages are good. I might see something that reminds me to go check on the chickens or check on the dog or bring him in or whatever (F, 38, Adelaide).*

17. *Scott:*   *Even though you probably have a lot of the knowledge you need, that repetition might be helpful for you or for other people?*

    P: *Both.*

    Scott: *Because why? Can you tell me that?*

    P: *It always brings up, it refreshes what you need to do and brings it back to the front of your mind (F, Adelaide, 28)*

18. *Scott:*   *In those times did you feel like you were adequately warned or had enough information to adapt?*

    P: *I think it should be mentioned more often, the things that people should look at doing, keeping fluids up and keeping cool and whatnot, so I don't think there are enough warnings, no (M, 45, Adelaide).*

19. *Scott:*   *Do you think the kind of information that's communicated about heatwaves is common sense or not?*

    P: *Yeah, but people are idiots, I think they need to be really, really more into the heat protection messages and stuff. If they tell you there's a heatwave coming, like I know it's on the weather channel or the news or whatever, but however it comes out I think they should try to explain more what that actually means, "If there's a heatwave, remember to take these precautions", or "If you're working outside do this and that" and whatever because…don't really get it sometimes (F, 31, Mount Gambier).*

20. *Scott:*   *Do you feel that there are too few or too many warnings and messages about heat?*

    P: *No, I don't think there could be too many, no I don't.*

    Scott: *Why is that?*

    P: *Well people need to know if it's going to be a heatwave, what to do. XXX for instance, if she knows it's going to be a heatwave, she'll make sure she's got enough shopping in, so she doesn't have to go out. If it's going to be intolerable heat, it's nice*

that people get prepared for it, all my friends do. If it's going to be on the radio that it's going to be 49 degrees, they don't open their blinds, they prepare for it. Yeah, you need the warnings so that you can be prepared, I really do believe that. Like we get when there's going to be rain and storms. I think yeah as much as you can get, definitely (F, 74, Adelaide).

These extracts suggest that heatwave messaging plays an important role in 'refreshing' or 'triggering' existing knowledge about what to do in heatwaves. Although some subpopulations may perceive messages as repetitive, or redundant, they nonetheless recognise that messages can elicit habitual behaviours in themselves (e.g., 'bring the dog in') and, importantly, provide adaptation advice to others who may not be as experienced in heatwaves as themselves. Extract 19, in particular, speaks to the need for messages to convey practical risk mitigation advice to target groups that may need more support to prepare for and respond to heatwaves.

The qualitative and survey data strongly suggest that the frequency of heatwave messaging is not 'overdone', and that more frequent and segmented messaging before and during heatwaves could be deployed without the risk of fatiguing the population. This is a key finding and has import for thinking on heatwave communication.

Of course, some community members will experience a negative response to heatwave messaging, yet our qualitative findings strongly suggest that it may not be the 'official' message *per se* that is engendering 'annoyance' or fatigue, but rather, negative feelings may relate to how the media and other 'transmitters' *frame* heatwaves, and the degree of message exposure audiences receive. The following extracts bear this out.

21. *Scott:*   *The warnings or the messages on the news, do you feel like you have too many of those during summer, are they annoying?*

    P1:   *…They do get annoying especially if you've got 5 or 6 days in a row and it's like, "Yeah, we know it's fucking hot. Just open the window and you'll see it".*

    P2:   *But for older people it might be a reminder to drink water, that's if their telly is working if the power is on.*

    P1:   *…I think it just gets annoying to the point you turn on, you turn off, like you turn your radio off. (Males, 60-74, Davoren Park)*

22. P1:   *Yeah that's the thing, they (the media) make it seem like the 'Bold and the Beautiful' sort of drama.*

     P2:   *And they do seem to clutch at "We don't have any good filler for this week's show so let's just expand on it, and the last heatwave we had that was significant" and they'll bring in two or three people that are so-called experts that might have had something to do with a heatwave or they might have been weather men 20 years ago in a different State.*

     P1:   *Or they're outside...*

     P2:   *Yeah, you get someone standing outside going, "Oh gee it's hot". They do put in too much filler and it takes the emphasis away, like [X] was saying, there needs to be that emphasis and we need to understand the importance of what can be a big issue, but the way they do report it seems to sensationalise it too much and we become desensitised to what other specifics we need to be careful of I guess. You get that then with your friends going, "Blah, blah, blah" about the weather and you're like "I've heard it on the news all day, shut up". (Males, 65-75, Mount Gambier)*

