



COMMUNITY LEVEL INFLUENCE ON INDIVIDUAL BEHAVIOURS

FINAL REPORT FOR THE HUMAN BEHAVIOUR UNDER STRESS PROJECT

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1. Executive Summary

When bushfires occur, many of the people who confront them are ill prepared to take actions which would mitigate risk to life and property; others are well prepared. There also appear to be large differences between communities in their preparedness, as well as in other characteristics which may be important in determining property owners' perceptions of risk and their subsequent preparedness. As yet, there appears to be no systematic account of the nature of these community differences and what effect they have on individual preparedness. Nor has there been any concerted effort to disentangle individual characteristics from community influences.

The studies described in this report were designed to fill this gap and to identify those community characteristics which influence fire preparedness and danger management. By preparedness, we refer to actions undertaken by householders prior to the occurrence of a bushfire (i.e. where bushfire poses a distal, rather than immediate threat). In particular, we sought to examine the extent to which individuals are influenced by their local communities in their perceptions of risk and their judgments about their capacity to influence outcomes, as well as the subsequent impact this has on individual action.

The first study was a commissioned survey of residents' responses following bushfires in Western Australia in 2011. This assisted us in identifying community level variables related to people's preparation for bushfires as well as in refining our measures of fire preparedness. The second, qualitative, small-sample pilot study was designed to provide an in-depth study into how people think about bushfires and bushfire risk as well as how they prepare for such events. It also provided material to inform the design of the measures used in subsequent phases of the project. Two large-scale, quantitative studies of community and individual level predictors of fire preparedness were then conducted: one based in fire-prone communities in Western Australia; the other sampling similar at risk communities in three additional states: Tasmania, Victoria and South Australia. Both community and individual characteristics were measured using self-report questionnaires comprised of some standard measures (e.g. Social Capital and Place Attachment) and some devised specifically for this research project (e.g. perceptions of risk, fire preparedness).

Our approach was designed to enable us to study behaviour from a multilevel perspective (i.e. individuals embedded within communities) with a view to measuring the amount of variance in individual behaviour that is affected by community level variables. We employed a statistical technique (Hierarchical Linear Modelling) which allowed us to untangle the relative importance of community and individual influences on household preparedness.

Three main questions were addressed in the four studies which constitute this project:

- To what extent do community characteristics influence individual perceptions of risk and fire preparedness?
- How much variation in fire preparedness at the individual level can be explained by community characteristics as opposed to individual level characteristics?
- What combination of community level and individual characteristics best predicts preparedness?

Although our results showed clear differences between communities in all the samples and on many variables, the HLM analysis of data from the fire-prone Western Australian communities indicated that the actual contribution of community level variables to individual preparedness, although significant, was small; only the aggregated perceptions of the bushfire risk in the respondents' town was a significant community level predictor. Most of the differences between respondents in their preparedness were related to individual characteristics such as the location

of their property, home ownership, employment status, previous experience with fire and involvement with bushfire related organisations.

The second survey of 18 additional communities from Victoria, South Australia and Tasmania produced similar results. Again, HLM analysis revealed that community level influences were significant, but small in magnitude and that individual level characteristics predicted most of the variation in preparedness. Being retired, being involved in community preparedness activities and living on rural blocks were significant predictors. When individual-level variables derived from the Theory of Planned Behaviour were added, results showed that the better prepared were those who had favourable attitudes to controlled burning and those who reported stronger social norms to undertake bushfire preparation. Those who felt more capable of undertaking bushfire preparedness actions were also more likely to take them. Only one community-level variable, the 'Proportion of Respondents Involved in a Community Preparedness Activity' was a significant predictor: the greater the proportion of the community involved in community preparedness activities, the greater the overall level of preparedness.

The results from Western Australia suggest that communities may develop shared perceptions of risk which, when high, predict the amount of preparation undertaken. In addition, the national data show that a high degree of community involvement in preparedness activities like community meetings, information sessions and the volunteer bushfire brigades also generate higher levels of preparation in any community. They also confirm that individual preparedness is influenced by greater levels of participation in community organisations, like bushfire ready groups, an experience which seems to induce people to better prepare their own properties as well as taking part in community actions (Shiralipour, Monroe, Nelson, & Payton, 2006). These findings are consistent with research which shows that local knowledge of bushfires and a history of bushfire experience within communities influence both risk perception and trust that preventive measures make a difference (Blanchard & Ryan, 2003; Bushnell & Cottrell, 2007b). The results also show that where community members are aware of social norms which highlight the importance of preparedness, they are more likely to prepare.

Bushfire mitigation policies based on these findings should incorporate strategies which facilitate participation in community bushfire organisations, elevate perceptions of fire risk within communities and reinforce social expectations (norms) that preparedness actions will be and should be carried out.

Key findings

Initial investigations: post-fire questionnaires (Chapter 4)

1. Data supported the existence of community level differences in bushfire preparedness.
2. Residents in the best prepared areas also reported higher perceptions of bushfire risk than residents of the other two surveyed communities.
3. Community preparedness was also associated with the degree to which members of the community were involved in local 'bushfire ready groups'.

Survey of fire prone communities in Western Australia (Chapter 7)

Differences between fire prone communities (urban fringe and rural)

1. The ten communities differed significantly in fire preparedness.
2. There were also significant differences between communities in:

- social capital, which was lower in urban fringe communities than in rural communities;
 - aggregated perceptions of bushfire risk to town or suburb;
 - average length of residence in the town or suburb;
 - the proportion of those reporting previous experience with bushfires;
 - the proportion of the community involved in bushfire relevant organisations;
 - the proportion of residents who were aware of their properties having been inspected for compliance in the previous five years; and
 - their level of confidence in their local government;
3. Place Attachment was consistently high, but there were no significant differences between communities.

Relationships between community and individual characteristics and preparedness:

1. Respondents on urban fringe residential properties were significantly less well prepared than those on both large and small rural properties.
2. The unemployed were the least prepared, while the retired were the best prepared.
3. Home owners were significantly better prepared than renters.
4. Respondents who had been affected by fire within the previous two years were the best prepared.
5. Increased involvement in community bushfire related organisations predicted personal preparedness. Those people who took part in such organisations were also more likely to report having had experience with bushfire.
6. There was *no* association between high confidence in government and preparedness.

Hierarchical Linear Modelling

1. Hierarchical Linear Modelling showed only a small but statistically significant variation in preparedness attributable to community level differences.
2. Of the three community level variables entered into the Hierarchical Linear Model, only the aggregated perceptions of the bushfire risk to the respondents' town was a significant predictor of individual preparedness.
3. Neither the amount of Social Capital nor the proportion of properties inspected by local government within communities predicted preparedness.

Survey of fire prone communities in South Australia, Victoria and Tasmania (Chapter 8)

Community differences:

1. There were significant differences in preparedness between the 18 communities.
2. There were also significant differences between communities in:
 - the perceived quantity of bushland in their local government area;
 - Social Capital scores, which also differed between States and were strongly associated with place attachment to the area;
 - Place Attachment scores;

- aggregated risk perception: both in perceived risk to the area and to personal property;
 - the degree of confidence in responsible fire agencies ; and
 - the proportion of people involved in community preparedness activities.
3. There were no apparent differences between States or between communities in the proportion of people who reported having had their properties inspected for compliance with bushfire regulations.
- More residents in South Australia reported receiving bushfire education materials than residents in Victoria and Tasmania.

Variables correlated with preparedness:

1. Those on larger blocks were better prepared.
2. Occupation predicted preparation: retirees were the best prepared.
3. There was a small, but significant correlation between length of residence and the level of preparedness.
4. People's attachment to their homes (and both place dependence and place identity) predicted preparedness.
5. Those who had previous experience with bushfire were more likely to perceive a higher risk of bushfire and to be better prepared than those who had not had such experience.
6. Those who had attended information meetings and/or community safety meetings related to fire in the previous two years were better prepared than those who had not.
7. People who reported having had their property inspected for compliance with fire regulations were significantly more prepared than those who had not.
8. Those who reported having been involved in community preparedness activities – community safety groups, brigades, management committees – were better prepared.
9. People who judged the education materials to be high quality had more confidence in fire agencies and were better prepared for bushfire.
10. Where the level of inspection of fire preparedness by responsible authorities was reported as high, residents were better prepared.
11. Respondents' perceptions of risk were strongly related to their judgements about the amount of bushland in their community and their proximity to bushland.

Hierarchical Linear Modelling

1. Hierarchical Linear modelling showed that a small but significant proportion of the variance in individual preparedness lies between communities.
2. When individual variables were entered into the model, the results showed that being retired, being involved in community preparedness activities and living on rural blocks predicted preparedness. Being previously affected by bushfire did not quite reach significance.

3. When individual-level predictor variables derived from the Theory of Planned Behaviour were included, results showed that:
 - respondents who viewed controlled burning favourably were better prepared;
 - those who felt more capable of undertaking bushfire preparedness actions were *more* likely to undertake preparedness actions; and
 - those who reported stronger social norms to undertake bushfire preparation were more likely to undertake such actions.
4. Only one community-level variable, the 'Proportion of Respondents Involved in a Community Preparedness Activity' was a significant predictor of community-level variance; the greater the proportion of the community involved in community preparedness activities, the greater the overall level of preparedness.

2. End User Statement

Some communities or localities have always seemed to prepare more for bushfire threat than others.

This research team set out to investigate why, delivering probably the first quantitative study of its type conducted in an Australian context.

Involving four separate but related studies (both qualitative and quantitative), the large-scale project was undertaken over two years in 28 bushfire-prone communities across four states: Western Australia, Victoria, South Australia and Tasmania.

The findings show that bushfire preparedness is largely driven by individual factors, rather than by community level influences. These individual factors include the influence of perceived social norms (for example, that fire preparation is expected by others), as well as previous experience with fire and heightened risk perceptions. Only one community level variable, the proportion of people involved in a community-based bushfire preparedness activity – was a predictor of bushfire preparedness.

The results underline how community and householder information needs are different in relation to bushfire preparedness. Importantly, they offer meaningful insights into how we can tailor and target messaging and information to individual householders, the level at which decisions are typically made about how and when to prepare for bushfire threat.

I commend the researchers for this large-scale national study and, in particular, for adopting a 'multi-level' approach to disentangle individual characteristics from community influences. The research findings better inform how we communicate risk and influence the behaviour of people living in bushfire-prone areas.

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3. Communities and Bushfire Preparedness: A Background

3.1. Introduction to the Problem

Bushfires are a constant threat in many parts of Australia and have resulted in devastating loss of life and property. As well as widespread displacement and relocation of populations they also cause: long-lasting psychological problems in affected communities; loss of stock, forests and agricultural equipment; changes in the demographic structure of communities and ecosystems; damage to and loss of income from businesses; and destruction of individual and community assets, including prized heritage (Baker, Hunt, & Rittenburg, 2007; Beale & Jones, 2011; Claro, 2010; Dass-Brailsford, 2008; El Morjani, Ebener, Boos, Ghaffer, & Musani, 2007; Elsworth, Gilbert, Rhodes, & Goodman, 2009; Krum & Bandeira, 2008; Levine, Esnard, & Sapat, 2007; McFarlane, Clayer, & Bookless, 1997; Tibbits & Whittaker, 2007). Of all the natural disasters in Australia, bushfires have resulted in the greatest loss of life - 552 recorded civilian deaths between 1900 and 2008 (Beatson & McLennan, 2011; Bianchi et al., 2014). In the Victorian bushfires in 2009, Australia's worst natural disaster since Federation, 173 lives were lost, over 2000 homes were destroyed, about 6000 households were significantly affected and thousands more were seriously disrupted (Australian Government, 2010; Whittaker & Handmer, 2010).

In recent years, the risk from bushfires has increased due to severe droughts, higher than average temperatures, urban expansion into semi-rural areas and increased housing construction in rural areas at bushfire risk. These risks are likely to accelerate even further with increases in population, increased "tree-change" (amenity) migration and global warming. The newness of some of the urban fringe communities and the "hollowing out" of some rural communities, which have an increasing proportion of non-residents, might well be contributing to an alleged decline in community capacity to prepare for and respond to bushfires and other threats. Aronsson (2004), for example, argues that the degree of mobility in today's world is undermining traditional community values, including people's attachment to place; this matters because research also shows that those who are only weakly attached to their communities are less likely to participate in community life through volunteering, fundraising, or environmental conservation (Brehm, Eisenhauer, & Krannich, 2006; Kelly & Hosking, 2008; Mishra et al., 2010).

Recognition of these elevated risks has prompted research into the factors that influence the capacity of people and communities to prevent and/or respond effectively to natural disasters such as bushfires (Moritz & Stephens, 2008; Paton, Sagala, et al., 2010; Renaud, Birkmann, Damm, & Gallopin, 2010). The realisation that the demands on formal fire-fighting resources far outstrip their capacity to fight large scale fires has also prompted research into how community-based mitigation and preparedness can be better harnessed to reduce fire risk (Schoch-Spana, Franco, Nuzzo, & Usenza, 2007). Natural disasters often expose major gaps in the social organisation of communities and the quality of emergency management, particularly in relation to the extent that community members are engaged in prevention and response (Langer, 2004; McCabe, Barnett, Taylor, & Links, 2010). Breakdowns occur in government agencies, community services, and neighbourhood networks, and in how they work together. The community safety model, which has developed out of this understanding, proposes that effective preparation and response require all sectors of the community to work together (De Marchi, 2007; Donner & Rodriguez, 2008; Duxbury & Dickinson, 2007; Elsworth et al., 2009; Glavovic, 2008; Hunt, 2009; Levine et al., 2007).

While government fire services agencies and resources are expected to be deployed to respond to bushfires, there is a growing expectation that residents in fire-prone locations should also assist by accepting some responsibility and taking actions which reduce the likelihood of fire and fire damage

prior to the occurrence of the bushfire. As Killalea and Llewellyn (2010) argue, “managing risk and reducing loss is a shared responsibility between government, communities and individuals” (p.1). For example, local governments require householders to reduce the fuel load around their homes, maintain fire breaks and facilitate access for fire trucks by providing enough space for turn-around in the event of fire. To design effective fire mitigation and response programs, it is obviously important to understand how people conceive of the fire problem and what influences their efforts to reduce risk or their failure to do so. Throughout this report, we focus on the threat of bushfire as being a distal threat; likely to occur at some point in the future, but not an immediate danger. While there are undoubtedly actions householders can undertake on the day of an actual fire, preparedness as it is discussed here refers to those actions (including planning behaviours) that are undertaken in advance of an immediate threat.

Despite bushfires occurring regularly, and widespread publicity and targeted education about bushfire risks, many exposed households still fail to undertake the recommended actions to mitigate fire risk, although they do appear to recognise the risk to which they are exposed (Cottrell, 2009; Killalea & Llewellyn, 2010; Paton, Tedim, Buergelt, & Johnston, 2010; J. Sutton & Tierney, 2006). It also appears that the capacity of communities to prepare for and respond to bushfires is limited and precarious (Agani, Landau, & Agani, 2010; Cottrell & King, 2007). This was particularly evident in analyses of community responses to the Victorian bushfires (Beatson & McLennan, 2011; Cottrell, 2009).

As previously mentioned, it has been argued that at the same time as there has been increasing exposure to natural hazards and an escalation of the economic and psychological costs of these hazards, people’s access to collective resources has diminished and the community capabilities needed to deal with adversity and to manage risk have deteriorated. These changes have generally been ignored in the preparedness literature which has largely neglected examination of the role of the community-individual relationship in influencing the type and extent of preparedness. In addition, while there has been an increase in the attention paid to research and policies which improve disaster prevention (e.g. De Marchi, 2007; Donner & Rodriguez, 2008; Duxbury & Dickinson, 2007; Elsworth et al., 2009; Glavovic, 2008), a good deal of this effort has been directed at the adequacy of physical infrastructure and fire agencies and much less to the social systems within communities and how they might provide a foundation for improving disaster preparedness. Consequently, there is a need to research how community-level activities inform preparedness actions at household and individual levels. Failing to pursue this line of inquiry increases the risk of a poor return on investment in risk management and an increasing risk that hazard events will exceed local capacities and become disasters (Fairbank & Jakeways, 2007).

3.2. Preparedness

Bushfire preparedness has been conceptualised as a decision making process that includes both physical and psychological components. The disaster management literature suggests that people need to be physically and psychologically prepared to cope with the complex and uncertain nature of bushfires (Morrissey & Reser, 2003). Physical preparedness usually refers to the actions that are taken to reduce the risk from bushfires, while psychological preparedness refers to the cognitive processes and capabilities that influence the way people think, feel and behave when they are faced with the need to prepare for and respond to a bushfire (Bender, Martin, & Raish, 2006). The focus in this investigation is on physical preparedness.

Homeowners living in fire prone areas are usually given advice by State and local government agencies about a) what they are required to do by law and b) what is advisable to do to prepare for a bushfire so as to reduce the risks to their lives and properties (home, pets and livestock). Some researchers have categorised these recommended behaviours according to their function e.g. mitigation,

preparedness and planning (Paton & Johnston, 2008). Others have classified them by reference to “temporal proximity to the fire, level of occurrence, difficulty, and the requirement for social interaction and dependency on others” (Beatson & McLennan, 2011, pp 6).

These distinctions indicate that physical preparedness should be treated as a multidimensional concept, taking account of the fact that all preparedness actions are not equally important in reducing risk and may be influenced by different psychological and social factors (Paton & Johnston, 2008). For example, an individual who reports that they have completed a number of low impact actions (e.g. obtaining a metal bucket) may receive a high score on measures of preparedness which simply count all the actions taken, even though they have undertaken few of the difficult, high impact actions (e.g. clearing and maintaining a defensible space around their homes) that may well render the property significantly safer. Paton and Johnston (2008) also argue that in order to determine whether a person is well-prepared, the importance (impact) and hierarchical interdependence between the actions need to be considered. For example, if an alternative water source is not available in the event of fire, then the initiation of other protective behaviours may well be hindered by the lack of water.