Our evidence intimates that heatwave information, warnings, and other messages disseminated via secondary channels such as the mass media play a critical role in shaping public perception. Indeed, our survey found that mass media were far and away the most common communication conduit through which heatwave information was received. Interestingly, as the above extracts emphasise, negative or 'fatigued-like' responses to heatwave messages do not necessarily mean that individuals will disregard the 'importance' (salience) of the issue, especially when considering the needs of the broader community and those considered more vulnerable. Although some of our respondents conveyed annoyance when thinking about heatwave messaging, this was rarely levelled at health and emergency management agencies. Nearly all complaints were directed at the media who were viewed as 'sensationalising' and trivializing heatwaves and using heatwave stories as 'filler' (Extract 22).

For heatwave communicators, these findings are at once problematic and promising. Undoubtedly, the mass media and, increasingly, social media, are fundamental to disseminating warnings and messages that assist the public to enact mitigation strategies vital to protecting health. It is hard to imagine how this kind of 'reach' could be achieved without the help of multiple media channels. Yet, as our data suggest, once messages are in the hands of the media, control of the message is lost. Messages can be *re-represented as infotainment*, and key health advice for vulnerable groups glossed over or completely

ignored. The dilemma here is not easily reconciled, but it is important to see the potential to work with a variety of media channels to at least ensure that core heat-health and adaptation information is being communicated in the fashion in which it was intended.

In summary

The qualitative analysis shows that people make sense of heatwave risk and their personal vulnerability dependent on a complex and interrelating set of contextual and individual factors, including:

- Whether individuals or families are responsible for vulnerable groups, such as young children, older people, or people with pre-existing health problems.
- If targeted vulnerable groups, including 'older people', classify themselves part of that 'vulnerable' group, and how they view the comparative vulnerability (comparative optimism bias).
- Perceived 'controllability' of heatwave impacts e.g. mitigating risk through the use of air-conditioning.
- Social, spatial and economic contexts - which include, access to quality, well-insulated housing and air-conditioning, and the finances to run air-conditioning.

In accord with the survey results, heatwave messaging was understood to:

- Play an important role of triggering habitual knowledge about adapting to the heat.
- Not elicit classic message fatigue. Yet, some media generated messaging did extort feeling of annoyance. These responses were mainly associated with how the media 'sensationalised' heatwaves in their reporting.

When thinking about the practical utility of these findings, communicators may find it fruitful to employ a strategic social marketing approach to deciding which social and psychological factors are amenable to change through communication, and which social groups may benefit the most from targeted messaging. This research suggests there is scope for repeated messaging, as there is little evidence of message fatigue in the population. However, from our viewpoint, messaging should strategically be segmented so as to provide advice to those who are most vulnerable because of multiple/interacting health, social, housing, psychological and financial stressors. When reckoning on the most effective use of

a scarce communications budget, targeting intervention to the most vulnerable – defined across different vulnerability metrics (not simply age, or pre-existing health problems) – is a worthwhile tack, as those groups may garner the greatest benefit. As some of our participants articulated, those living with low incomes, and in inappropriate or poor-quality housing, are seriously in need of messages that provide behavioural advice that is geared to their discrete conditions. Moreover, we know that there is a strong correlation between low SES suburbs and urban 'hotspots' (202020, 2018), largely due to lack of tree cover. In short, messaging - and socio-economic action - is required to address the growing inequality between social groups when it comes to coping with heatwaves.

Study 3. Representing heatwaves: An exploratory analysis of Australian TV news reporting

What we did

The aim of this study was to collect insights into: how are heatwave messages represented on one mainstream media channel – TV-News. This question, we contend, is important given the following assumptions: a) it is highly likely that a significant proportion of the public will receive a heatwave warning or message via TV-news, and, b) the TV media does not, or cannot, reflect heatwave warnings and information verbatim from the SES, state health agencies or BOM; rather, it will variably re-frame heatwaves as 'stories', based on 'media norms and values'. Journalistic norms and values influence what stories are published and how these stories are presented. For instance, stories that can be fashioned to provide entertainment value (e.g. Infotainment), describe a human-interest story, or can use evocative images intended to hold an audience's attention, are often privileged over other potential stories. In this way, heatwaves, warnings and health advice - if selected for broadcast at all - are re-represented by TV-News in accord with journalist practices. We contend that these practices mediate the perception, seriousness, and salience of heatwaves.

Our analysis draws upon established social psychological theory and methods to examine how heatwaves are represented in Australian TV-News media. Social Representations Theory (SRT) (Moscovici, 1984) is employed as a conceptual framework for understanding how heatwaves messages, disseminated via the media, 'socially construct' the issue. Put simply, SRT conceptualises how knowledge is socially constituted, and how these "…systems of values, ideas and practices" (Moscovici, 1973, xiii) enable people to orientate, or respond, to their world. Social representations are inherently functional: they enable people to categorise and order various elements of the world, whilst facilitating communication between members of social groups.

Importantly, SRT holds that the process of representing is achieved through discourse; moulding attitudes, understandings, evaluations, and feelings regarding an object or phenomenon, such as a 'heatwave'. Social representations are deeply embedded in the cultural fabric of society, facilitating our interpretation of our world. It is through the frame of social representations that intelligible communication can occur, enabling people to discuss and make sense of hazards and informing responses to them.

Australian free-to-air television news stories on heatwaves were searched using the news database, *TVNews* (Informit). Search terms included '*Heatwave'* and/or *'Extreme Heat',* airing between 10 November 2016 and 30 March 2018. The initial search returned over 150 news items. Many of these items related to international heatwaves and were thus omitted from the data set. Traditional 'weather reports' were also omitted from the data-set. Weather reports were omitted because they follow a basic formula and are chiefly concentrated on providing observed and forecasted national temperature ranges and expected precipitation. As such, the depth and diversity of these reports were considered too shallow for in-depth analysis. Ultimately, twenty-seven news reports met the criteria for analysis, stemming from all major free-to-air channels: ABC (15), Channel 7 (4), Channel 9 (4), Channel 10 (3) and SBS (1).

To identify themes (patterns) within the data-set, Thematic Analysis (TA) (Braun & Clarke, 2013) was used. TV reports were transcribed verbatim and subjected to initial coding, which involved a repeated process of watching and re-watching news reports where notes were made on interesting imagery and speech within and across reports. This process generated the initial coding frame and coded extracts were sorted into overarching thematic categories and sub-categories. Themes were then inspected to examine the potential effects these may have on public perception of heatwave risk and the need for adaptation responses.

Key Themes

The dominant visual, linguistic and source (e.g. SES, BOM) themes identified in the data-set are now discussed. It is important to note that the current analysis has not, for the most part, sought to evaluate the comparative amount of airtime given to themes within a story. Our focus here is on identifying the building blocks of the social representation of heatwaves in TV-News reportage.

The following themes were identified in the data-set:

- Beaches and waterways imagery

- Humour and jocular 'coping'

- Braving the heat

- Conflating heatwaves, bushfire, electricity grid stability, and drowning risk.

- Reporting on heat-stress and heatstroke cases

- Official warnings and advice from emergency services, health agencies, and the Bureau of Meteorology (BOM)

Beaches and waterway imagery

A majority of news items (17 separate reports on 36 occurrences) used images of beaches, rivers, pools and water-parks as backdrops and contexts for their reports. In many instances, beaches and waterways were portrayed as chief adaptation options for people wanting to cool down and 'wait out' the heatwave. In some reports, short interviews (Vox-Pops) with individuals and families underscored the importance of watercourses and beaches to staying cool in the heat:

Journalist: *As the mercury soared to forty-one degrees, South Australians did what they could to keep cool.*

Beachgoer: *Hanging out by the beach, going for a swim. It's pretty hard to escape when it's forty degrees.*

(ABC, SA. 18 Jan 2018)

Journalist: *Escaping the heat a top priority for some.*

Beachgoer: *Probably come down the beach again to be honest, yeah. I'll be on the water, so should be fine.*

Journalist: *Others will just embrace it.*

Beachgoer: *I've got no beef with the heat, so I'm happy.*

(Channel 10, Sydney. 5 Jan 2018)

In a handful of other cases, Vox Pop interviews featured interviewees - often children - delivering excitable statements about how the heat afforded them opportunities to spend pleasurable time in and around waterways and beaches.

In many other cases, beaches and waterways were simply used as a moving 'backdrop' (and visual cue for the heat) behind journalists as they provided temperature forecasts and predictions for the extended heatwave.