Fire preparedness is not a single behaviour but a complicated set of attitudes and behaviours in which community level factors, although difficult to capture, are certainly implicated, both through their influence on individual decision making as well as via joint community actions.

3.3. Community

Although ‘community’ has re-emerged as a focus in discussions about disaster management (and other social problems), it is rarely defined with any specificity, despite the fact that, as Sampson (2004) has noted, community building has become a “modern elixir” for curing our ills. In the literature, the term ‘community’ is usually used to describe a range of overlapping social units that serve as a *‘focus of social activity’* (Dynes, 1998, pp 113) and/or of shared identity. In the context of bushfire preparedness, the word ‘community’ is generally used to delineate the population living within the bounds of a town or local government area, which is considered to be exposed to a relatively high degree of environmental hazard risk. However, it is important to remember that communities are constantly changing and, rather than being discrete, isolated entities, they are also affected by wider regional and national influences (Mohan & Stokke, 2000).

Geographic definitions of community are amongst the most common in the literature on natural disasters, referring at their simplest to the co-location of a group of people (Robertson, 1987). While we agree with Buckle (1999) that such definitions are not comprehensive of all types of community, we consider that they are the most relevant to studying natural disasters which are, in most cases, geographically bounded. The definition of ‘community’ employed throughout this work is linked to the purpose of the study: to investigate and explain what causes the differing preparedness levels between geographic locations. Earlier research in W.A (Chapter 4) has revealed that some locations are well prepared, while others are not – in some cases the well and poorly prepared sit side by side. Given our research aim, our definition of ‘community’ is necessarily geographic in nature. While we acknowledge that each individual sits in what Marsh and Buckle (2001) call a mosaic of communities, including communities of interest, communities of economy as well as communities of geography, such communities will not be a focus in this research

Our first (Western Australian) study investigates geographic communities at the level of the Local Government Area, since local governments in Western Australia usually have the primary responsibility for fire management and mitigation. Individuals within a local government area typically receive similar preparedness advice, have access to similar community preparedness programs, and will be subject to the same bylaws regarding the management and preparation of their properties. Since differences in the vigilance of local governments in fire preparedness is a key variable of interest,

segmentation at this level was essential. For example, Interviews conducted by the UWA School of Psychology CRC team following bushfires in W.A. showed big differences in the number of preparatory actions taken by people in different local government areas, particularly between those in urban fringe, semi-rural and rural householders.

Communities differ too in how seriously they take fire risk, how well informed about they are about what should be done to reduce fire risk and how to respond in the event of fire. Brenkert-Smith, Champ, and Flores (2006), for example, conducted a series of interviews in fire prone areas of Colorado and noted that communities differed in how they approached wildfire risk. In one community, the emphasis was on prevention and residents undertook mitigation strategies such as reducing the fuel load; another focused mainly on fire response, organising a community communications system and developing liaisons with the local fire brigade.

We do not yet have a comprehensive account of how or why such community differences exist, how they influence individual and household perceptions of fire risk and the willingness of community members and organisations to undertake fire mitigation actions. Such knowledge is clearly crucial to improving fire readiness and reducing risk. Nonetheless, qualitative studies of fire affected communities, research in other content domains and expert observations indicate that there are numerous factors at the community level which may influence risk perception and danger management (Brenkert-Smith et al., 2006; Bushnell & Cottrell, 2007a; Gavilanes-Ruiz et al., 2009; Jakes, Kruger, Monroe, Nelson, & Sturtevant, 2007; Sagala, Okada, & Paton, 2009). These include the strength and density of community networks; how agencies in the community (e.g., the local fire brigade) and community members share relevant information and resources; how “embedded” these agencies are in the local community and how much they are trusted; the nature of the local culture and climate of opinion about fires and fire preparedness; and the role of community leaders and leader organisations in shaping attitudes and behaviours. Interestingly, in the post-fire interviews in W.A described above, those people who reported the highest levels of preparation were the ones most likely to have relied on community information sources, such as fire brigade officers, and to have attended community meetings. Structural characteristics such as demography (age profile, SES) and physical location (rural, peri-urban) are also known to influence individual preparedness, although their relationship to community level characteristics is less well understood. Understanding the interplay of these factors is important in accurately portraying the profile of a well prepared and resilient community and in devising appropriate interventions to improve preparedness and to minimise the adverse consequences of bushfires.

Although many investigators argue that the nature of the community is important in predicting and understanding effective risk mitigation, especially as it relates to wildfires, the research literature is not extensive. Unlike the voluminous research in epidemiology and criminology (Kawachi, Subramanian, & Kim, 2008; Sampson, Morenoff, & Gannon-Rowley, 2002), systematic analysis of the separate effects of individual and community characteristics (or their interaction) is rare in the literature on disaster preparedness. There appear to be two main approaches in the relevant literature to understanding such differences: on the one hand, a focus on the importance of the actions of individuals and on the other a focus on the importance of community level actions including zonings, policies, and the investment in fire suppression equipment. However, little research has evaluated the interplay between the two. Too often, research investigating vulnerability has studied variables specific to individuals that expose them, as individuals, to risk. These variables include the age, poverty, social isolation, disability, and racial or ethnic background of an individual (Buckle, 1999), each of which influences the degree to which that individual undertakes preparedness activities on their property, and the subsequent risk to which they and their properties are exposed. These variables are, however, superficial in that they treat the individual, or at best the household, as an isolated unit, uninfluenced by the social system in which they live. Studies of these variables, while

important to bushfire risk management, fail to investigate the context of the community within which individuals live including the collectively held perceptions of risk, normative expectations of behaviour and legally mandated actions required of a household.

3.4. Interactions between Individual and Community Level Influences

While individual-level variables have received considerable attention in the preparedness research, this has sometimes been at the expense of understanding the diverse and complex social, environmental and community influences on individual preparedness decisions (Brenkert-Smith, Champ, & Flores, 2012; Gavilanes-Ruiz et al., 2009; Sagala et al., 2009). Variations in levels of individual preparedness are likely to result both from those characteristics and experiences unique to a particular individual (Spittal, 2003) as well as from the shared experiences of living in a particular community. Assessing the risk of an objective hazard and how to deal with it, for example, is a complex process (Sjoberg, 1999), shaped by both social and individual forces (Bushnell, Balcombe, & Cottrell, 2007; Gavilanes-Ruiz et al., 2009; Johannesdottir & Gisladdottir, 2010). At an individual level, acting on information about risk can be constrained by everyday demands such as health conditions, family well-being, and limited finances (López-Marrero & Yarnal, 2010; McIvor, Paton, & Johnston, 2009). Equally, how community members interpret risk, and how they choose to respond to that risk, is influenced by the views of other community members (Lion, Meertens, & Bot, 2002) and the wider public.

In the psychological literature, individual characteristics predictive of disaster preparedness include numerous cognitive factors, such as intentions, locus of control, problem-focused coping, self-efficacy, hazard anxiety, critical awareness, perceived risk, perceived responsibility, resource efficacy, and outcome expectancy (Bender et al., 2006; e.g. Lindell & Perry, 2000; McClure, Walkey, & Allen, 1999; Paek, Hilyard, Freimuth, Barge, & Mindlin, 2010; Paton & Johnston, 2008). While this is not an exhaustive list, it does point to the fact that psychological factors are crucial in understanding preparedness. For example, there is evidence to suggest that greater perceptions of risk and critical awareness, along with moderate levels of anxiety, increase the motivation to prepare for natural disasters (e.g. Duval & Mulilis, 1999; Paton, Smith, & Johnston, 2005). Evidence also suggests that people with a greater sense of their self-efficacy (their perception of their ability to carry out relevant actions) and those who possess a problem-focused coping style and internal locus of control (the perception that they have control over their actions), are more likely to prepare (e.g. Duval & Mulilis, 1999; Sattler, Kaiser, & Hittner, 2000; Spittal, 2003). Research using the framework of the Theory of Planned Behaviour (TPB) also indicates that people are more likely to prepare when they expect positive outcomes from their actions and when they believe they are responsible for preparing and have the necessary resources to do so (e.g. Basolo et al., 2009; Bender et al., 2006; McIvor et al., 2009). TPB provides a useful framework for examining the individual and contextual predictors of behaviours like bushfire preparedness, which is the subject of this research.

Highlighting the complex interaction between individual and community variables is the fact that such attitudes can be powerfully influenced by social factors such as media coverage which, in addition to transmitting crucial local knowledge about community safety (Cohen, Hughes, & White, 2007), frames information in ways that shape general perceptions of risk and views about appropriate preparation (Cohen, Hughes, & White, 2006; De Marchi, 2007; Perez-Lugo, 2004). For example, coverage which emphasizes government responsibility and downplays individual and community' responsibility may have the effect of reducing people's willingness to look after their own safety (Barnes et al., 2008).

The relationship between people and the natural and physical environment in which they live is a particularly important, if obvious, community influence on preparedness (Jakes et al., 2007). For example, factors such as weather, topography, vegetation and fuel load are all significant (Blanchi,

Leonard, & Leicester, 2006; Priyanka, 2009). The geographical location of a community (Cottrell, 2005; Hess, Malilay, & Parkinson, 2008; Mendez et al., 2003), land-use and infrastructure planning are also relevant in understanding preparedness (Blanchi et al., 2006; Comfort, 2006; Glavovic, 2008; Glavovic, Saunders, & Becker, 2010a, 2010b). Locality may also create specific expectations and beliefs which are broadly endorsed within a given community (Bushnell & Cottrell, 2007a), and these may vary depending on characteristics such as the importance of tourism, the proportion of absentee landlords and fly in and fly out workers, as well as geographical remoteness (Calgaro & Lloyd, 2008; Fowkes, Blossom, Anderson, & Sandrock, 2007; Margolin, Ramos, & Guran, 2010).

Local knowledge of bushfires and a history of bushfire experience, woven into the fabric of community life, appear to influence both risk perception and trust that preventive measures make a difference (Blanchard & Ryan, 2003; Bushnell & Cottrell, 2007b). Historically developed distrust (e.g., previous problems with burns that got out of control) can interfere with disaster preparedness (Quinn, 2008; Rees, Pittaway, & Bartolomei, 2005). The significance of local history is usually lost on new residents since they do not, initially at least, have access to the social networks which provide such information (Mendez et al., 2003). Research suggests that both individuals and communities learn crucial lessons from previous disasters and make appropriate adjustments in their preparation (Brody, Zahran, Highfield, Bernhardt, & Vedlitz, 2009; Moore, Trujillo, Stearns, Basurto-Davila, & Evans, 2009; Reyes, 2010). Conversely, Ballantyne, Paton, Johnston, Kozuch, and Daly (2000) found that some people responded to information about civic and scientific agencies undertaking hazard monitoring to reduce risk in their area by intending to undertake *less* preparation in the future. It seems that if people perceive that the environment is safer, they may see less risk and thus reduce the protective measures they are prepared to undertake (Adams, 1995)

It is likely that individual preparedness is influenced in crucial ways by the activities and effectiveness of emergency management agencies, non-government organisations, schools, neighbourhood networks, and businesses. How effective these agencies are in influencing individual preparedness decisions has been argued to depend on their ability to understand and accommodate the diversity of views within communities about bushfire risk and appropriate preventive action (Bushnell et al., 2007). Governments at all levels play a central role in preparing for, responding to and recovering from hazards (Park & Millar, 2006; Preston, Brooke, Measham, Smith, & Gorddard, 2009; Schouten, Callahan, & Bryant, 2004). They also influence the communication flow through organisations, agendas, and the development of knowledge and technology (McCaarthy, 2007). Equally, their own actions to reduce bushfire risk may provide visible models, for good or ill, of what are considered desirable and effective actions. Government agencies can also deliberately seek to influence community preparedness by designing and practicing emergency management plans, educating citizens, conducting vulnerability assessments and enforcing vegetation management by-laws. They may also facilitate participation in neighbourhood organizations, like bushfire ready groups, an experience which seems to induce people to better prepare their own properties as well as taking part in community actions (Shiralipour et al., 2006).

Several demographic characteristics are also known to influence the likelihood that people will successfully undertake preparatory action. For example, people who are physically or psychologically disabled, the elderly, those on low incomes and those with chronic health conditions face greater challenges in preparing and responding to fire. Housing ownership and length of residence (Spittal, 2003; Zhang, 2010; Zhang & Peacock, 2010) also introduce diversity into preparedness decisions. It is important to note that while these may be construed as individual variables, communities composed of a disproportionate number of individuals from a particular category of an individual variable (e.g.. retirees from the category of employment status) may cause community level differences in preparedness.

3.5. Selected Community Level Variables

There are clearly many possible dimensions along which communities vary and which may influence individual preparedness. On the basis of a comprehensive literature review and the interviews undertaken in the qualitative phase of the study (Chapter 5), we selected four community attributes as suitable candidates for further study: Social Capital, Place Attachment, aggregated perceptions of risk and the vigilance of local government in enforcing by-laws relevant to bushfire prevention.

As indicated above, empirical studies suggest that some variations in the decision to prepare may be the result of social influences (e.g. Basolo et al., 2009; Patterson & Weil, 2010) which, in turn, produce differences between communities in overall levels of preparedness. Strong social networks are important because they may provide greater access to information and resources, as well as influencing the decision to prepare through shared social norms (Bates, Quick, & Kloss, 2009; DiGian, 2005). Social factors which have been found to influence preparedness include: sense of community, community bondedness, place attachment, community participation, social networks, community norms, subjective norms, trust, empowerment, and collective efficacy (e.g. Bates et al., 2009; McGee & Russell, 2003; Paton & Johnston, 2001). For example, people often seek to find out what people similar to themselves are doing (Norris et al., 2002) and make decisions about what to do after to interacting with others (Mileti & O'Brien, 1993). There is some evidence that informal interactions between neighbours may lead to joint mitigation efforts (Brenkert-Smith, 2006), resulting in a better prepared community. However, we still know relatively little about how social networks and interactions affect levels of preparedness. What research there is indicates that the quality and number of social relationships within communities influence the success of response and recovery *following* disasters (e.g. Buckland & Rahman, 1999; Comfort, 1999; Hurlbert, Haines, & Beggs, 2000; Zhao & Dalen, 2006¹ and others), although we know little about the mechanisms that underlie positive outcomes and whether they apply to preparedness as well. Many of these characteristics may be usefully captured by the concept “social capital” which can vary in both level and type.

Social Capital

The literature on social capital offers a means of understanding whether and how individuals' relationships with one another influence them to undertake actions which reduce the risk of and damage from disasters. While the academic – and general - literature which relies on the concept of social capital is prolific and the research linking social capital and a variety of outcomes abundant, social capital is not precisely defined nor are the causal pathways and mechanisms well delineated or understood. In an attempt to capture the key elements of the concept, the OECD has defined it as “*networks together with shared norms, values and understandings that facilitate co-operation within or among groups*”¹. This mirrors the approach taken by the sociologist Robert Putnam (1995) who defines social capital as those “*features of social life – networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives*” (64-65) and that of Neil Adger (2003) who similarly argues that, “*At its core, social capital describes relations of trust, reciprocity, and exchange; the evolution of common rules; and the role of networks*” (p 389). According to this conception, a community rich in social capital will have effective civic institutions which ensure greater prosperity and order (Putnam, 1992); social capital is seen as “*a collective dimension of society external to the individual*” (Lochner, Kawachi, & Kennedy, 1999), potentially providing an explanation of how people use their relationships with one another for the collective good. It is a collective concept, measured using either aggregate variables that combine individual responses or integral variables describing neighbourhoods or communities.

¹ <http://www.oecd.org/insights/37966934.pdf>

It is possible to categorise social capital as having two major dimensions: the structural aspects of social relations (e.g. size, density, type of networks) and the quality of social relations (norms of trust and the reciprocity arising from them, including exchanges or favours that people do for one another). These dimensions are sometimes characterised in terms of whether social capital performs a bonding, bridging or linking function². For example, Hawkins and Maurer (2010) tracking the recovery of 40 families from Hurricane Katrina, found that bonding social capital, indicated by close ties, predicted the level of support available immediately following the hurricane, while bridging and linking social capital were important in “longer term survival and wider neighbourhood and community revitalization” (p 1777).

Most of the current work on social capital stresses the importance of social networks, reciprocity and interpersonal trust in allowing individuals and groups to accomplish more than they could by acting in isolation. Research has linked social capital to positive outcomes in a variety of areas such as schooling and education, the quality of community life, work and organizations, democracy and governance, collective action and economic development (Brunie, 2009; Grootaert & van Bastelaer, 2002). Conversely, the absence of social capital has been linked to community deterioration (Sampson, 2004) and poor public health (Lochner et al., 1999). The beneficial effects of social capital appear to derive from the support and skills provided by dense and varied social networks based on trust and a willingness to participate in community activities and solve common problems. The spread of information and community expectations is also facilitated by the networks which underpin social capital – people talk to one another.

Although developed in a vastly different setting than fire preparedness, Sampson’s work on social capital, collective efficacy and community safety provides some useful insights into the likely impact of community characteristics on fire preparedness. Investigating disadvantage and crime in the neighbourhoods of Chicago, Sampson (2004) argued that community social capital should be thought of, not as the aggregation of individual characteristics but as the properties which emerge when certain conditions are present. He identified and measured four key indicators of “social capital”: Social Ties or Networks, Collective Efficacy, Organizational Involvement, and Conduct Norms. His concept of “collective efficacy” emphasised shared beliefs in a community’s capability for action to achieve an intended effect and captured the link between trust and shared expectations for action. Norms, defined as shared attitudes and behaviours, shape perceptions of events and threat conditions and set expectations about the right responses to these conditions. Research findings on the influence of cultural norms on the decision to adopt preparedness behaviours (e.g. Bates et al., 2009; Hausman, Hanlon, & Seals, 2007; McIvor et al., 2009) support this analysis. In the context of bushfires, communities where everyone is expected to prepare typically have higher levels of preparedness (Paek et al., 2010).