Considering the prevalence of this theme within the media data-set, we argue that images of people using and enjoying beaches and waterways functions as a visual trope (e.g. motif) and media device for representing heatwaves. However, the potential for message inconsistency between such images, denoting 'fun' and sun exposure, coupled with journalists' language and Vox Pops, could be considered problematic for emergency management communicators. It is interesting to consider how beach and waterways images could mitigate or conflict with health messaging about the importance of staying out of the sun and keeping hydrated. How do receivers of such stories reconcile this seemingly incongruent messaging? As we have already noted, images are powerful mechanisms for communicating subtle meanings and messages, and can be encoded, comprehended, retained and recalled in and from memory far more easily than information received via language. As we will go on to suggest, in heatwave reporting, what is said and what is shown are not always aligned in advancing positive health advice.

Humour and jocular 'coping'.

A recurrent feature identified in 11 heatwave reports (16 instances) was the use of humour. This included accounts, with accompanying vision, of people using novel coping methods, and reporters using these to add 'entertainment value'. Jocular stories included a mechanic in regional Australia working only in his 'speedos' to keep cool; vision of former Prime Minister Bob Hawke 'sculling' a beer at the cricket while the journalist advises on 'staying hydrated and in the shade' (ironic humour); vision of a group of men drinking beer behind a reporter who jokingly laments, 'The advice from authorities during a heatwave is to stay

hydrated, so that means fewer of these [beers]. But on a hot Friday afternoon, try telling it to this lot.' (ABC, Brisbane. 10 February 2018)

The deployment of humour in some reports came directly before or after comparatively more serious messages, including health advice, and concerns about the stability of the power grid during the heatwave. This light-hearted rendering of heatwaves is unsurprising; TV-News media, as we have suggested, adheres to a set of interacting journalistic norms that include the norm of 'entertainment'.

Of course, the use of humour does not necessarily undermine the gravity of messages highlighting potential risk to health - but as part of a historical representation of heatwaves, it can be discerned as maintaining a normalised risk representation; that is, as a taken for granted and 'natural' part of Australian summers. The use of humour must also be contextualised with other features of reports, such as imagery of beachgoers and children happily playing in rivers. The accumulation of meaning derived from these different components of heatwave stories constitutes its overall social representation. The next theme we describe only reinforces this contention.

Braving the heat

Fourteen stories (22 instances) featured individuals and groups working or exercising in the daytime heat. Most of these involved road and construction workers, and some individuals who had chosen to exercise in the hottest part of the day. The next extract is notable because we can assume that the journalist has intentionally sought the long-distance runner for an interview about his decision to run during a heatwave.

Journalist:	*It's the middle of the day in sweltering Brisbane and it's the perfect time for a jog. Call him crazy, but this heatwave provides a rare training opportunity for the ultra-marathon runner.*
Runner:	*I've raced in forty-five-degree temperatures before, so, wanna be able to run in conditions you might actually have in the race. Um, so just that you are mentally prepared for it, but also to practice the strategies that I might use to cope with those conditions.*

(ABC Brisbane. 11 February 2018)

Why has the journalist identified this athlete and taken this particular resilience 'angle' in this story? Could this story tempt others who consider themselves as adequately 'acclimated' to exercise in dangerously hot parts of the day? It is difficult to read the minds and intentions of journalists and potential audience interpretations of stories. Yet, in the context of similar stories described below, there is evidence to contend that showing people braving the heat is serving as 'entertainment value', potentially undermining the seriousness of heatwaves and their risk to health.

Journalist:	Think you had it bad today, try this. Hot asphalt underfoot, the sun beating down from above, what a job!
Road Worker:	Just another day another dollar, mate.

(Channel 10, Sydney. 10 February 2017)

Student 'O week' Organiser 1:	This is incredible, it's free ice-cream and perfect for a hot day, and we're just loving being out here.
Student 'O week' Organiser 2:	People are out here all day, four hours in the sun. It's Brisbane heat, its humid, gotta make sure people are stayin hydrated and keeping cool, so, making sure they don't pass out and enjoy the day.'
Journalist:	There's no doubt SE QLD students are feeling the heat, cooling off in any way they can. But those from the harder North say we should toughen up, for them this is nothing special.
Worker:	We don't take our jumpers off till it's thirty-six. I think you are a pack of sooks if you are winging about thirty-six.

The preceding extracts are representative of the media's interest in telling stories about people going about their work, exercising, partying, and engaging in everyday activities during a heatwave. Road workers in particular were shown working in harsh, highly exposed settings, and their work was prioritised over taking shelter from the temperatures. Very few reports showed workers drinking or stopping their work. Indeed, akin to the long-distance runner, workers were used as stoic exemplars, coping and 'just getting on with it'. Interestingly, all road and construction workers were male, and we can speculate that this stoicism is built upon notions of masculine 'toughness': the Traffic Controller's words and physicality are prototypical of this stereotypical masculine toughness.

Conflating heatwaves, bushfire, electricity grid stability, and drowning risk.

In 16 reports, on 37 separate occasions, the heatwave topic was conflated with associated hazards and risks. Most often (18 occasions), bushfire and heatwave narratives were noted within the same story, and in some instances, the bushfire reporting received dominant airtime. In these stories, dramatic images of burning forests and rural fire brigades' dousing flames accentuated bushfire risk. Contrastingly, heatwave components of the stories employed maps and temperature figures. In one report (Channel 9 Sydney, 6 November 2017), the News Reader began her story with talk of a 'dangerous heatwave', but the back-image and text concomitantly denoted 'bushfire threat', and a still image of flames licking around the edge of a house.

Moreover, the link between heatwaves and electricity grid stability was noted in 8 stories on 12 occasions. For the most part, these story components pivoted on whether energy generators could balance electricity supply and demand, thus avoiding blackouts, while prioritising the domestic market over large industry users of electricity. The following extract is an exemplar:

| Journalist: | The Australian Energy Market Operator is preparing to order more than a dozen big energy users to power down or off this weekend. A precaution to avoid major blackouts, like the one seen in South Australia in twenty-sixteen. Paramedics are on standby too. |

(Channel 10, Sydney. 5 Jan 2018)

Heatwave and water safety were also found to co-exist in 3 stories (on 5 occasions). Clearly, in hot weather, the number of people accessing beaches and waterways rises exponentially, and hence the risk of drowning similarly rises. Warnings on water safety were formulated around key recommendation of 'swimming between the flags.'

Reporting on heat stress and heatstroke cases

Interestingly, far fewer stories (6 stories and 10 instances) reported on heat stress or heat stroke cases. All but 2 of these stories were featured on ABC News (QLD and SA). Of these, the most in-depth story related to the case of a forty-five-year-old woman working at an outdoor market on the Gold Coast who suffered heat stroke and subsequently went into cardiac arrest. Two other workers at the same site were also taken to hospital with heat stress. This story was immediately followed by reports of surf-rescues and the safe retrieval of dogs from locked cars.

In a rare example of reporting heat-related illness case numbers, (albeit, immediately after a jocular Vox Pop with a man embarrassed about his on-air attire), a Queensland Ambulance Service spokesperson provided the following statement:

Beachgoer:	Can't believe I'm on telly wearing a terrible singlet!
Journalist:	Paramedics have been run off their feet treating heat exhaustion patients almost every hour.
Ambulance spokesperson:	On Thursday we had about 18 cases across the state. Yesterday, that went up to 25. And today we're still going.

(Channel 10, Brisbane. 14 Jan 2017)

Perhaps unsurprisingly, on only 2 occasions were heatwave stories accompanied by images of a victim. Heatwave Sand their victims do not normally leave behind a trail of physical consequences, unlike bushfires, storms and car accidents. Therefore, TV-News cannot normally use contextualising, salient imagery to build their stories. On rare occasions where a TV-News crew is close by to a person suffering from a heat related illness, normally in the course of reporting on a completely different story (e.g., cycling event), the heatwave narrative is 'humanised'. The humanisation of personal accounts paints a very different portrait of heatwave risk than temperature statistics, imagery of beachgoers, and of those braving the heat in the course of their jobs.

Official warnings and advice from emergency services, health agencies, and the Bureau of Meteorology (BOM)

A range of news reports (22 reports and 44 instances) included short 'takes' from EM press conferences, or individual interview 'snippets' with agencies with a stake in communicating about heatwaves. A significant proportion of these were from BOM spokespeople sharing meteorological forecasts and explanations for the extreme heat. Far fewer reports featured interviews with medical or public health staff disseminating heat-health information.

The following extracts are representative of BOM interviews from the dataset.

A number of Sydney suburbs reached more than 10 degrees above average. And that for the 5th or 6th time this month. Sydney has officially rounded-out its hottest January on record, one

degree warmer than the previous record 150 years ago. With an average day-night temperature of 29.1 degrees.

(Channel 9, Sydney. 30 January 2017)

It's been one of the more humid periods across northern and central Australia that I can remember. A lot of humidity is penetrating from the Indian Ocean from the northwest of Australia, where that tropical air mass is coming down with the monsoon

(ABC SA, 11 February 2017)

Respective state health authorities, and in some cases GPs and ambulance spokespeople provided heat-health advice. These edited snippets ranged from basic advice on the importance of hydration and staying out of the sun, to more articulated statements (the following extracts are the full transcripts of the snippets before the report moves on).