Sampson argued that a community’s efficacy exists in relation to specific tasks, such as maintaining social order (or preparing for bushfires). In several of his studies, residents were asked about the likelihood that their neighbours could be counted on to take action under various scenarios, ranging from children truanting to budget cuts to the local fire station. His “cohesion” measure consisted of items which capture local trust, willingness to help neighbours and shared values. In his research, after controlling for a wide range of variables, collective efficacy was associated with a 40% reduction in crime rates. He further argued that dense social networks are important because they foster the conditions under which collective efficacy may flourish.

² *Bonding* social capital - relationships amongst members of a network who are similar in some way

Bridging social capital - relationships amongst people who are dissimilar in a some way, such as age, socio-economic status, race/ethnicity and education.

Linking social capital- - relationships across group boundaries, often with those who provide access to services, jobs or resources.

It is important to note, however, that despite the conceptualisation of social capital (however it is defined) as a collective construct (Kawachi et al., 2008), it is usually measured by aggregating individual perceptions, based on survey questions, to a spatial scale, such as a neighbourhood or community. This inevitably raises the question of whether spatial differences in social capital levels can accurately be attributed to collective experiences at the neighbourhood level (contextual effects) or to compositional effects (the characteristics of individuals that constitute neighbourhoods). Recent research in epidemiology (see Mohnen, Groenewegen, Volker, & Flap, 2011), for example) has applied the technique of “ecometrics”, advocated by Raudenbush and Sampson (1999), to partition between-community differences in social capital into individual, community and test effects.

Unlike many other researchers, Sampson also examined the role that formal and informal organisations (including local government and other service providers) play in the community, highlighting the importance of connections between residents and such organisations in achieving agreed goals. As he pointed out, “communities can exhibit intense private ties (e.g. among friends, kin), and perhaps even shared expectations for control, yet still lack the institutional capacity to achieve socially desired outcomes “. His own long term studies show that strong institutional structures and working trust among organizations help sustain the capacity for collective action. These observations are potentially very important in improving fire preparedness and response – if communities do not trust the organisations dedicated to preventing and managing fires and these organisations do not trust one another, then community and household preparation is likely to be compromised. In bushfire research two dimensions of efficacy appear to be important: the extent to which community members believe they are collectively able to respond to fire threat and the extent to which they believe they are generally competent, regardless of the type of challenge.

Evidence in the disaster literature on the role of social capital in influencing preparedness is scarce. While it has been recognised that high levels of social capital might predict which communities are able to respond to and recover from disasters (Dynes, 2002), it is less clear what role social capital actually plays in shaping disaster preparedness. High social capital, measured by strong social networks, high levels of trust among community members and high levels of civic and voluntary participation, has been claimed to affect both the sharing of information and the setting of norms for appropriate behaviour. Hausman et al. (2007), for example, investigating preparedness among Philadelphia residents for natural disasters and terrorist events, found that the more social capital in the community (as measured by items assessing community participation and involvement, the extent of social networks, trust and reciprocity), the more prepared was the respondent’s household. The level of social capital was also related to concern about terrorism – the higher the capital, the greater the concern, indicating perhaps that those with strong networks were also more susceptible to fear-based communications from friends and neighbours. Extrapolating these results to the context of bushfire preparedness, strong networks might be expected to predict higher perceptions of risk.

In a study of household emergency preparedness for cyclones in Dominica, Brunie (2009) examined people’s awareness of appropriate protective measures, their knowledge of evacuation procedures and their familiarity with response agencies. She found that the degree of relational social capital, defined as the useful resources (including information) available to people through their social networks, influenced household awareness and preparation. It seemed that participation in many, rich networks with people of varying backgrounds enabled people to engage in informal discussions on natural disasters and on preparedness. The author argued that such discussions were important to filter, legitimise, supplement and even substitute for information received from other sources – including the media and official agencies.

There may, of course, be a downside to this, as illustrated in a study by British researchers (Wolf, Adger, Lorenzoni, Abrahamson, & Raine, 2010) on the effectiveness of programs to reduce the vulnerability of the elderly during heat waves. They found that those with strong networks sometimes ignored advice because they reinforced one another in overestimating their resilience – and underestimating their age – “I’m not old!” In fact, very tight, close knit groups may lead to the exclusion of certain people and create pressures to conform which make the adoption of new ideas and practices very difficult.

A survey of residents in fire-prone areas of Florida reported more positive outcomes. Those people who perceived greater social capital in their community were the ones most likely to take steps, including clearing vegetation, to reduce wildfire risk and to participate in wildfire education programs. The same people were also the most likely to report that talking to friends and neighbours and community leaders has influenced their decisions to undertake risk mitigation strategies (Agrawal & Monroe, 2004). Although they did not specifically measure social capital, McGee and Russell (2003) also found that residents in an Australian country community who had strong community networks (typically those who had lived there the longest) were better prepared, in part because bushfire preparedness was regularly discussed in their networks. In a study of earthquake preparedness and awareness in California, Turner, Nigg, and Paz (1986) similarly found that informal discussions affected a range of preparedness outcomes including awareness of hazards, attention to earthquake predictions, fear, whether predictions are taken seriously and the extent of personal and household preparedness.

One of the most systematic and comprehensive investigations into social capital and fire preparedness is that of Bihari and Ryan (2012) who surveyed six fire-prone communities in the U.S., measuring various dimensions of social capital and indices of preparedness. They showed that those who perceived greater social capital in their community were the ones who prepared most thoroughly, clearing vegetation, thinning trees and planning for evacuation. Such people also indicated greater support for fuel reduction policies and were more likely to share information about wildfires and to engage in community planning to reduce bushfire risk and respond to disasters. In Australia, Paton and his colleagues have undertaken several surveys which also show that household intention to prepare for fire depends in part on community participation and collective efficacy, both elements of social capital.

Of course, with all of these studies, there is a chicken and egg problem; what is the direction of influence – does high social capital result in better preparedness or does the process of acting together to reduce fire risk develop higher levels of social capital? While the evidence is not conclusive, Bihari and Ryan (2012) found that previous experience with bushfires produces greater social cohesion and a willingness to collaborate – it may be a two way street.

Together these results indicate that social capital is an important factor to consider in analysing what leads to differences in community and household preparedness. Social capital seems to facilitate the achievement of collective outcomes by increasing co-operation and volunteering, improving the quality of local decision making and of the relationships between responsible agencies as well as mobilizing people to assist one another; but it is also important in influencing what people do in their own households, by providing examples of appropriate action, facilitating the flow of relevant information and giving emotional support. The big question is what circumstances and experiences determine the level of social capital in a community and can it be increased? The truth is we know more about what erodes social capital than we do about what stimulates it.

The recent focus on social capital by everyone from the World Bank to the Productivity Commission³ has stemmed in part from concern that the pressures of modern life are eroding our capacity to work together to solve communal problems. Robert Putnam (2000) famously depicted what he saw as the decline in U.S. civic life with the image of people “Bowling Alone” rather than joining bowling leagues – depicting communities as fragmented into their constituent parts and households connecting less and less often for social and communal purposes.

Whatever may be the case in the U.S., it is clear that there are pressures in Australia making it harder for communities to function - social capital can be eroded by high mobility and population shifts, increased working hours and unsocial shifts, on-line technologies which substitute for face to face contact and the economic circumstances which undermine mutual trust. For example, growing inequality may be eroding social capital. Today, the wealthiest twenty per cent of Australians own sixty one per cent of the nation’s wealth; the poorest twenty per cent own just one per cent. When inequality grows within societies, several major problems are likely to emerge: shrinking opportunity, reduced economic efficiency, reduced investment in public goods such as education, and a wide range of health and social problems, including reduced trust and participation in civic activities. For example, one U.S study (Uslaner & Brown, 2005) found that the level of trust within a state is the strongest predictor of the proportion of people who give their time in volunteering and that the level of economic inequality is a strong predictor of trust. In other words, high levels of inequality lead to less trust and in turn to lower rates of people giving their time for community purposes. The authors concluded that more inequality leads to less trust and less caring for people who are different from oneself. It seems fair to conclude that people living in very unequal communities will have low levels of trust and will be less likely to put themselves out for others, to join local fire brigades and bushfire ready groups and take fire preventive actions which benefit others. Trust is particularly important when a people perceive themselves to be at risk, such as in the event of a bushfire (Coleman, 1990). People who trust their community and community leaders tend to participate more in their community and have a greater willingness to adopt preparedness measures (e.g. Johnston, Bebbington, Lai, Houghton, & Paton, 1999; McIvor et al., 2009).

At the local level, the actions of responsible agencies and local government may also reduce or enhance social capital, particularly the community’s trust and competence. Sampson (2004), for example, points to the fact that heavy handed enforcement appears to reduce the willingness of the local community to work with authorities. Residents need to perceive the authorities as competent and legitimate, but they also need to have a sense of public ownership of the problem and to be kept informed. According to social capital theory, communities are more likely to be rich in the various elements of social capital when key agencies involve communities in decision making. Similarly, public leadership that is divisive can weaken some types of social capital, in contrast to that which is inclusive.

Because of the lack of certainty about what leads to high levels of social capital, devising policies to create social capital is generally problematic, including in relation to fire preparedness. However, it’s clear that agencies and governments should at least consider the scope for modifying policies that are found to damage social capital, and find ways of harnessing existing social capital to deliver programs more effectively. As the productivity Commission pointed out, experimentation is needed to provide better knowledge about communities and their variability and to explore the best tools for incorporating social capital considerations in policy development.

³ <http://www.pc.gov.au/research/commission/social-capital>

Place Attachment

It has also been suggested that people's disaster preparedness is likely to be influenced by their place attachment- the emotional bond they have to their homes and local areas. It is conceivable that place attachment also operates as a "derived" community level variable i.e. it captures group properties that are more than summaries of individual influences. Place attachment is typically conceived as multi-dimensional, although there is no firm consensus about how many and what these dimensions are. However, most researchers have settled on a definition of place attachment which delineates at least two principal components: place dependence and place identity (Brown & Raymond, 2007; Vaske & Kobrin, 2001; Williams & Vaske, 2003); others also include social bonding (Kyle, Graefe, & Manning, 2005), which appears to overlap conceptually with social capital. Place identity is usually defined as an emotional, symbolic and psychological attachment to place (Vaske & Kobrin, 2001; Williams & Vaske, 2003) while place dependence is seen as a functional, resource dependent attachment (Vaske & Kobrin, 2001; Williams & Vaske, 2003). Social bonding refers to the social ties that people have to the people in a place (Kyle et al., 2010). A factor analytic study by Raymond, Brown, and Weber (2010) of rural landholder attachments to their natural resource management region in South Australia produced a five-dimensional model of place attachment: place identity, dependence, nature bonding, family bonding, and friend bonding. However, in one of the three samples they studied, confirmatory factor analysis showed that the two-dimensional model - place identity and place dependence - provided a better fit for the place attachment data than the five factor model.

Those studies that have examined the link between place attachment and disaster preparedness have produced mixed findings. One line of inquiry is based on the proposition that if people are highly attached to their homes they will be more inclined to implement preparedness measures which protect their homes from the effects of natural disasters. In support of this view are quantitative studies which show that place attachment is predictive of both household fire mitigation (Kyle et al., 2010) and flood preparedness (Mishra et al., 2010). Bihari and Ryan (2012) also found that those people who showed high levels of place attachment were also more likely to be involved in local associations and activities and were more aware of wildfire risk. Similarly, a number of qualitative studies have concluded that place attachment is correlated with better fire preparedness. Jakes and colleagues' case studies of bushfire prone areas in the United States indicated that strong attachment to place motivated people to improve their fire preparedness (Jakes et al., 2007).

A contrary proposition is that when mitigation requires changes to the valued landscape, strong attachment might actually inhibit preparedness. Brenkert-Smith found that some of the residents living in fire-prone areas in Colorado were unwilling to implement mitigation measures that altered the landscape unless they were under direct threat from a fire, and viewed such measures as compromising the environmental conditions that they valued (Brenkert-Smith, 2006; Brenkert-Smith et al., 2006). Similarly, Paton and his colleagues found that regardless of people's attitudes to safety, those who had strong environmental values and were attached to their places often rejected mitigation measures, such as controlled burning, which altered the environment (Paton, Kelly, Buergelt, & Doherty, 2006).

Risk perception

The way people assess the risks from hazards to which they might be exposed has also been identified as a variable which operates at both an individual and a group level. Such judgments and evaluations are usually described as "*risk perceptions*"; interpretations of the world, derived from people's experiences and beliefs; they are also influenced by the norms, values and "cultural idiosyncrasies" of the societies in which people live (Finucane & Holup, 2006; French, Sutton, Kinmonth, & Marteau, 2006; Rohrmann, 2003; Slovic, 2000). How community members interpret risk, and how they choose to respond to that risk, is shaped, in part, by the views of other people in their community (Lion et al., 2002). The United Nations study *Living With Risk: A Global Review of Disaster Reduction Initiatives*

(ISDR 2002: 24) stressed that, “it is crucial to appreciate that risks are always created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.” As a result, perceptions of risk are likely to vary substantially within and between communities (Bushnell & Cottrell, 2007b; Rhodes & Reinholdt, 1999; Sjoberg, 1999).

There is now a considerable body of research on the way people perceive risk, how they manage it and how it affects their decision-making. In general, it is clear that people’s judgements about risk do not necessarily correlate with the objective probabilities of that risk (Bushnell et al., 2007; Gavilanes-Ruiz et al., 2009; Johannesdottir & Gisladdottir, 2010). Of note is the fact that people’s past experience with disasters molds both their risk perception and their behaviour when disaster threatens.

In relation to emergency preparedness, risk perception is important because it appears to affect whether and how people prepare for and respond to emergencies, such as bushfires and floods (Miceli, Sotgiu, & Settanni, 2008). Rohrmann has argued that risk perceptions are “a core influence on behaviors before, during and after a disaster” (Rohrmann, 2008, pp 1). However, one review of the relationships between private flood mitigation actions and flood risk perceptions (Bubeck, Botzen, & Aerts, 2012) found they were “hardly observed in cross sectional studies (p 1493). The authors suggested that this finding might be attributable to the possibility that high risk perceptions are not predictive of action unless they are accompanied by strong beliefs about being able to cope with the risk.

3.6. Concluding Overview of the Research Schedule

In addressing the research questions identified in this Chapter, we first report the findings of a commissioned survey of residents’ responses following bushfires in Western Australia in 2011 (Chapter 4). We used the data to identify community level variables which may be related to people’s initial awareness of and preparation for bushfires as well as refining our measure of fire preparedness (Chapter 6). The second, qualitative, small-sample pilot study was designed to provide an in-depth study into how people think about bushfires and bushfire risk as well as how they prepare for such events (Chapter 5). It also provided material to inform the design of the measures used in subsequent phases of the project. Two large-scale, quantitative studies of community and individual level predictors of fire preparedness were then conducted: one based in fire prone communities in Western Australia (Chapter 7); the other sampling similar at risk communities in three additional states: Tasmania, Victoria and South Australia (Chapter 8).

4. Initial Investigations: Roleystone-Kelmscott, Red Hill & Gidgegannup Post Fire Questionnaires

Note: a large part of the content featured in this chapter is derived directly from the “Final report on the February 2011 fires in Roleystone, Kelmscott and Red Hill research project” (Heath et al., 2011).

4.1. Fires at Roleystone/Kelmscott and Red Hill: Rationale for Post Fire Questionnaires

Two major, but separate, bushfires affected the Perth urban fringe suburbs of Red Hill, Herne Hill, Millendon, Baskerville and Gidgegannup (Fire 1 – City of Swan) and Roleystone and Kelmscott (Fire 2 – City of Armadale, see Figure 4.1.1) on the weekend of the 5th and 6th of February 2011. While there was no loss of life in either of the fires, Fire 1 in the City of Swan burnt through approximately 1000 hectares of bushland and while no homes were destroyed there was significant destruction caused to fencing and infrastructure in the region. Fire two in the City of Armadale burnt through approximately 400 hectares of bushland, causing major damage to over 100 homes (72 completely destroyed and a further 37 significantly damaged) and significant damage to infrastructure.