Queensland Chief
Medical Officer: Even the fittest of people can develop heat exhaustion and
*   heat stroke in this hot weather.*

(ABC Brisbane, 10 February 2018)

Journalist: The extreme weekend conditions saw one woman rushed to hospital on the
Gold Coast.   The forty-five-year-old was working at a Helensvale open-air market on
*   Saturday. She was found to be in cardiac arrest.*

Ambulance
spokesperson: The patient was transported to the Gold Coast University Hospital. 'Code one',
*   in a critical condition.*

Journalist: Soon after, two other women at the same location suffered heat stroke. It's
*   prompted a warning from Ambulance Officers.*

Ambulance
spokesperson: Family and friends can be those ones that say: guys, maybe now it's time to
*   take a break, or finish it when it's a bit cooler.*

(ABC Brisbane, 4 January 2018)

(ABC, SA. 18 January 2018).

Most clearly, the type and depth of information communicated in these stories is not only decided on by the speakers; the selection of the particular snippets is equally a function of the broadcasters' editing processes. Information omitted from interviews and press conferences, and editorial decisions relating to who to interview and on what 'angle' the story will take, is premised on media norms and values i.e. time constraints, perceived audience 'interest' and entertainment value.

These extracts also speak to the power of the media, vis-a-vis their editing processes, to identify and name social groups (and animals) who are more vulnerable to heatwaves than others. Some categories are very broad (i.e. 'even the fittest people'), whilst others are narrow and discrete e.g. 'Children and animals in cars'. Our chief point here is that it is beyond the speaker's power to determine what messages are broadcast and which are not. Their overall message will always be delineated by the media that will, in turn, present a re-represented message to the public.

In summary

This exploratory analysis of Australian TV-News reporting has shed light on a fragmented social representation of heatwaves - an eclectic assortment of messages, tropes and images that are, arguably, contradictory and incongruous. Heat-health warnings were found to be competing with imagery of beaches, beachgoers and waterways, which signified enjoyment and a common adaptation option for managing the heat. Bushfire and drowning risk narratives recurrently competed with heatwave messages for airtime and salience in stories. Humour was employed by journalists to lighten the tone and provide entertainment value as per media norms and values.

Possibly the most concerning finding was the relative paucity of health warnings, narratives, and advice coupled with compelling vision. Only a handful of stories attempted to link abnormally high temperatures with adverse health outcomes. This is especially worrying given the prevalence of story components that are notionally working to undermine the perceived seriousness of heatwaves i.e. stories featured social actors 'braving the heat'. Showing people working unshaded in heatwaves may provide stories with compelling images (and elicit schadenfreude[4] from the audience?), yet it can also send a powerful and somewhat subtle message to some audiences about their own degree of resilience. People 'modelling' strenuous work during heatwaves could be interpreted by some audience cohorts that heat may not, in fact, be as serious as warnings make out, and/or that only 'vulnerable populations' are prone to becoming ill in such conditions. It is impossible to know how such messages are interpreted without further empirical examination, yet we are confident in arguing that whatever the impact of such stories, they are not communicating information that could be employed by people to protect themselves from heat related illnesses.

The media do not simply convey information in a linear fashion to the public - they also recycle representations and beliefs from the public in their stories. In other words, they act as an 'echo chamber' for collective beliefs and ideas that in some instances become taken-

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[4] A feeling of pleasure or self-satisfaction that comes from witnessing others' discomfort or troubles.

for-granted representations, or 'common-sense'. As such, representations of heatwaves in the media are closely linked to the public's view of extreme heat and its risk. Agencies responsible for heatwave communication with the public may need to consider developing messaging that counters assumptions that appear in TV-News. The cultural representation that we have begun to characterise here may be used as a starting point for formulating such messages. Alternatively, communicators may contemplate communication efforts that reach audiences directly, dodging the potential mediating role of mainstream media on messages.

In respect to message fatigue and threat normalisation, our findings strongly suggest that journalists, and their editors, are only too aware of the potential for heatwave stories to be received with disinterest and 'fatigue' from audiences. Of course, the media value of 'entertainment' is specifically designed to avoid audience message fatigue - it is in the media's interest to maintain audience attention! Hence, the phenomenon of message fatigue in the media may be functioning ironically, pushing journalists to consistently find new angles and framings of heatwaves to keep the topic 'fresh' and, thus, avoid audience fatigue. Novel and entertaining angles on heatwaves were clearly observed in our data, and this journalistic imperative presents serious challenges to risk communicators.

Finally, this report suggests that state health and EM agencies must continue to work closely with the media to moderate journalistic norms and values influencing reporting on heatwaves. In the eastern states especially, commercial TV-News appears to favour comical renditions of coping in heatwaves and demonstrates a preference for more easily dramatizable events i.e. bushfires. It may be the case that preparatory communication with the public long before a heatwave event is one timing strategy that could avoid, or at least reduce, heatwave messages being pushed aside for the sake of 'infotainment'.

Implications for practice

Heatwave communication campaigns cannot be 'all things to all people' (Grier & Bryant, 2015), and taken together, our findings stress the need for message and audience segmentation premised on the audience's needs, values and social vulnerability variables. As we have argued, a social marketing approach to communication means that hard decisions are required to identify and target those who have most to benefit from interventions and campaigns. Currently, age (very young and older people) has been employed as a key demographic used to identify vulnerability, and segment audiences. This criterion is likely to be too blunt and may be neglecting individuals and households who struggle with multiple and interlaced social vulnerabilities, including poor quality housing, living in 'hot spot' suburbs (urban heat islands caused by lack of vegetation), low SES, and health problems. In particular, a *sharpening of segmentation strategy will overcome issues of information redundancy identified in the present study, affording those most vulnerable with much needed support and information.*

Our findings strongly suggest that for a majority of the public, message fatigue is not being perceived in relation to heatwave warnings and messages. However, heatwave information is construed as 'redundant' - as 'already known' knowledge that is not adding anything new to how individuals understand heatwaves and their adaptation options. Messaging is 'triggering' habitual behaviours but does not appear to be offering new perspectives on coping with heat or challenging well-worn discourses - many undermining the seriousness of heatwaves - propagated through channels including TV-news. Heatwave messaging is generally viewed as necessary and important, and this brings to bear opportunities for communicators to *refashion messages to account for redundancy and challenge predominant discourses and logics that work to attenuate risk perception*.

TV-news is a key heatwave communication channel, which is providing a range of mediated messaging to the public. For the most part, messaging was framed in accord with media norms and values, that rendered information as *infotainment*. Our data suggests that TV-

news reporting is most likely contributing to information being met with scepticism and irritation. Heatwave stories are seen as sensationalised and misrepresenting the gravity of heatwave risk. Communicators are faced with the challenge of their messages being subverted and *must find a way to communicate with individuals directly, or to circumvent the influence of some media reporting.*

In a changing climate, where heatwaves are becoming longer, more spatially widespread, and extreme - especially overnight temperatures - tried and tested adaptive strategies may gradually become less effective and more expensive for significant segments of the community. A clear finding from the survey and qualitative phases was that the community is pervasively confident that current adaptions will serve them into the future. Communication efforts will, if they are to remain relevant, adjust messaging in accord with the lived experiences of the public in a capricious social, economic and environmental climate. Greater attention to audience segmentation will become increasingly relevant as South Australian summers stress households struggling with multiple and interacting social vulnerabilities.

Appendices

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Appendix B. Survey instrument

Welcome to the *Is it hot Yet?* Survey

Thanks for finding your way to the *Is it hot, yet?* survey.

Please click 'next' below to find out more about what the survey is about and what participation involves.

Heatwave Survey

IS IT HOT YET? SURVEY

What is the project about? This project aims to better understand how warning messages about heatwaves are understood and responded to by the South Australian public.

Who is undertaking the project? This project is being conducted by researchers at The University of Adelaide. This research is jointly funded by the Commonwealth and South Australian governments under the Natural Disaster Resilience Program. The chief investigators in the study are listed below.

Why am I being invited to participate? You are being asked to participate because you are 18 years or over and a member of the South Australian public.

What will I be asked to do? Your contribution to the project will involve undertaking an on-line survey on heatwave messaging. Participation requires a time commitment of approximately 10 minutes.

Are there any risks associated with participating in this project? We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach of confidentiality is always possible. To the best of our ability your answers in this study will remain confidential. We will not collect identifying information such as your name, email address or IP address. To help protect your confidentiality, the survey does not contain information that will personally identify you. All data will be securely stored on password protected electronic format and only accessible to the research team. The analysed results from the survey will be summarised in a Report and also used for scholarly purposes. No identifying information will be divulged.