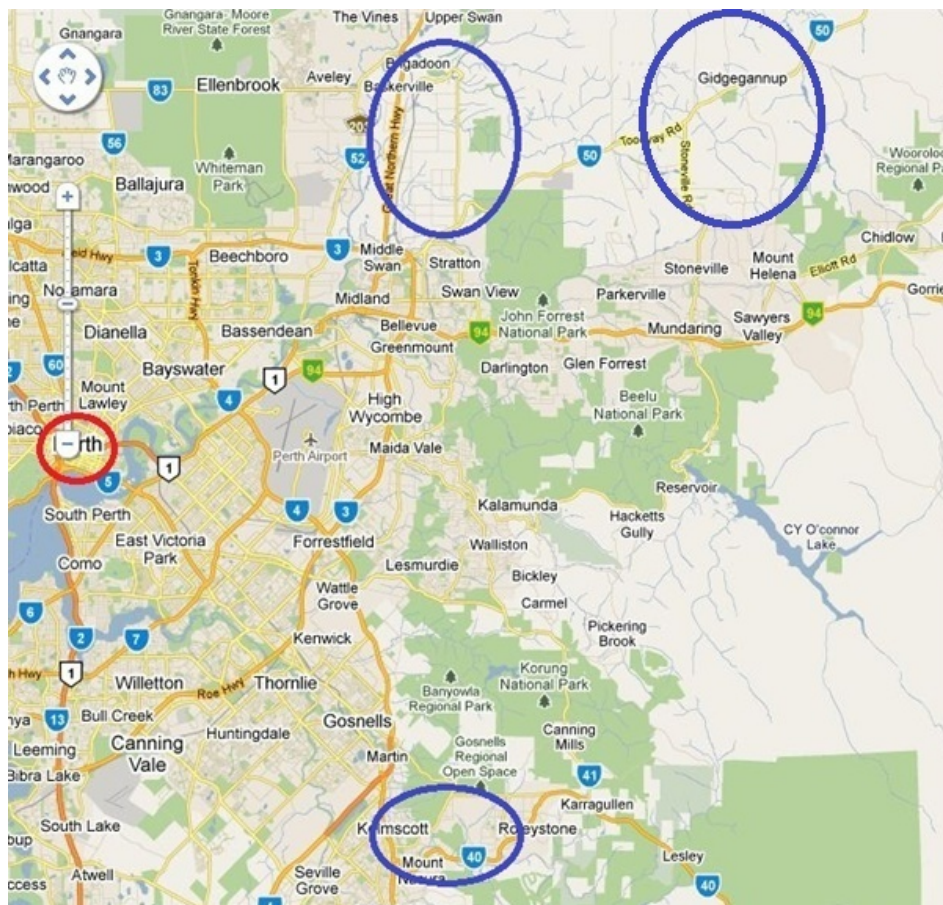


Figure 4.1.1: Map showing the 2011 fires at Roleystone-Kelmscott, Red Hill-Brigadoon and Gidgegannup areas (blue circles) in relation to the Perth CBD (red circle).

In the wake of these fires, the Fire and Emergency Services Authority of Western Australia (FESA, now DFES) commissioned the Bushfire CRC (and by extension this research group) to undertake a project aimed at getting a better understanding of the community response prior to, during, and after the 2011 bushfires in the Kelmscott-Roleystone and Red Hill-Brigadoon area through a combination of

interviews and in-person household surveys, and mail out questionnaires. Both methods collected information on preparedness, warnings and attitudes. The original project focused on providing information into three areas:

- Initial awareness of and preparation for bushfires in these areas.
- Individual expectations of and responses to bushfire messages and warnings, and
- Individual behaviours and decision making on the day of the fire event.

In the present chapter we focus only on the first of these research questions; that which relates directly the aim of this project in determining the community level variables that lead to bushfire preparedness. Further detailed information on each of these aspects can be found in Heath et al. (2011).

4.2. Questionnaire Development and Distribution

Sampling Demographics

In total, 3000 questionnaires were mailed out to households across the three areas surveyed. The proportion of questionnaires administered to each region reflected the relative populations of those regions. Kelmscott-Roleystone had approximately 2.93 times the population of the Red Hill-Brigadoon and Gidgegannup areas and as such received respectively 2.93 times the number of questionnaires. 2115 questionnaires were mailed out to residents in the Kelmscott-Roleystone area using addresses provided by the Armadale City Council. A further 885 questionnaires were mailed out to the Red Hill-Brigadoon and Gidgegannup areas. These questionnaires were mailed to residential addresses that listed their suburb as Baskerville, Brigadoon, Gidgegannup, Herne Hill, Millendon or Red Hill on a list provided by the City of Swan.

Questionnaire Development & Data Collection

The questionnaire was developed with the goal of addressing a set of themes specified *a priori* by FESA along with a goal of enabling some comparisons with results from the similar study conducted after the February 7th “Black Saturday” Victorian bushfire. Upon receiving the questionnaire respondents had the option of either completing the paper questionnaire they received in the mail and then returning the questionnaire in the provided reply paid envelope, or completing the questionnaire online at: <http://www.psychology.uwa.edu.au/research/bushfire>.

The questionnaire itself contained questions on a range of topics including:

- Information received regarding warnings about bushfires
- **Perceptions of risk prior to the bushfire**
- **Amount of planning prior to the bushfire**
- Expectations about what would happen in the event of a bushfire
- **Specific preparedness actions undertaken prior to the event**
- Barriers and enablers to the undertaking of preparedness activities
- Actions on the day of the fire (before, during and after)
- Attitudes towards bushfires
- **Demographic information about the respondent and their household**

Those sections highlighted bold in the list above are those specifically touched on in the present report (refer to Heath et al. (2011) for more complete results).

Bushfire Preparedness

The questionnaire presented the respondents with a list of 16 preparedness items as well as an “Other (please specify)” option, from which respondents could indicate not having completed the action, having completed the action prior to the day of the fire, having completed the action on the day of the fire, and ‘not applicable’. The 16 preparedness items are presented in Table 4.2.1 below, and represent a preliminary version of the Bushfire Preparedness Scale developed by Dunlop, McNeill, Boylan, Skinner, and Morrison (2014) presented in Chapter 5 of this report.

Table 4.2.1. Showing the 16 preparedness items presented in the survey to householders in response to the February 2011 fires in Roleystone, Kelmscott and Red Hill.

Preparedness Action (Have you...)
Cleared leaves, twigs and long grass for a distance of about 20-30m around the house
Removed bushes close to the house and cut back overhanging tree branches
Used landscaping or the layout of garden to reduce the fire risk
Moved combustible materials such as firewood and wooden garden furniture away from the house
Cleared gutters of leaves
Installed gutter protection
Covered underfloor spaces to prevent embers and flame entering
Covered all gaps and vents to reduce the risk of embers entering the house or cavities (e.g. roof, walls, etc)
Obtained and prepared fire-fighting equipment (e.g. hoses and a pump)
Obtained and prepared equipment such as ladders, buckets and mops to put out spot fires
Installed seals and/or draft protectors around windows and doors
Installed a sprinkler system on or around the house
Installed shutters
Prepared a kit of personal protective clothing for each member of the household
Obtained a battery-powered radio
Stored important documents and possessions off-site or in a fire safe compartment
Other (Please specify).

Perception of Risk

Risk perception was assessed by two items, assessing respondents’ perceived likelihood and severity of bushfires in their area. The items were rated on a 5 point scale from ‘very likely’/‘very high’ to ‘very unlikely’/‘very low’ and each featured a ‘hadn’t thought about it’ response option.

Planning Behaviours

Planning behaviours undertaken prior to the day of the event were assessed using seven items. The first assessed the respondents overall levels of thought devoted to planning for the event of bushfire and actions undertaken. Respondents were allowed to choose from seven options ranging from “Never thought about what I would do if a bushfire occurred” to “Had made a firm plan about what to do if a bushfire occurred”. A second item assessed respondents’ intended actions in the event of a bushfire affecting their house and property (variations on the defend vs leave dilemma). This question is identical to that utilized in later chapters and allowed for eight different response options ranging from “Stay and protect your property throughout the fire” to “You would not be at home because you intend to leave on days of high fire danger”⁴. The item also allowed for two further response options including “Haven’t thought about it” and “Other (please specify)”. Lastly, a series of five items assessed particular planning behaviours that the respondent may, or may not have undertaken. These items

⁴ Note that some of the wording utilised in this item differs from that utilised in later chapters. For example, the response option “You would not be at home because you intend to leave on days of high fire danger” was later changed to “You would not be at home because you intend to leave on days of **extreme** fire danger”.

are shown in Table 4.2.2 below. It is important to note that these items, or variations thereof, were later included in the Bushfire Preparedness Scale as a distinction was no longer made between preparedness actions related to planning and those related to vegetation management or changes to the home.

Table 4.2.2. Five items assessing particular planning actions potentially undertaken by respondents in the Roleystone/Kelmscott, Red-Hill, Gidgegannup areas. Each of these items was provided with three response options ('yes', 'no' and 'not applicable (single person household)').

<i>Planning Action Items (Have you...)</i>
Discussed what you would do with all members of the household? Thought about what each person would need to do?
Considered how things could change if some members of the household were not home during the fire? Written down important things to do and remember?
Let relatives and neighbours know about what you intended to do?

Demographic Information

Demographic details were collected on a range of variables including the following:

- Age
- Gender
- Acreage or property size
- Length of residence (property and community)
- Property ownership status
- Household Composition
- Insurance status
- Involvement with community level bushfire preparedness organization (Volunteer bushfire brigade, Bushfire ready group etc).

Timeframe

The questionnaire was sent out with a request that it be completed within the next seven days. A reminder letter was sent out to each address ten days later requesting that the questionnaire be completed. Data was inputted from all questionnaires that were received up to five weeks after the surveys were initially mailed out.

4.3. Results: Observable Community Preparedness Differences

Response Rates and Demographic Data

Based on the post-codes provided by 1032 respondents, 685 (66%) of mail out questionnaires were completed by residents of the Roleystone-Kelmscott area, 139 (13%) by residents of the Red Hill-Brigadoon area and 118 (11%) by residents of the Gidgegannup area. The remaining 90 respondents did not provide post-codes or provided post-codes that were outside these areas, likely reflecting their home address where they live between multiple properties (see Table 4.3.1A and B).

Demographic information collected from the mail out questionnaires is shown in Table 4.3.1 (A and B). Approximately 95% of respondents owned their property and approximately 97% of respondents lived at their property on a full time basis. There was only a handful of respondents ($n = 3$) who did not live on their property at the time of the fire. The largest proportion of respondents had lived at their property for over 21 years and over 40% of respondents had lived within the community for over 21 years.

Table 4.3.1A: Demographic information from respondents to the mail-out questionnaires. Values in the cells show the percentage of respondents that fit into that category; values in parentheses indicate the number of respondents who fit in to that category.

	Kelmscott- Roleystone	Red Hill- Brigadoon	Gidgegannup	Other / Unspecified	All Regions
Total Respondents	66.38 (685)	13.47 (139)	11.43 (118)	8.72 (90)	100 (1032)
Gender					
Male	39.47 (266)	44.12 (60)	54.70 (64)	43.33 (26)	42.15 (416)
Female	60.53 (408)	55.88 (76)	45.30 (53)	56.67 (34)	57.85 (571)
Age					
18 – 24	1.17 (8)	1.44 (2)	1.71 (2)	0.00 (0)	1.20 (12)
25 – 34	7.33 (50)	4.32 (6)	3.42 (4)	5.00 (3)	6.31 (63)
35 – 44	14.81 (101)	17.99 (25)	19.66 (23)	6.67 (4)	15.33 (153)
45 – 54	22.43 (153)	28.78 (40)	29.06 (34)	25.00 (15)	24.25 (242)
55 – 64	27.71 (189)	28.06 (39)	24.79 (29)	33.33 (20)	27.76 (277)
65 – 74	20.38 (139)	11.51 (16)	16.24 (19)	20.00 (12)	18.64 (186)
75+	6.16 (42)	7.91 (11)	5.13 (6)	10.00 (6)	6.51 (65)
Type of residence					
Owner	94.11 (639)	99.28 (138)	98.28 (114)	93.85 (61)	95.30 (952)
Renting - Family Household	5.15 (35)	0.72 (1)	0.86 (1)	6.15 (4)	4.10 (41)
Renting - Share House	0.29 (2)	0.00 (0)	0.00 (0)	0.00 (0)	0.20 (0)

Table 4.3.1A: Demographic information from respondents to the mail-out questionnaires. Values in the cells show the percentage of respondents that fit into that category; values in parentheses indicate the number of respondents who fit in to that category.

	Kelmscott- Roleystone	Red Hill- Brigadoon	Gidgegannup	Other / Unspecified	All Regions
Time spent on property					
Full time	99.56 (676)	96.40 (134)	89.74 (105)	93.94 (62)	97.60 (977)
Part time	0.15 (1)	1.44 (2)	4.27 (5)	4.55 (3)	1.10 (11)
Do not live on property	0.29 (2)	2.16 (3)	5.98 (7)	1.52 (1)	1.30 (13)
Year lived on property					
0 - 5 years	22.71 (154)	27.54 (38)	23.64 (26)	25.00 (16)	23.64 (234)
6 - 10 years	21.98 (149)	24.64 (34)	26.36 (29)	20.31 (13)	22.73 (225)
11 - 20 years	21.83 (148)	18.84 (26)	32.73 (36)	20.31 (13)	22.53 (223)
21+ years	33.48 (227)	28.26 (39)	16.36 (18)	32.81 (21)	30.81 (305)
Do not live on property	0.00 (0)	0.72 (1)	0.91 (1)	1.56 (1)	0.30 (3)
Year lived in suburb					
0 - 5 years	16.05 (109)	25.36 (35)	24.56 (28)	15.87 (10)	18.31 (182)
6 - 10 years	16.49 (112)	23.91 (33)	24.56 (28)	19.05 (12)	18.61 (185)
11 - 20 years	21.80 (148)	18.12 (25)	31.58 (36)	12.70 (8)	21.83 (217)
21+ years	45.66 (310)	32.61 (45)	19.30 (22)	52.38 (33)	41.25 (410)

Bushfire Preparedness Actions Undertaken

Respondents to the mail out questionnaire were provided with a list of possible preparatory actions their household might have undertaken in order to prepare for bushfire. Respondents were asked to indicate whether they had undertaken the action *prior* to February 2011. As can be seen in Figure 4.3.1, households in Gidgegannup (Mean = 12.57) endorsed significantly more actions on average than Red Hill-Brigadoon (Mean = 9.61), and households in the Kelmscott-Roleystone (Mean = 6.76) area endorsed the lowest average number of preparatory actions.

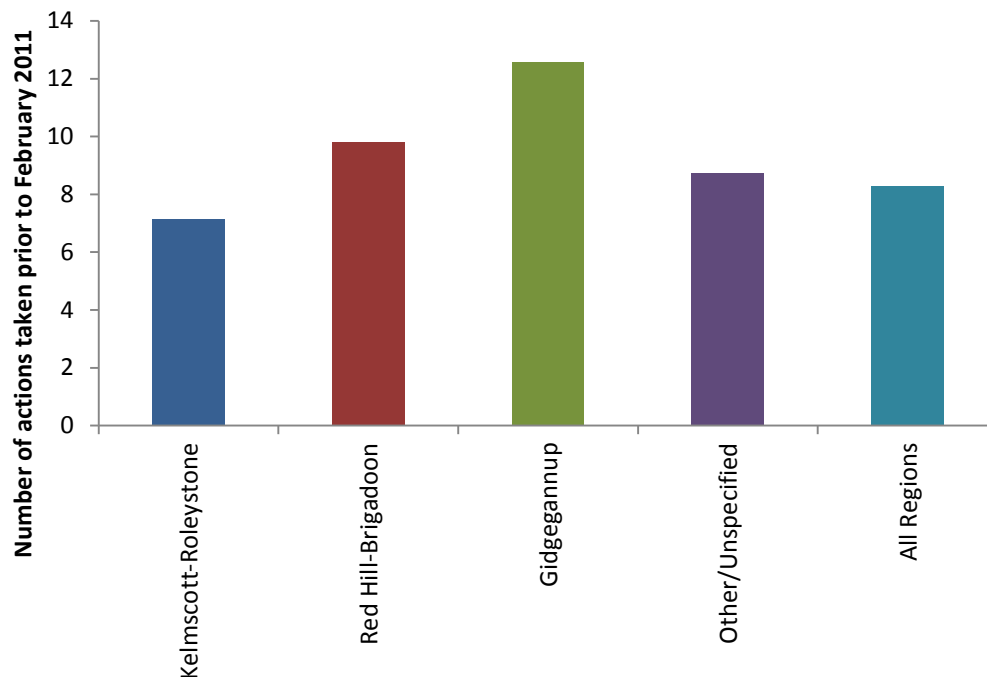


Figure 4.3.1: Showing the mean number of preparatory actions undertaken by respondents across different communities. Note that while there were 16 explicit actions mentioned, respondents had the option of selecting 'other' and identifying further, unlisted, actions that they undertaken.

As was previously discussed, the present questionnaire featured a separate set of five planning actions that residents were asked whether they had completed. In later work, these items (or variants thereof) have been included in the preparedness measure, but they were listed separately in the present work. Of the five planning actions specified, respondents across all communities most frequently reported having discussed what the household would do in the event of a fire with other members of the household. Across all communities, less than 30% of respondents indicated having written down the important things to do and remember in the event of a bushfire. As with the previous preparedness items mentioned above, differences between communities were observed, with residents of Gidgegannup once more reporting higher levels of planning behaviours than other localities (see Figure 4.3.2).

While it is difficult to establish cause and effect from the data collected, it is interesting to note that residents of Gidgegannup, who in the previous figures displayed higher numbers of completed preparedness actions and more evidence of planning for bushfire, were also more likely to indicate that they wanted to stay and actively defend their homes in the event of a bushfire (see Figure 4.3.3.). It should be noted, however, that across all communities, the most likely response to fire was to 'do as much as possible to protect your property but leave if threatened by fire'.

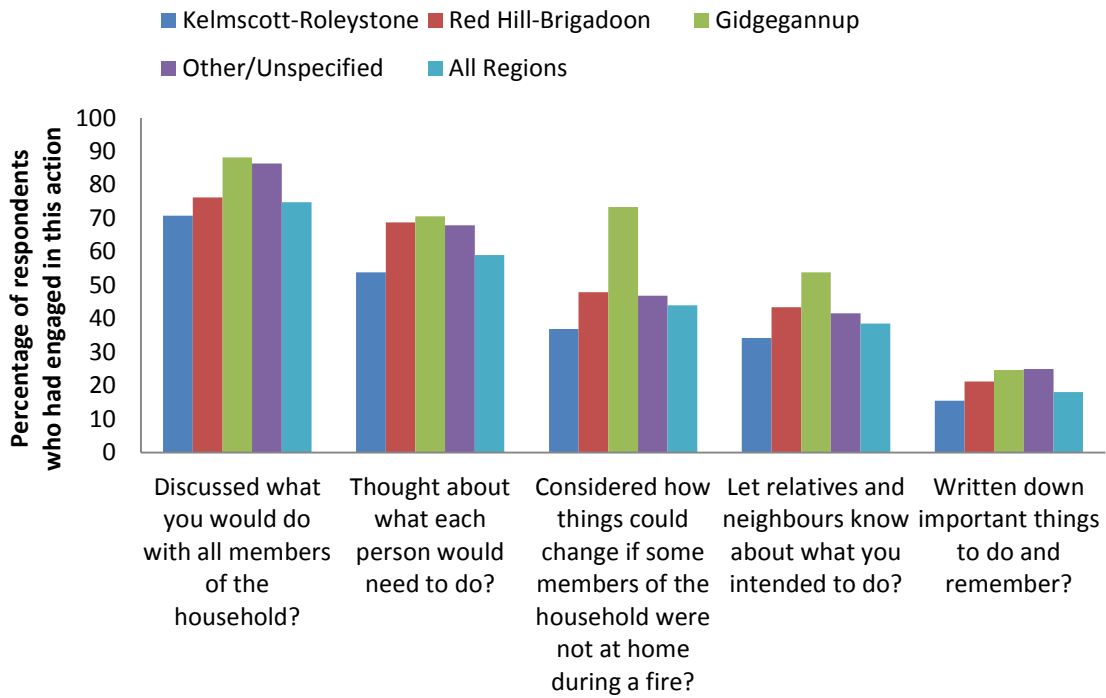


Figure 4.3.2. Percentage of respondents across different communities who had indicated engaging in a selection of bushfire planning activities.

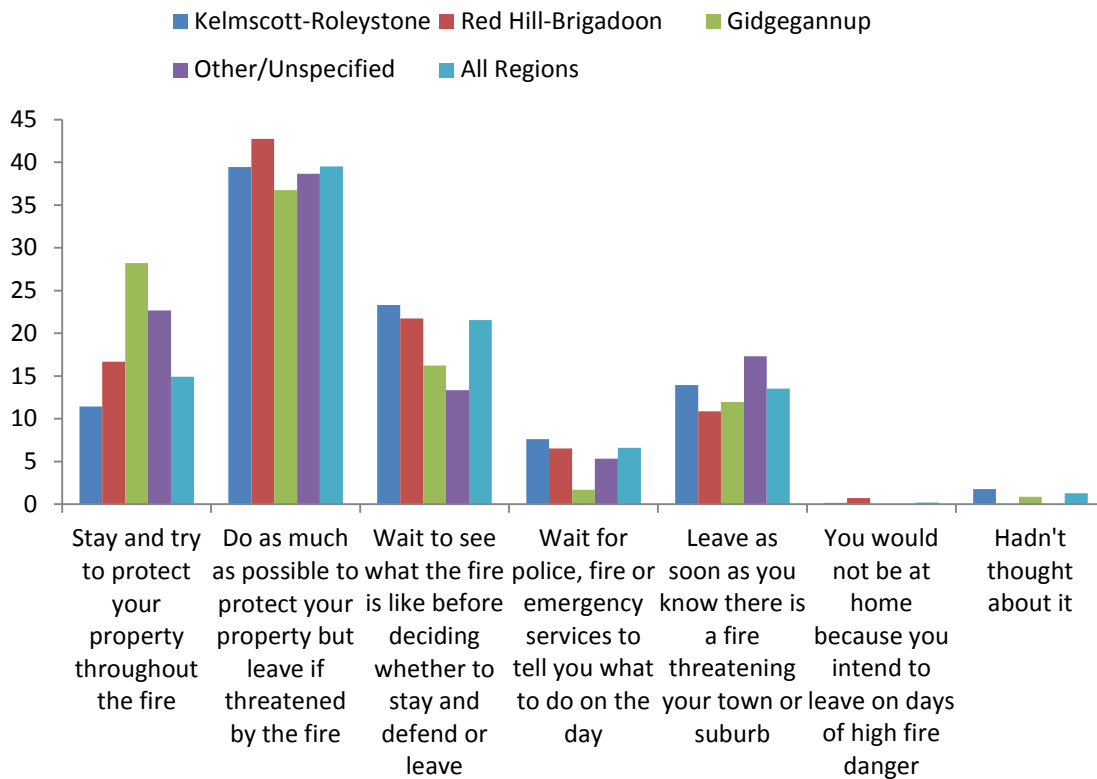


Figure 4.3.3: Percentage of respondents across each community indicating a particular response to the imminent threat of a bushfire to their house and property.

The following sections will explore some of the reasons apparently leading to these community differences.

Perceived Likelihood of Bushfire

As shown in Figure 4.3.4A and B, differences were observed between communities with regards to the average perceived likelihood of bushfire (A), and threat posed by bushfire (B) to residents' homes and property. In both cases it can be noted that residents of Gidgegannup seemed more inclined than residents of either Red Hill-Brigadoon or Kelmscott-Roleystone to believe that there was a high chance of bushfire affecting their town or suburb, and that if a bushfire did affect their town or suburb, that it would pose a significant threat. While residents of all locations believed that there was an above-average chance of a fire affecting their town or suburb (mean scores above the mid-point of the scale), only residents in Gidgegannup rated the threat of bushfire above the mid-point of the scale. When levels of threat are paired up with data on preparedness as is shown in Figure 4.3.5, it is clear that as the perceived threat of bushfire increases, so does the number of preparatory actions undertaken. This effect holds also for likelihood of being affected by bushfire (figure not shown).

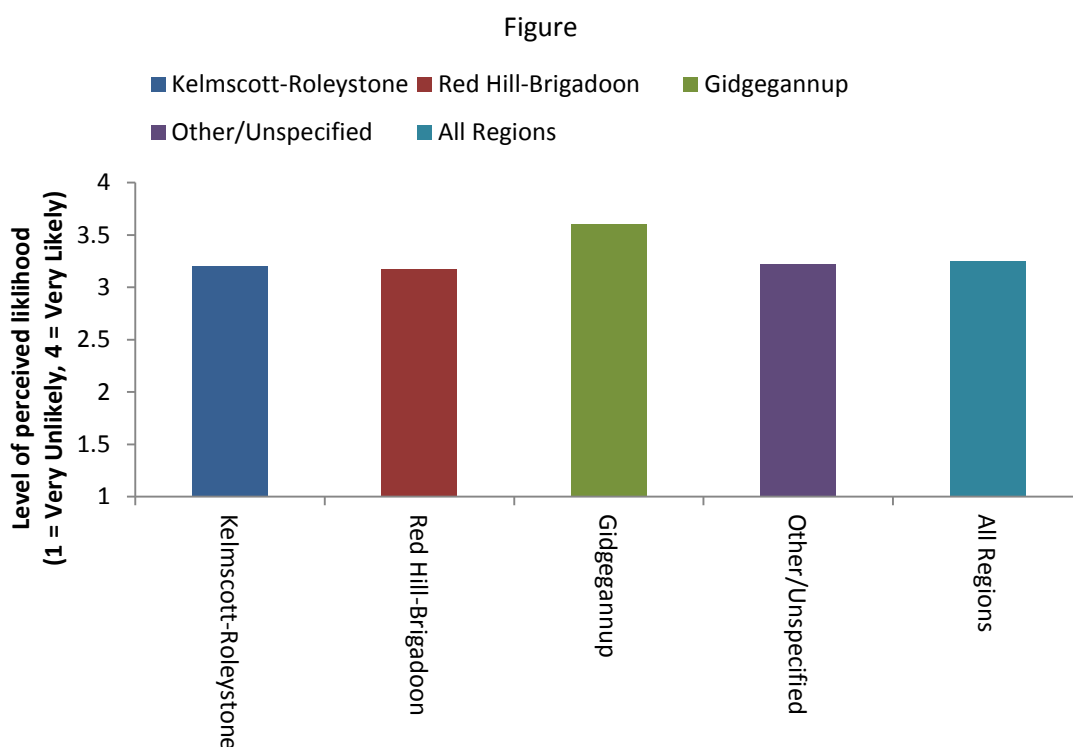


Figure 4.3.3A: Perceived likelihood of a bushfire affecting respondents' town or suburb.

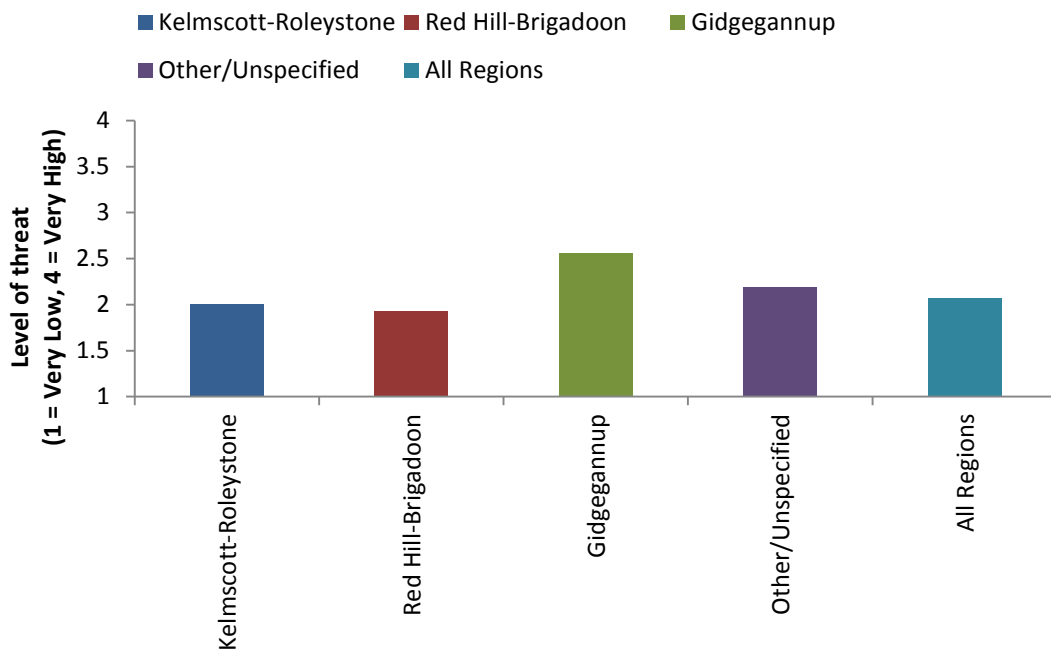


Figure 4.3.3B: Perceived threat of a bushfire affecting respondents' town or suburb.

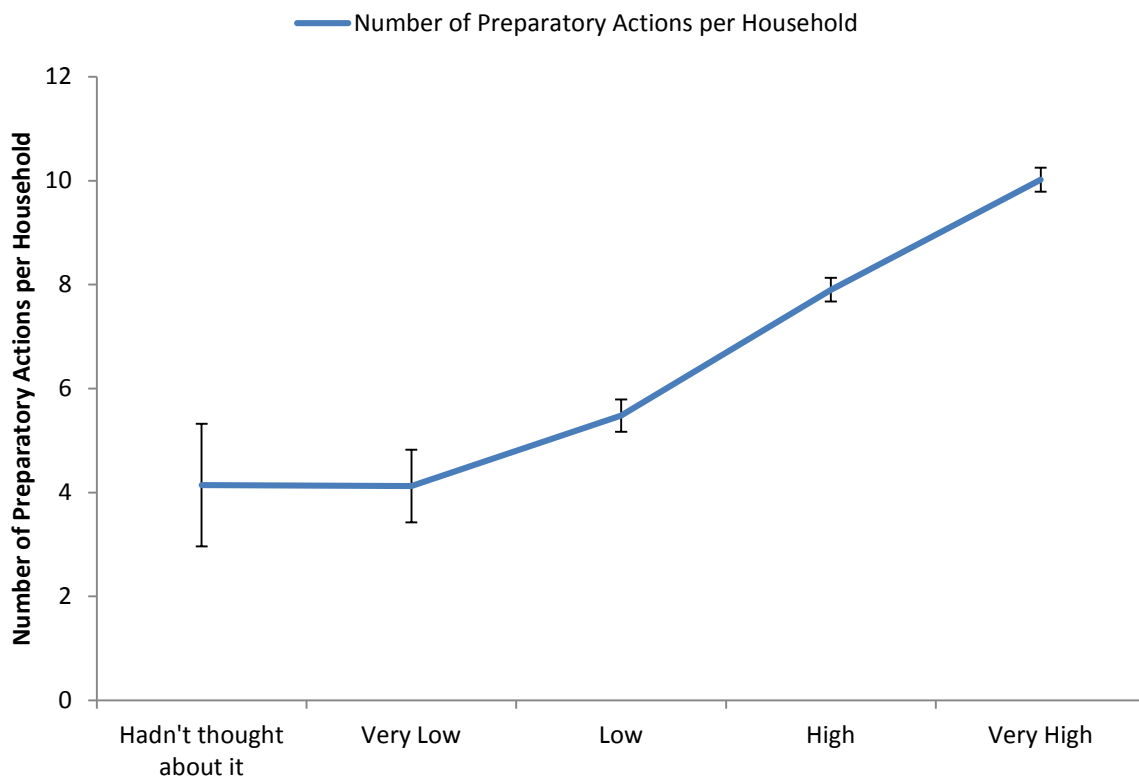


Figure 4.3.5: Mean number of preparatory actions undertaken depending on the perceived level of bushfire threat across respondents from all communities.

Involvement with Bushfire Brigades and Bushfire Ready Groups

Respondents were asked if they were currently or had ever been a member of a Bushfire Ready Group (BRG; Figure 4.3.6). Approximately 90% of respondents reported that they had never been a member of a Bushfire Ready Group, though for Gidgegannup this percentage fell to 77%, indicating that membership of Bushfire Ready Groups varies between Council areas and also within Council areas. When examined across the three areas, the highest rates of Bushfire ready Group participation was found for residents of Gidgegannup (26%), followed by Kelmscott-Roleystone (7 %) and Red-Hill Brigadoon (10%). Households with a BRG member engaged in between 2.5 and 4 additional preparatory measures than households without a BRG member (see Figure 4.3.7 below).

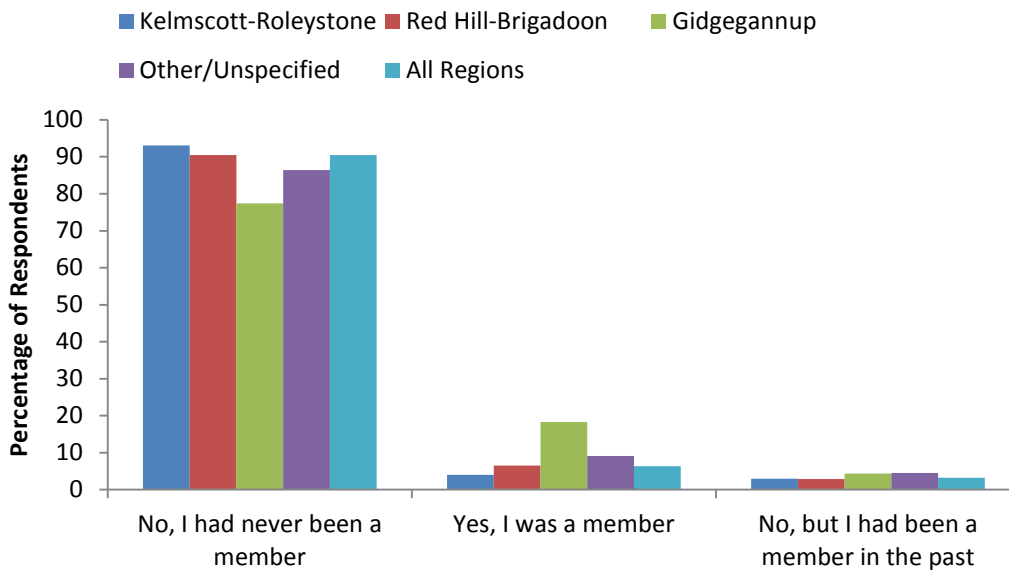


Figure 4.3.6: Rates of membership of a Bushfire Ready Group across three different communities sampled.

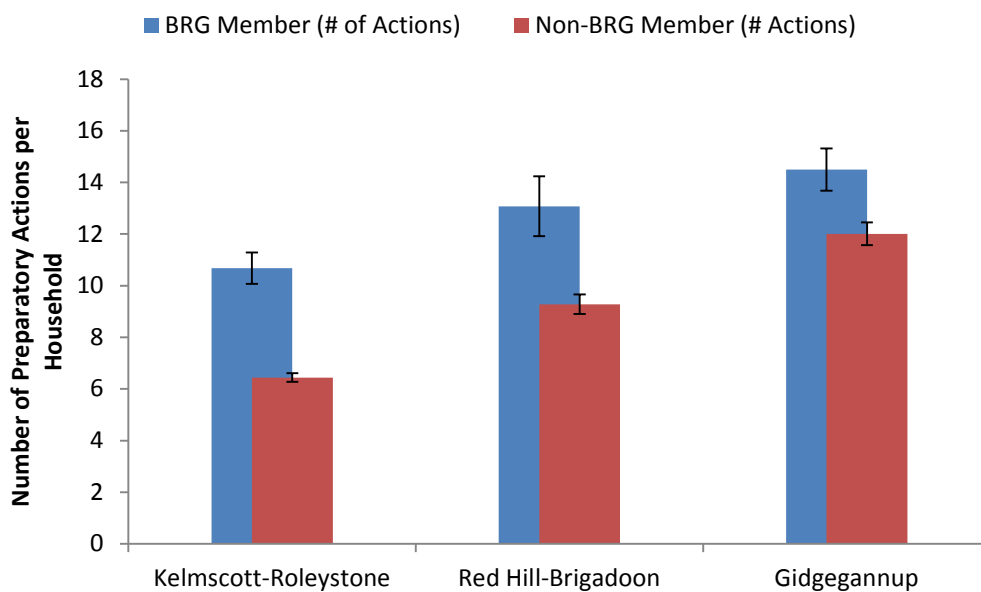


Figure 4.3.7: Mean number of preparedness activities engaged in as a function of both the respective community the respondent lived in, and whether the respondent had previously been a member of a Bushfire Ready Group.