What are the benefits of the research project? Please note the project may not be of any direct benefit to you or your organisation. This research may, however, lead to improved heatwave messaging that could help communities stay safe in extreme heat events.

1

Can I withdraw from the project? Participation in this project is completely voluntary. If you agree to participate, you can withdraw from the study at any time and your data will be removed and deleted from our database.

Who do I contact if I have questions about the project? If you have any queries about the research, please contact the Lead Researcher: Dr Scott Hanson-Easey, School of Public Health, The University of Adelaide; Ph (08) 83130160, Email scott.hanson-easey@adelaide.edu.au or Chief Investigator: Prof Peng Bi, School of Public Health, University of Adelaide; Ph: (08) 8313 3583; Email: peng.bi@adelaide.edu.au

What if I have a complaint or any concerns? The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2017-141). If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding a concern or complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

Phone: +61 8 8313 6028

Email: hrec@adelaide.edu.au

Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

Electronic Consent: Please select your choice below.

Clicking on the "yes" button below indicates that:

• you have read and understood the above information

• you voluntarily agree to participate

• you are at least 18 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the 'no' button

* 1. Do you agree to participate in the study?

○ Yes

○ No

Heatwave Survey

Your age

2. What is your age?

○ Under 18   ○ 45 - 59

○ 18 - 29   ○ 60+

○ 30 - 44

Heatwave Survey

2

Demographics

* 3. With which gender do you most identify?

- ○ Female
- ○ Male
- ○ Transgender Male
- ○ Transgender Female
- ○ Gender Variant/Non-Conforming
- ○ Not Listed
- ○ Prefer not to answer

4. How many years have you lived in South Australia?

[   ]

* 5. What is your postcode?

[   ]

Heatwave Survey

Heatwave information

In this section we are interested if, and how, you receive heatwave information.

* 6. Do you recall hearing or reading a warning or information about heatwaves?

- ○ Yes
- ○ No
- ○ Not sure

Heatwave Survey

Heatwave information

* 7. Which organisation(s) gave this warning or information?

[   ]

3

* 8. Again, when thinking about when you heard or read a heatwave warning or information, please tell us how this information got to you (Tick as many boxes as necessary).

☐ Internet   ☐ Friends and family

☐ Television   ☐ Smartphone 'app'

☐ Radio   ☐ Social Media i.e. Facebook; Twitter

☐ Newspaper

☐ Other (please specify)

[   ]

Heatwave Survey

Thinking about heatwaves

In this part of the survey, we will ask you some questions about how you think and feel about heatwaves, and how you cope when it gets very hot.

Please rate how you agree with the following statements

* 9. In summer, I worry about upcoming heatwaves.

○ Never   ○ Often

○ Rarely   ○ Very Often

○ Sometimes

* 10. Heatwaves present a danger to me

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 11. I have heard enough about how important it is to stay safe in heatwaves

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

4

* 12. In summer, there are too many messages about how to keep safe in heatwaves

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 13. Heatwave information rarely provides me with new information

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 14. Information about what to do in heatwaves is 'common sense', so I don't need to listen to it

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 15. Heatwaves mainly present a risk to young children and older people

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 16. During heatwaves, I use air-conditioning to keep cool at home

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disasgree

○ Neutral   ○ I don't have air-conditioning at home

* 17. During heatwaves, I often limit the amount of air-conditioning I use

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 18. When thinking of why you limit the amount of air-conditioning you use during heatwaves, please select from the list below (Select as many as needed)

☐ Don't think air-conditioning is necessary   ☐ Dislike air-conditioning

☐ The electricity costs of running the air-conditioner are too high   ☐ The air-conditioning unit does not work properly

☐ Other (please specify)

[   ]

5

* 19. Messages about heatwaves seem repetitive

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 20. I am tired of hearing about what I should and shouldn't do in a heatwave

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 21. It is important that heatwave warnings or information be made available to help people keep safe

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 22. Messages about staying safe in heatwaves are tedious

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 23. I wish I knew more about how to prepare for heatwaves

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 24. I think I am well prepared for heatwaves in the future

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

* 25. Heatwave messages remind me to change my behaviour to stay safe

○ Strongly Agree   ○ Disagree

○ Agree   ○ Strongly Disagree

○ Neutral

Heatwave Survey

Anything else?

26. Is there anything else you would like to say about heatwaves?

Heatwave Survey

You have finished the survey

Thank you for visiting our *Is it hot, yet?* survey. We appreciate your time.

Kind regards

Scott and the team