4.4 Discussion

The present chapter presents preliminary work on community level differences in preparedness and factors which may account for these differences. While the initial brief from FESA for the present project concerned the community response prior, during and after the damaging 2011 bushfires in Kelmscott-Roleystone and Red Hill-Brigadoon, the study offered rich data supportive of the existence of community level differences in bushfire preparedness.

Of the three areas studied, the community of Gidgegannup demonstrated considerably higher levels of bushfire preparedness actions being undertaken when compared to the other study locations of Kelmscott-Roleystone and Red-Hill Brigadoon. While the list of preparedness items presented to respondents was not exhaustive (see later chapters for refinement of this scale), it is nonetheless indicative of greater preparedness in this area. Furthermore, it is important to note that these actions were taken in advance of the day of the fire and represent stable beliefs regarding the need to prepare.

An additional set of planning related preparatory items was also asked of residents across the three communities, with respondents from Gidgegannup once more demonstrating higher levels of engagement across each of the five planning activities. The data supported the possibility that physical preparedness behaviours and psychological/planning preparedness behaviours varied synchronously with one another.

The data investigating residents' responses to the imminent threat of bushfire mirrored exactly the reported levels of preparedness. As the mean number of reported preparedness activities increased, so did the likelihood that residents would opt to stay and actively defend their homes, perhaps as a result of being in a more capable position to do so. In the less prepared communities of Kelmscott-Roleystone and Red-Hill/Brigadoon there was a greater likelihood that residents would wait on fire and emergency services for instruction. Further research is needed to determine the causal pathways between these variables and whether less prepared communities have a greater propensity to attribute responsibility for resident safety to government and emergency services organizations.

The demographic data collected from respondents did not offer any clear indications of the existence of long-term structural differences between the communities which may have been related to the higher levels of preparedness seen in Gidgegannup. Each of the communities would be considered as urban-fringe communities with the majority of respondents across all communities being middle-aged owner-occupiers who had lived for a substantial period of time in their present community. If anything, the community of Gidgegannup featured more residents with short to medium durations of residence in the local area when compared to the communities of Kelmscott and Red-Hill/Brigadoon who featured more long-term established residents. Given that the ages of the respondents did not appear to vary substantially across the communities, it is difficult to understand how a shorter duration of residence might lead to higher preparedness, though this is a variable that may deserve future investigation.

From the data collected in the present questionnaires it appears that the most likely candidate to account for the increased preparedness amongst residents of Gidgegannup was residents' perceptions of the risk of bushfire. Regardless of whether the question was phrased in terms of the 'likelihood' or 'severity' of a potential future fire, residents of Gidgegannup reported higher perceptions of bushfire risk than residents of the other two surveyed communities. This conclusion is further supported by comparisons conducted across all respondents (regardless of community), demonstrating a linear link between the perceived level of risk and the number of preparedness activities undertaken on their properties. Respondents who perceive more bushfire risk were likely to have undertaken more

preparedness activities, though, perhaps somewhat reassuringly, all communities perceived (on average) moderate to high levels of bushfire risk.

Finally, an additional variable potentially related to community preparedness is the degree to which members of the community were involved in local 'bushfire ready groups'. Once again, residents of Gidgegannup demonstrated the highest levels of involvement, followed by residents of Red-Hill/Brigadoon and residents of Kelmscott-Roleystone; once again mirroring results regarding the number of preparedness activities undertaken. Further analyses demonstrated clearly that within each community, those residents who were current or former members of the local 'bushfire ready group' had undertaken significantly more preparedness activities than those who had not been members. Of course, what is difficult to ascertain from these results is the direction of causality. Based on the data collected here, it is impossible to determine whether having undertaken significant numbers of preparedness activities leads residents to join the local 'bushfire ready group', or whether information gathered through membership of the local group prompts residents to undertake further preparedness activities. The same critique must also be made with regards to the data presented above relating to the association between perceptions of risk and preparedness activities, though here the causal link from risk to preparedness seems intuitively more logical.

In conclusion, the results from the present post-fire questionnaire revealed a number of important pieces of information related to the projects' aims. While acknowledging that the preparedness measure utilized in this chapter did not account for the full range of preparedness behaviours possible, clear evidence was found confirming our initial suspicions of the existence of sizable inter-community differences, and this despite there being only a relatively small geographic distance between communities. Of even greater interest was the demonstrated association between involvement in bushfire ready groups and preparedness. Involvement in bushfire ready groups can perhaps be seen as a community-level variable. Such variables, while undoubtedly also individual-level, are likely to be fostered by activities at the community level – perhaps arising as a result of the actions of the local government or via strong inter-personal and community ties in the form of high social capital.

Equally important was the establishment of the association between perceptions of risk and preparedness. Once again, risk can be viewed as an individual-level variable, but it also has the capacity to function as an important community level variable. The present questionnaire asked residents to rate the perceived threat of fire to their homes and property, and while we cannot rule out the possibility that their assessments are specific to the structure of their homes and the vegetation on their properties, it seems reasonable to assume that a portion of the risk assessment is related to the surrounding geography and the region's vegetation. While future questionnaires should (and do – see Chapters 7 and 8) assess risk to individuals' properties and the surrounding areas separately, it appears at least possible that risk perceptions reflect the surrounding landscape in the community and would thus function as a community level variable when viewed as the aggregate of multiple residents' perceptions. Unlike community engagement or social capital discussed in the context of involvement in 'bushfire ready groups', assessments of regional risk may be less amenable to change and influence. However, they may nonetheless be an important differentiator of preparedness between communities and this concept is explored further in the following chapters.

5. Pilot Study: Qualitative Research

5.1. Introduction

To complement the insights derived from the post-fire interviews described above, the pilot phase of the research project was a qualitative study of a small number of residents and local government staff of a bushfire prone community on the urban fringe of Perth. This part of the investigation was designed to throw light on how people think about bushfires and bushfire risk, what they consider it is normal to do to prepare for bushfires, how they relate to responsible emergency management agencies, including local government, and how they view their community. These interviews were planned to provide material suitable for shaping the questions employed in subsequent quantitative stages of the research project where extensive sampling of numerous communities required the use of self-administered, closed format questionnaires.

5.2. Research Design

Research Methodology: Grounded Theory

The overarching methodology employed for this exploratory phase of the study was Grounded Theory (GT), a qualitative research methodology providing general strategies and heuristic devices for collecting and analysing data (A. Bryant & Charmaz, 2007; Antony Bryant & Charmaz, 2008; Charmaz, 2005; K. Charmaz, 2006; Flick, 2009; Strauss & Corbin, 1998; Strauss & Corbin, 1990). GT is especially suited to studying the psychological and social processes that influence experience, meaning, and actions as well as the similarities and differences between people and the conditions under which these differences arise and are maintained. The GT methodology allows a description of the phenomenon of interest to be developed from people's perceptions of their own experience and the circumstances in which they develop these perceptions.

5.3 Data Collection Methods: Episodic Interviews and Participant Observation

Episodic Interviews

From the various interview types available, episodic interviews were selected because they allow interviewees to describe their experiences in narrative form as well as responding to specific questions from the interviewer. They have been shown to be particularly useful for investigating differences between groups in their experiences as well as general, common-sense knowledge (Flick, 2009). It was judged they would be effective in yielding insights into the commonalities and differences between better and worse prepared communities and between better and worse prepared community members.

Sampling and Interviews

Although these techniques are not designed to achieve a representative sample of the community of interest, we did seek sample people and incidents from communities where bushfire was a significant risk (Chamberlain, 1999; Strauss & Corbin, 1998; Strauss & Corbin, 1990). This was accomplished by studying a variety of experiences surrounding preparedness: what people do or do not do; the range of conditions that give rise to those actions and their variations; how conditions change or stay the same over time and with what impact; and the consequences of either actual or failed actions.

For the purpose of this study, it was decided that local government was the most appropriate unit of analysis (See section). The Shire of Mundaring was selected as the case study community because it was identified by emergency management experts as one of the better prepared communities in Western Australia. Studying a well prepared community promised the possibility of a reaching a preliminary identification of community-level preparedness measures and of community-level variables likely to influence individual preparedness which could be further explored in subsequent quantitative phases of the study.

The research questions required a study of both community members and community leaders. Community members included people who were likely to differ in the extent of their bushfire preparedness and community participation, including singles, families with school aged children or caring for parents, people from different property locations and sizes, locals, immigrants, new residents, elderly, and people with disabilities. The community leaders invited to take part included Shire Councillors and managers and leaders of community groups and as well as those responsible for different aspects of emergency management. The participants were sampled successively based on insights gained in previous interviews (Atkinson & Flint, 2001; Patrick, Pruchno, & Rose, 1998).

In total, we conducted interviews with fifteen participants (see Table 5.3.1). This number seemed large enough to cover a wide variety of factors yet small enough to manage a detailed analysis within the time frame of the project. We conducted seven multiple interviews with community leaders and four interviews with community members in the Shire of Mundaring. To understand the wider context in which the local government operates, interviews with four key staff in the state government agency responsible for emergency management (Department of Fire and Emergency Services) were first conducted. These interviews were not formally analysed.

Table 5.3.1: Overview of Interviews conducted with Shire of Mundaring Staff and community individuals

Variable	
Number of interviews	15
Total length	32.24 h
Average length	2.09 h
Range	1.11 - 3.59 h

The interviews were conducted in the participants' homes, work places, fire brigade stations and fire fighter schools. Conducting the interviews in the participants' own environments established the familiarity necessary for intensive interviewing and to enhance disclosure (Atkins & Hammersley, 2007; Liamputtong, 2007; Morgan, 1997). The researchers participated in several emergency management committee meetings, went on field trips in bushfire prone areas guided by emergency management experts, and had many informal conversations with practitioners working in various areas of emergency management from around Australia. Based on these experiences and the research literature two interview guides were developed: one for community members and one for community leaders. The topics and concepts covered in the interviews are summarised in Table 5.3.2. The knowledge gained through interacting with each participant during the interviews and participant observation influenced the interviews with later participants.

Table 5.3.2: Content areas covered in Community Leader and Community Member interview guides

Interview Guides	
Community Leaders	Community Members
- Leadership	

- Structures	- Structures
- Preparedness culture and climate	- Preparedness culture and climate
- Roles and Tasks	- Roles and Tasks
- Experience and Knowledge	- Experience and Knowledge
- Risk Perceptions	- Risk Perceptions
- Perceptions and Responsibilities	- Perceptions and Responsibilities
- Perceptions of Community	- Perceptions of Community
- drivers and inhibitors --> factors facilitating or hindering preparing & participating	- drivers and inhibitors --> factors facilitating or hindering preparing & participating
- perceptions of state government	- perceptions of local & state government
- preparedness activities at community level	- preparedness activities at individual level

5.4. Data Analysis: Grounded Theory Analysis Techniques

The interview transcripts of the community members and leaders were analysed using GT analysis techniques (Kathy Charmaz, 2006; Strauss & Corbin, 1990) to identify key concepts and dimensions which emerged from the interviews. Atlas.ti was used to analyse the data because it is based on the GT approach and matched the needs of this study (Flick, 2009; Muhr, 1997).

5.5 Results and Discussion

The first half of this section outlines the key community actors identified as being involved in community preparedness and response; the major community-level preparedness activities; and the core variables, processes and outcomes indicated by the interviews and observations. The second half highlights the variables that appear to motivate and enable community members to prepare their own households and to participate in community-level preparedness activities. It also delineates the variables that may be involved in motivating and enabling community members and/or those working for civic agencies (including the local government) to become leaders (volunteers or professionals) and to be effective as leaders.

Key Community Actors

Disaster preparedness takes place in the context of a complex web of relationships at different levels. Within a local government area, the key community actors are: the local government administration; civic agencies, community organisations and businesses; neighbourhoods; households; and individual community members. The various actors at the various levels may be conceived as linked as illustrated in Figure 5.5.1.

Interviewees indicated that local government may shape preparedness within the community through its influence on community organisations, businesses and neighbourhoods. These, in turn, were said to influence individual preparedness. Local governments were also argued to influence individual preparedness directly. Civic agencies, community organisations and businesses referred to in the interviews included emergency management agencies (e.g., fire brigades) but also schools, health care providers (e.g., nursing homes, hospitals), NGOs, community organisations (e.g., sport clubs, religious groups, interest groups), and businesses. Organisations at this level were seen to contribute directly to preparing and responding (e.g., volunteer fire fighter brigades, health care providers) as well as

indirectly. For instance, schools designed their own emergency management plans tailored to their specific circumstances, practiced the plan, identified safe havens and made sure that the fuel loads on and around the school property were kept low. Such organisational actions might, in turn, enhance the individual preparedness of those who participate.

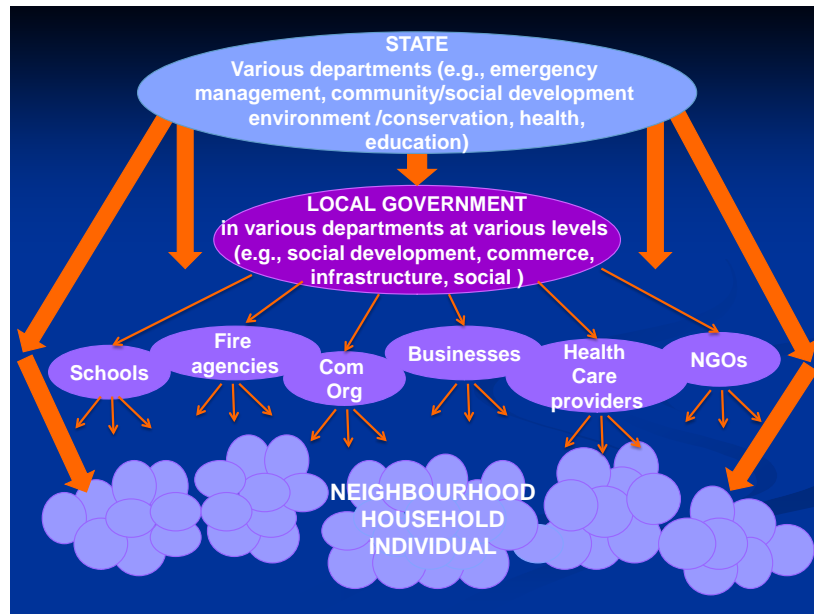


Figure 5.5.1: Overview of key community actors inside the local government

Community organisations and businesses also appear to influence local government preparedness by communicating local knowledge (e.g., what works and doesn't work on the ground); their needs, issues and concerns; their resources and strength, and their ideas for solutions through representatives participating, for instance, in the local emergency management committees. Local government actions, in turn, were seen to be influenced by various state government departments, particularly those pertaining to emergency management (e.g., Fire and Emergency Services Authority - FESA), environment (e.g., Department of Conservation WA), education (e.g., Department of Education WA), social development (e.g., Department for Child Protection WA), and health (e.g., Department of Health WA). These state government departments were described as influencing local government approaches to risk management via laws, regulations and plans (e.g., emergency management plans, building codes, environmental laws), the provision of resources (e.g., emergency management levy, education material and programs, including jointly funded staff), the provision of services (e.g., professional fire fighters), and the coordination of various activities (e.g., education programs, emergency management committees). It appeared that the various state government agencies made these contributions independently of each other with the result that local governments did not necessarily know exactly what was happening on the ground in their shire or city. Neither did the agencies necessarily know about the activities of other agencies regarding fire preparedness.

Community-level Preparedness

The analysis identified a variety of preparedness activities at the community level that local governments conduct to increase the safety of their residents. These were:

- councillors and staff working in emergency management
- emergency management planning
- warning systems

- evacuation facilities
- firefighting resources
- mitigation activities
- education
- policies, laws and guidelines

Crucial features of emergency management planning identified in the interviews included whether local governments developed emergency plans, who was involved in their development (e.g., the degree and diversity of input from the community), whether they considered the needs of community organisations and businesses, how they were coordinated with the emergency plans of community organisations, and how they were up-dated and are practiced.

Warning systems described included sirens, fire danger ratings signs, telephone trees, and announcements via email, social networking websites (e.g., Facebook) and local radio stations. Evacuation facilities such as evacuation centres, safe havens, and shelters were described. The effectiveness of these centres in the event of fire were portrayed as depending on a number of factors: the capacity of the evacuation facilities, whether community members were informed about their location and capacity, whether there were plans for providing the necessary supplies over the full period of evacuation, and whether there were agreements with neighbouring local governments to use their evacuation facilities or to secure resources if demand exceeded capacity, particularly if evacuation or re-settlement was required over an extensive period of time.

Western Australia is unique in that the local government is responsible for fire-fighting in rural areas. Local governments fulfil this responsibility via volunteer bushfire brigades. Key variables identified as influencing the degree of bushfire fighting capability of the local government were the number and size of the bushfire brigades, the quality and extent of the bushfire suppression equipment, the degree of funding and the degree to which volunteer fire fighters were trained, the type of management and the degree of central control.

Mitigation activities undertaken by local government identified included: surveying the vegetation and the geography of the Shire, developing bushfire risk maps, conducting controlled/prescribed burning, planning new developments, proscribing appropriate building designs and materials, developing and enforcing property clearance regulations, egress programs, the maintenance of strategic fire breaks and green waste disposal.

A major influence on preparedness was said to be the degree to which local governments required their residents to clear their properties and whether the local government enforced compliance with these requirements: what local governments required their residents to do in clearing their property, how they informed residents of these requirements, how they supported residents in fulfilling the requirements, and how they enforced the requirements (e.g., inspections, fines, work orders, prosecutions). The local governments' diligence in maintaining strategic fire breaks on their own land, pruning trees along road verges and providing for green waste disposal from private properties appear to influence the extent to which residents reported that they cleared their properties of dead material on a regular basis.

Key community preparedness activities that emerged were: developing and maintaining a community register of high-risk residents, organisations, businesses, and priority assets; supporting volunteer bushfire brigades and bushfire ready groups; and ensuring the preparedness of schools, businesses and community organisations. Community engagement activities consisted of surveying community members' views about risks, offering personalised consultations, publicly acknowledging participating and preparing, and organising regular bushfire related community events (e.g., emergency service and

bushfire expos). Community engagement appeared to be facilitated by councillors and local government staff actively listening and talking with residents in person, considering their perspectives on hazards, as well as acknowledging their contributions to preparing and responding. Interactive meetings tailored to specific sub-communities (e.g., schools, elderly, immigrants) were judged to facilitate participation.

The establishment of bushfire ready groups also seemed to facilitate local participation and individual preparedness by providing practical information about necessary fire prevention and mitigation activities. Respondents reported that the insights into what actually happens during a bushfire, what to do and how to respond, and what works and what doesn't work is often gained from people who have experienced bushfires. These informal community stories were perceived to have greater impact on turning residents' intentions into action than formal factual information provided by official agencies and the media.

Informants stressed the importance of Local Government staff expertise and experience relevant to both the local community and fire preparedness in influencing the extent and quality of fire preparedness in the community. Structures that were identified as influencing staff performance included the level of collaboration among the various departments of the local government, with community organisations and with other local governments and state government agencies.

Local government preparedness was also considered to be influenced by State government policies. Key government agencies identified were those responsible for emergency services, environment and conservation, community development, education, and health. Respondents believed that these agencies exerted an influence mainly via policies, emergency management plans, funding, firefighting resources, development and distribution of information material, development and organisation of community engagement activities (e.g., community meetings, bushfire ready groups), and emergency management officers.

Community Spirit

Community spirit emerged as the community level variable most frequently identified as critical to fire preparedness. Community spirit was defined by the degree to which residents:

- want their own environment to be enjoyable, vibrant and as safe as possible;
- do things for each other and can rely on each other;
- share common values about the community, the environment, and what is needed to make a community safe;
- care about and encourage members of the community;
- share knowledge about what is happening in the community;
- know what other do – what their work is, what they are doing in the community, and what their situation is; and
- interact and communicate a lot with each other.

Our analysis suggested that these variables should be seen as interdependent; the more values residents have in common and the more they value a goal and believe it is possible to achieve, the more likely they are to interact and communicate with each other, get to know and care for each other and work with others to accomplish agreed goals. Some of those interviewed suggested that new residents, especially those from cities, don't necessarily understand the community spirit in rural areas or how to be part of this process. Interviewees also indicated that living in a place with high fire risk made community spirit especially important.

Applied to bushfire preparedness and response, people referring to “community spirit” appeared to mean that residents are expected to know about their neighbours’ situations, emergency plans, and preparedness measures; to hold each other to account for preparing their properties; to assist each other in preparing and responding to fire and to create and maintain networks to provide information and respond in the event of a fire. The result was believed to be that they would develop a sense that they could rely on their neighbours for assistance in preparing their property and responding to a fire, increasing their perceptions of self-efficacy in managing fire risk and, thus reducing the levels of anxiety and stress. Some informants referred to the fact that there appeared to have been some decline in “community spirit” compared to the past.

Responsibility-Trust-Respect

The perceptions community members have of their local government, state government and community organisations (e.g. bushfire fire brigade, bush fire ready group, businesses) seemed to influence the degree to which they said they were willing to accept information, comply with requests to undertake certain activities and to take personal responsibility for both individual and community fire preparedness. Perceptions that appeared decisive included assessments about the priority such organisations give to bushfire preparedness and emergency management and the extent to which they are fulfilling their roles and responsibilities in creating a safer community. In particular, perceptions of the usefulness, safety and environmental impact of controlled burnings, and the degree to which reserves and verges are maintained appeared crucial. If community members believe that government and community organisations have competent people working for them, have sufficient and adequate resources and equipment, and are communicating well, they appear more likely to trust and respect them.

Social Norms, Community Pressure and Enforcement

Respondents indicated that if they saw neighbours having certain things in place they were more likely to undertake the same preparations. Residents reported being more willing to prepare when they could see that their immediate neighbours appeared to be making their properties safe from fire. Official acknowledgement that a property was well prepared appeared to give people confidence that they had done a good job and were on the right track, motivating them to sustain their preparedness.

Similarly, residents reported being more likely to prepare if they heard from other community members that the local government officers (rangers) were strict in reinforcing compliance, perceived that the processes in place to enforce compliance were fair, and respected and accepted the authority of the Shire/rangers telling them what they need to do to. Not wanting to be fined or taken to court and securing insurance cover seemed to motivate some residents to ensure that they implement all the requirements specified. When there was no monitoring of whether the preparedness measures are actually in place (e.g., property inspections) the impact of compliance measures appeared to be weakened.

Well Prepared Communities

The analysis helped identify a consensus among interviewees about the characteristics of local governments, community leaders and members which are related to high levels of fire preparedness. Well prepared local governments were seen as balancing community safety with a healthy environment; developing long-term, plans (> 5 years) which integrate preparedness to different hazards and encompass the whole process (i.e., PPRR; planning, building, education, enforcement).

They were also seen as active in searching for and attracting experienced and appropriately qualified staff, ensuring that staff worked as a team and were also able to work together and coordinate the activities and resources of relevant players in other agencies and organisations. It was suggested that the greater the cooperation with the relevant agencies, the greater the community-level preparedness of the whole Shire. Having enough people to mitigate and respond to fire (e.g., volunteer fire fighters) and having enough, high quality equipment was also judged important.

Individual Level Variables and Preparedness

Demographic Variables

The key demographic variables identified by the interviewees as likely to influence community preparedness overall included how many of the current residents grew up in a bushfire prone area; what proportion had responsibility for children and animals; the employment status of residents; the state of their health/well-being; and the income levels of families.

Having children in one's care was assessed as particularly important in driving better preparedness because it creates a sense of being responsible for the lives of others. And because having children makes it easier to meet and get to know other residents who are also parents (e.g., at playground, waiting for children during activities or when they pick them up), this was thought to provide opportunities to discuss bushfire issues and to develop shared views of risk and how it might be managed at a local level, thus increasing "community spirit" and trust.

Experiences

Growing up with bushfire threat

Growing up on a property with a bushfire risk and in an environment in which people were taught about fire, where preparing was common sense and practiced, and where they were involved in burning appeared was believed to lead to more realistic perceptions of risk (i.e., fires can happen, no fear but respect of fire). It was also judged likely to make preparing second nature (i.e., part of everyday living), to improve the quality of experiential knowledge (e.g., I saw that if there is no fuel it doesn't burn, 'back burning' using the fire attracts fire principle); and to increase beliefs about self-efficacy (e.g., we never worried because we knew it wouldn't ever burn because of the way we lit the fire).

For instance, one participant could remember that her family used to have a big bonfire and the whole family raked leaves and collected branches all year to build the fire. The preparedness experiences and knowledge were passed onto the next generation when they were little kids. Some participants also remembered that preparing was much more rigorous, supported and collective in the past. For example, Shires once had a requirement that you had two 200 litre drums of water on a stand at the entrance to your property and anybody could come along and use them if needed. Likewise, people had to have proper breaks done with a grader and the Shire always made earthmoving equipment available if it was needed.

Disaster experience

Unsurprisingly, experiencing bushfires first-hand was assessed as having a more powerful impact on preparing than hearing about fires from community members or via the media. Experiential knowledge was judged more powerful because it entails both knowledge of what happens in a

bushfire as well as strong emotional reactions. Experiencing bushfires was thought to result in more realistic perceptions of risk, increased motivation to prepare and more informed decision making about whether to stay or to leave. For instance, seeing how quickly a fire can get out of control and feeling terrified may lead to the decision to evacuate in case of a fire. First-hand experience of what happens during a fire, either as a resident or as part of an emergency management team, allowed people to link specific preparedness actions with their effectiveness and to identify the gaps in preparing, as these two quotes illustrate:

From experience I know what [conditions] I am going to defend in. I know the terrifying noise and how traumatic it is. So I need to ensure that I am well prepared and aware of what it is like to be facing a bush fire.

We have had a couple of close calls and then we realised that we didn't have a plan in place and started making enquiries.

Experience with controlled burning

Controlled burning is a contested preparedness measure that seems either to facilitate or to hinder individual preparation. Controlled burning seemed to be accepted if it was believed to reduce the intensity of wild fires, enable the fire brigade to better control a fire and make it safer for them to fight fires. When controlled burning was accepted, it appeared to make residents feel safe and reassured. On the contrary, when residents experienced controlled burning as out-of-control and dangerous, as unnecessarily destroying vegetation and as posing a health risk, they rejected it as a valid policy. How such views are likely to affect preparedness is not certain.

Expectations

Staying vs leaving

The decision to stay or leave seemed to interact with willingness to prepare. Those residents who said they would leave in the event of fire indicated they would go as soon as they could smell or see the fire or if others (e.g., neighbours, family, friends or authorities) told them to evacuate. Residents who chose this option, and who were confident that they would be able to get out in time seemed less motivated to prepare since they saw no benefit in doing so. The reason residents gave for leaving included their judgement that leaving was safer, that their houses were not defensible, that they were not sufficiently prepared to defend, that they couldn't defend with their children around, and that they were physically unable to defend.

Perceived self-efficacy

Whether community members said they would undertake various measures also appeared to depend on the degree to which they perceived themselves to carry out the actions, their expectations and beliefs about whether the recommended actions would lead to the desired outcomes, the degree to which they accepted responsibility for implementing the actions, as well as the perceived cost of the preparedness measures.

As previously discussed, the more experience residents had with fire and the more they had successfully dealt with fire in the past, the more confident they were in their knowledge about fire and what to do in the event of fire. In contrast, those with little experience of fire seemed more likely to perceive that preparedness was too difficult, were unsure about whether certain preparedness

measures were worth implementing, whether they could undertake more substantial measures (e.g., burn-offs), and whether they were doing the wrong things.

Outcome Expectancy

Generally speaking, responses suggested that people were less likely to prepare if they believed that planning and preparation would make little difference or they were uncertain about what best to do. Responses also suggested that residents might give up if they believed their neighbours or the local government were not actively preparing. It also seemed that those who viewed bushfires in extreme terms (i.e., fires are inevitably disastrous) were less likely to prepare. For instance, if they believed that a strong fire would take out their house anyway, they could not see any sense in filling their gutters with water. This fatalistic attitude seemed to be reinforced when residents saw that their neighbours were not prepared.

Information and knowledge

Residents learned about preparing for and responding to fire from a great variety of sources ranging from informal (e.g., their children, partners, extended family, friends, neighbours, colleagues, teachers) to more formal (e.g., schools, bushfire brigade, workplace, businesses (e.g., media, insurance, real estate agent, tourism), local and state government agencies). Informal sources seemed to be more trusted and regarded as more valuable than formal sources.

Three education types emerged: theoretical and conceptual (e.g., brochures, articles, meetings imparting information), practical (e.g., winter burn off workshops, training), and two-way conversations with community members exchanging and sharing stories (e.g., ranger inspections, meetings involving discussions). Generally speaking, residents judged the practical, interactive, local, hands-on education as most valuable.

Engagement

If respondents judged that the local government was interested in knowing the perspectives and needs of local residents and acted upon that feedback, residents appeared to be more willing to undertake preparedness activities and to participate in community actions. Furthermore, when local government was believed to be creating the opportunities and conditions (e.g., training, rooms to meet, equipment, administrative support) to assist residents to participate in community-level preparedness, interviewees suggested that they would be more willing to participate in activities to improve fire preparedness.

Awareness of Interconnectedness

Most residents interviewed were aware that they would not be able to deal with a bushfire by themselves. Because of the potential scale of such a disaster, they appeared to recognize the importance of collaboration with the people living around them; people seemed aware that, in the case of a bushfire, they would need support from others and hence, failing to build relationships with other residents could have devastating effects for themselves and their loved ones. This awareness of the value of community was judged especially important for people living in place with high fire risk.

Motivation to prepare

In the course of the interviews respondents gave a variety of reasons for preparing or failing to prepare. Values that appeared to increase reported intention to prepare included the importance placed on family and community spirit (see above), and concern for the natural environment (i.e., animals, plants). These values were expressed in the often repeated sentiment that life is much more important than property. A sense of belonging also seemed to motivate residents to participate in community preparedness; they said being involved made them feel part of the community. Similarly, the longer residents had been living in the place the more they wanted to take part in community activities to reduce fire risk. Residents who had previously been helped by others appeared to be motivated to take part so they could put back into the community something that had previously been given to them. Residents who recognised that they might need others' help and that this support could make a difference, especially in big challenging events like bushfires, expressed a desire to contribute.

Responsibility

Perceived personal responsibility differed between residents and preparedness measures. Some only accepted responsibility for their immediate environment whereas others accepted a wider responsibility. At the individual level preparedness included looking after themselves and their family, and managing the fire risk on their own property in line with the local government regulations. It could also encompass being responsible for having their own emergency response plan including deciding whether to stay or leave. It appeared that the more residents personally accepted responsibility for preparing their property and for ensuring that they and their immediate family were safe, the more they seemed likely to intend managing the fire risk on their own property. Acceptance of personal responsibility was apparently related to the degree to which they believed that they could prepare, that there was a risk and that they were worried. The degree of personal responsibility was also influenced by their perception of what they could realistically expect from the Shire. The less they expected from the Shire and the more they expected that there might be circumstances here the intensity of the fire would exceed the capabilities of the Shire, the more likely they were to report being well prepared.

At the neighbourhood level, preparedness activities included looking after their immediate neighbours and ensuring that they had an emergency plan as well as practically assisting them to prepare and respond. Many residents accepted responsibility for ensuring that the whole community prepared, and were willing to assist in community activities during response and recovery, whether they are affected or not. Activities comprised getting to know the community and local government emergency response plan and participating in community preparedness activities (e.g., bushfire brigade, bushfire ready groups, clearing community land and local emergency response committees).

At the same time, many thought that the local government should be responsible for community preparedness activities that required substantial resources, applied to the whole shire and were under the authority of the local government (e.g., local government emergency response plan, controlled burns, cleaning up of verges, education, developing and reinforcing regulations, requiring that organisations, schools and businesses have their own bushfire emergency management plan, local government emergency management committees and registers of high-at-risk groups). The more the local government was seen to be doing its bit to ensure that the community was safe, the more motivated residents appeared to be to prepare well and the more capacities residents believed they had to prepare. In contrast, those residents who transferred responsibility for managing the fire risk to the Shire, were less likely to report being well prepared or to take part in community fire

preparation. This was related to perceptions that the Shire was failing to take responsibility for managing the fire risk in the community (including ensuring that their neighbours and businesses prepared) and failing to care for its own property. A classic example relates to the management of Shire and crown land reserves including by controlled burning (e.g., What about the Shire land? How can you tell me I need to reduce the fuel load on my property if you are not doing yours?).

Risk perception

The more residents perceived that bushfires are a genuine, real and ever-present danger the more they appeared to be likely to prepare. Residents seemed to perceive the risk as more real the more they recognised that bushfires could directly affect them and that the majority of bushfires are lit by arsonists, rather than being naturally triggered events. Being aware of the landscape and weather characteristics that create bushfires and seeing them in operation in their own environment seemed to confirm to them that bushfires were a real possibility. People who were knowledgeable about bushfires also seemed more likely to see bushfires as a real danger. Stories in the community that reinforced high risk (e.g., in our community anybody reckons our area is just a disaster waiting to happen), and visible or audible preparedness activities in the community (e.g., seeing the fire brigade train, hearing fire trucks or helicopters) seemed to be powerful re-enforcers of high risk perception. In contrast, not perceiving that that bushfires might be a problem for them and their family, believing that a bushfire wouldn't happen to them (e.g., I'll be right, mate! it won't happen to me; it always happens to someone else), and believing that the fire brigades would always be in a position to contain was associated with low perceptions of risk.

Anxiety/worry/concern

People generally perceive bushfires as scary because they can't predict and control them. Worrying about the possibility of having a fire in their community seemed to motivate people to prepare, as did being fearful of infringing local government regulations.

Worry appeared to be triggered when residents heard helicopters or fire trucks and saw or smelled smoke. People said they worried about themselves and their property, their immediate family and neighbours as well as to about other people, animals, trees and properties being burned. In terms of preparing, they worried about which measures would make a difference, how to implement preparedness measures, and the preparedness status of their neighbours' properties. A major concern residents reported was not being able to evacuate safely if a fire were moving quickly or the roads were blocked. Residents living in a one way street were especially worried about getting out. Similarly, elderly and disabled residents were concerned that they might be too slow to get out. Night time fires were a particular worry and residents with children were especially worried that if a bushfire occurred during school time they might not be able to get to them. Many simply worried about how they would respond and what they would actually do when confronted with a bushfire.

Barriers to preparedness

Costs

Intending to prepare appeared to depend on whether residents perceived that some measures were beyond their resources especially in terms of time, money and energy. More expensive (e.g., sprinkler system, using fire resistant materials to build house), bigger (e.g., burn offs on properties), and ongoing (e.g., racking, cleaning gutters, driving green waste to the tip) activities were perceived as too

expensive, difficult and time consuming to implement. For some preparedness measures, residents lacked the equipment to carry them out (e.g., trailer, chainsaw). Residents also reported a lack of time and energy to talk with people to find out about preparedness and/or to build up relationships to enable co-operation in the event of fire.

Additionally, when residents did not perceive any value in a preparedness activity they said they were not motivated to implement it. A common example was that most residents did not believe that they needed to put their bushfire response plan in writing or that it was important for them to be aware of the emergency plans at the local government level.

Environmental concerns & constraints

The reason why many residents live in high bushfire risk environments – valuing and loving nature and living in a thick, lush environment – seems to lead to them eschew measures which have the potential to diminish the aesthetics of the environment (e.g. burning off was perceived as making the property look barren or like a moonscape). On the contrary, those who thought that fire is essential for nature to flourish and that patchwork or mosaic burning is less damaging were willing to do burn offs.

Residents reported that some preparedness measures were difficult to implement because their location (e.g., landscape, fauna) was not conducive to good planning for fire safety. For instance, a house built on a steep slope made it difficult to clean gutters because the roofs were too high off the ground.

Regulations

Perceptions that the requirements the Shire were too demanding and caused too much work appeared to provide some respondents with a justification for not preparing. The Shire's intensification of the rules and the regulations, especially regarding burn offs (e.g., permit required, restricting burning off periods and fire size), meant some put preparing in the 'too hard basket'. As a result, many residents who used to burn off said that they don't anymore and take their green rubbish to the tip.

Preparedness Outcomes

Several insights into how and why residents do *not* prepare emerged from the analysis. Residents might not be bothered to prepare, might intentionally choose not to prepare at all or to only implement selected preparedness activities (e.g., those that do not harm the environment, that they can afford, that they can physically do, that they can afford, that they believe make a difference) or prepare but under protest and with resentment. For instance, some don't read the brochures that are delivered to them each year, because they believe the content is the same anyway and that they know it all. Or they don't burn off on their property anymore, because the regulations increasingly limit what can be done and how it is done. Many residents do not attend bushfire preparedness community meetings.

In terms of bushfire emergency response plans, many residents have a plan, but have not written it down. They believe that they don't need to write the plan down because they and the people in their environment (e.g., partner, children, extended family, friends, neighbours) will know what they will do due to them having discussed together what they would do in the case of a bushfire with.

Other residents seem to have increased the level of sophistication of their preparedness. For example, some divide their property into sections and rotate burning off different bits every year (mosaic or patchwork burning) to address their aesthetic and environmental concerns. Likewise, residents have not only one emergency response plan but have alternative plans tailored to responding in different situations.

Perceptions of local government representatives and officials

Some local government interviewees complained that residents were not preparing and were not participating in community-level preparedness activities. They believed that the majority of residents were apathetic, cared only about themselves, and didn't consider how the local government might be able to create a safer environment. They also believed that many residents failed to prepare because of environmental concerns or because they were absent from their properties. These local government staff and representatives further believed that new residents from the city coming to live in their communities didn't know about a) the repercussions of living in a bushfire prone area (e.g., work involved, community spirit), and b) what their responsibilities were (e.g., risk management requirements).

Local government representatives also felt disempowered by being caught in a dilemma over controlled burning – some residents support it and some oppose. The local government representatives and staff generally believed that controlled burning is by far the best means of protecting the community because it reduces the intensity of bushfires. Less intense fires then enable the fire brigades to better control the fires and control them before they damage property and threaten lives. Less intense fires are said to create safer conditions for residents who decide to stay and defend, for residents who cannot leave, and for fire fighters. Controlled burns were also thought to give residents, schools or businesses located close to reserves a feeling of safety and reassurance. Controlled burning was also thought to fulfil an important ecological function.

Local government capabilities were also described by informants as often being constrained by financial and legal causes. With a limited budget the local government has to weigh up which financial expenditures best satisfy ratepayers' aspirations. Fire preparedness has to compete with other priorities. Local governments also have to comply with policy and legislation over which it has little control; the state sets out legal requirements (e.g., house design, clearing property/burning off) which may restrict the power of local governments to implement and reinforce individual fore preparedness. Some of them, such as environmental laws and strategies (e.g., biodiversity, smoke pollution) and development procedures for various lot sizes, were said to be in conflict with emergency management laws and regulations. Respondents from local government also claimed that new state policies were not always accompanied by sufficient resources to enable the local government to implement them competently.

Several commented that the relatively short time frame of local and state government elections are at odds with the long-term planning necessary for building and maintaining effective emergency management capabilities. They also noted that some companies (e.g. insurance, media, real estate agents and property developers) avoid playing their roles in emergency management and that this diminishes the capacity of the whole community. Some interviewees argued that good emergency preparedness and response is seriously hindered by the blame games played by residents, investigations/inquiries, media and insurance companies. Blaming others was seen as a strategy for avoiding responsibility.

5.6. Conclusion

What emerged from these interviews was a detailed portrait of residents' thinking about fire risk and fire preparedness which informed the later selection of variables for further, quantitative analysis. The importance of involvement in community based fire-relevant organisations, experience with and understanding of the risks posed by fire, trust in the competence of local government and other responsible agencies, the degree of enforcement of relevant regulations as well as quality information and an absence of attitudinal and cost barriers all emerged as possible determinants of preparedness. These and other variables are explored in more detail in larger samples in the later phases of the research project.

6. Refinement of a Measure of Community Preparedness

In the present chapter we describe the derivation of items and the construction of a short version of a scale measuring household bushfire preparedness. Many of the items utilized, as well as the procedure followed, are derived from the work of Dunlop et al. (2014). Nevertheless, it is important to note that some of the items featured here do not feature in the 118 item set initially sourced by Dunlop et al. (2014), but rather, are derived from preliminary work completed by this group, including the qualitative research described in Chapter 5. While the bushfire preparedness scale developed in this chapter is based on solid scale development procedures, and provides robust information as demonstrated in later chapters, future work is encouraged to utilize the more comprehensively developed scale described in Dunlop et al. (2014)⁵.

6.1 Derivation of Preparedness Items

Based on the descriptions of preparedness items derived by Dunlop et al. (2014) from Australian fire and emergency services agencies materials and relevant research papers, these authors chose to define bushfire preparedness as being any prior “cognitive or physical actions that will reduce the risk to the householders’ lives and/or the property in the event of wildfire” (pp. 6, Dunlop et al., 2014). As described by these authors, the actions broadly fall into two categories: those which facilitate a safe evacuation and those that reduce the chances of home or property loss. Furthermore, within each of these categories, actions can be either specific behaviours (e.g. the raking of leaves) or cognitively-orientated actions such as creating evacuation plans. Dunlop et al. (2014) further categorized preparedness actions into three broad categories related to the particular intentions residents may have in the face of a bushfire. Firstly, they identified what they termed ‘Type 1 Preparedness – Evacuation’ as being those actions that would maximize the chances of a successful evacuation for all householders. ‘Type 2 Preparedness – Active Defense’ was defined as those actions which would maximize the chances of actively defending the property whilst simultaneously minimizing the chances of injury to the defenders. Finally, ‘Type 3 Preparedness – Passive Defense’ was defined as being those actions which would maximize the probability of the home surviving the fire in the absence of the residents. The five sections in which 46 items appear in subsequent pages of this chapter reflect an earlier conceptualization of the above-mentioned three outcomes. The five sections (vegetation management, physical changes to the home, evacuation preparations, planning for bushfire, and ability to defend) broadly encompass the three scenarios discussed in Dunlop et al. (2014).

The complete 118 item set described in Dunlop et al. (2014) were derived from both Australian and International (Canada and the U.S) fire and emergency services agencies, as well as from published research papers. The shorter set of 46 items described throughout this chapter, by contrast, were derived only from Australian fire and emergency services agencies and relevant research papers (CFA, 2011; DFES, 2012; I. M. Martin, Bender, & Raish, 2007; Paton et al., 2006; Whittaker, Haynes, Handmer, & McLennan, in press). The initial 46 items discussed here had already undergone a process of refinement from a larger initial set of items. As a result, what is termed the ‘original’ Bushfire Preparedness scale throughout the remainder of this chapter, already features good psychometric properties and minimal redundancy. The original 46 item set had been evaluated on a community sample of 254 respondents across fire affected areas of Australia by Dunlop et al. (2014)⁶, and in the sections below we report the properties of this scale and its refinement with respect to this sample.

⁵ Note that references throughout this chapter to the original item pool developed by Dunlop et al. (2014) refer not to the pool of 118 items mentioned in Dunlop et al. (2014), but rather refer to an earlier, and smaller, set of items sourced from Australian Fire and Emergency Services agencies.

⁶ Note that once again, this sample is not the same as that described in Dunlop et al. (2014), but rather, is based on preliminary work by this research group.

For each item, respondents were asked to indicate for each of the items, whether the item was ‘true of their property’, ‘not true of their property’ or ‘not applicable’. For each item, ‘true’ responses were scored ‘1’, ‘not true’ were scored ‘0’, and ‘N/A’ was coded as ‘missing’. Total scores were computed as being the proportion of items scored as ‘true’ compared to the total number answered either ‘true’ or ‘not true’ (i.e. all items but those indicated as being ‘not applicable’).

6.2 Development of a Short Version of the Preparedness Scale

The original item set included 46 items across five sub-components (vegetation management, physical changes to the home, evacuation preparations, planning for bushfire, and ability to defend). The number of items within each sub-component is listed in Table 6.2.1

Table 6.2.1: Number of items within each sub-component of both the original 46 item preparedness scale developed by Dunlop et al. (2014), and the short version of the Bushfire preparedness scale developed here.

Sub-component	No. of Items	No. of Items
Vegetation Management	12	8
Structural Changes to Home	9	5
Evacuation Preparations	9	5
Planning for Bushfire	7	4
Preparations for Defense of Property	9	5

In order to maintain the relevant contributions of the particular sub-components to the total score, we aimed to remove an equal number of items from each sub-component of the original scale. As a maximum of 30 items was deemed the greatest number of items able to comfortably be included in the resultant questionnaires, approximately 4 items would need to be removed from each sub-component.

Items were removed based on three main principles:

1. items that demonstrated generally poor psychometric properties
2. Items that demonstrated a high correlation with another item (i.e. items that are measuring exactly the same thing as another item thereby making one redundant).
3. Items that featured low response variability (i.e. those items to which only a very small proportion, or very large proportion of respondents answered ‘yes’ to. These items are of minimal use in short scales as they do not add a great deal to the stratification of respondents).

Vegetation Management

Four items were removed from the Vegetation Management subsection of the original scale. The item ‘you have ensured that long grass and dense scrub is cut and well watered’ was removed as a result of demonstrating low item response variance, with almost all respondents indicating that they had completed the action in question ($M = 1.92$, $SD = 0.27$).

The item ‘Have you trimmed under fences and removed bushes and plants overgrowing them’ was removed as the item demonstrated moderate correlations with a range of other vegetation reduction items (see Table 6.2.3 below). Additionally, the item ‘you have removed shrubs and small trees under and between larger trees’ was removed as it demonstrated a substantial correlation with the item ‘tree branches up to 2m off the ground are pruned’ ($r=0.44$). It would appear that both of these items function similarly as a result of both relating to the removal of undergrowth. Finally, the item ‘cleared vegetation along the boundary of your property to create a fire break’ was removed as this item

relates only to large properties, is (or is not) a legal requirement in various jurisdictions, and relates to other questions asked in later questionnaires.

Table 6.2.3: Item inter-correlations (Pearson's r) for five items from the Vegetation Management sub-section of the Bushfire Preparedness scale.

<i>Item</i>	Cleared fuels (e.g., leaves, twigs and long grass) for a distance of at least 20m around the house	Maintained a minimum two metre gap between your house and tree branches or shrubs	Cleared vegetation along the boundary of your property to create a fire break	Removed shrubs and small trees under and between larger trees
Trimmed under fences and removed bushes and plants overgrowing them	0.38	0.41	0.48	0.36

Structural Changes to the Home

In total, four items were removed from this section of the original scale. One item ('Installed shutters to all external windows') showed low item response variance (i.e. most respondents answered in the same way; $M = 1.03$, $SD = 0.18$) as almost all respondents indicated not having installed shutters to all windows.

A further three items were removed from this section as a result of demonstrating moderate correlations with a single other variable in the section. The items 'you have checked that all roof coverings fit tightly so that there are no openings for sparks', 'you have placed metal fly-wire mesh on all vents to keep sparks and embers out' and 'you have covered under-floor spaces to prevent embers and flames from entering' correlated $r=0.49$, 0.43 and 0.36 respectively with the item 'you have covered all gaps and vents to reduce the risk of embers entering the house or cavities' (see Table 6.2.4). Semantically, each of these items relates to the closure of gaps and spaces so as to avoid the possibility of embers entering the home and as a result this concept was assessed using only a single item (that with the highest item-total correlation, $r=0.35$).

Evacuation Preparations

Four items were removed from the Evacuation Preparations section of the original Bushfire Preparedness Scale based on their inter-correlations with other variables in the same section. The items 'you have selected a suitable destination for evacuation' and 'you have ensured that everyone in the family knows the evacuation route to be used' were substantially correlated with the item 'you have mapped out an evacuation route' (see table 6.2.5a). Each of these three items related to planning for evacuation and the high correlations suggest that respondents who had considered the route had also considered the destination and communicated this plan with the rest of the family.

Two additional items were removed from the original scale. The item 'you have listed the items that you would need to take with you if you were to evacuate (e.g. medication, important documents, passport)' was worded almost identically to the retained item 'you have listed the items that you would want to take with you if you were to evacuate (e.g. laptop, photos and cameras)'; the two correlating at $r=0.75$. Finally, while the item 'have you considered atypical situations...' demonstrated moderate associations with numerous other items in the sub-scale, though no individual association was stronger than $r=0.46$ (see Table 6.2.5b).

Table 6.2.5a: Item inter-correlations (Pearson's r) for three items from the Evacuation Preparations sub-section of the Bushfire Preparedness scale.

Item	Mapped out an evacuation route
Selected a suitable planned destination for evacuation	$r = 0.51$
Ensured that everyone in the family knows the evacuation route to be used	$r = 0.66$

Table 6.2.5b: Item inter-correlations (Pearson's R) for three items from the Evacuation Preparations sub-section of the Bushfire Preparedness scale.

Item	Listed the items that you would want to take with you if you were to evacuate (e.g. photos, laptops, cameras)
Listed the items that you would need to take with you if you were to evacuate (e.g. Medication, important documents, passports)	$r = 0.75$
Considered atypical or unexpected situations (e.g., family members not all being at home, or in the same location, or other friends/family visiting who are not physically fit enough to defend), and have ensured our household has an appropriate	$r = 0.37$

Planning for Bushfire

Only three items were removed from the original 7 items in this section. The item regarding the maintenance of adequate home and contents insurance was removed as it had low response variability (mean score of 1.94, standard deviation of 0.23). A further two items were removed from this section. The two items ('Ensured that all of your family members are comfortable with the intended fire plan' and 'Ensured that all household members are aware of the fire plan'), apart from superficially sounding similar, were both highly correlated with one another ($r=0.75$) as well as being

substantially correlated with other variables in the section; namely 'Formed a household bushfire emergency plan' ($r=0.63$) and 'Thought carefully about what each person would do in the event of a bushfire' ($r=0.62$, see Table 6.2.6).

Table 6.2.6: Item inter-correlations (Pearson's r) for seven items from the Planning for Bushfire sub-section of the Bushfire Preparedness scale. Note that the correlations coloured red indicate high values for the two items subsequently removed from the scale.

Item	Formed a household bushfire emergency plan	Thought carefully about what each person in your household would need to do in the event of a bushfire	Ensured that your home and contents insurance is adequate	Ensured that all household members are aware of the fire plan	Made a list of important things to do and remember in case of a fire	Ensured that all of your family members are comfortable with the intended fire plan	Informed your relatives about the intended fire plan of your household
Formed a household ...	1	0.53	0.17	0.63	0.29	0.58	0.46
Thought carefully about what...		1	0.16	0.62	0.30	0.57	0.38
Ensured that your home contents...			1	0.22	-0.11	0.20	0.17
Ensured that all household members...				1	0.28	0.75	0.42
Made a list of important...					1	0.23	0.25
Ensured that all of your family members...						1	0.38
Informed your relatives about the intended...							1

Preparations for the Defense of Property

Four items were deleted from the initial 9 items in the subsection relating to residents' preparations to actively defend their properties. Two items were deleted on the basis of having low item response variance, including "you have acquired ladders that are long enough to allow you to check the roof cavity and eaves and put out spot fires and sparks on the roof" and "you have acquired long hoses that can reach all parts of your house and garden". In each case, almost all respondents indicated having the requested items.

A further two items were removed from this section. The item 'have you obtained woolen blankets' was removed as a result of having the lowest item-total correlation of any of the items in the original questionnaire. While many respondents indicated having not accomplished the activity indicated by the item (29.1%), the low item-total correlation indicates that many respondents may have acquired woolen blankets for reasons unrelated to bushfire preparedness. Finally, the item 'you have prepared a kit of personal protective clothing for each member of the household' was considered the best item of the remaining items in the 'defense' section to remove. Semantically, and based on correlations, it appears similar to another item in the same section ('you have acquired full length protective clothing (wool, cotton) including gloves, eye protection, work boots, and a broad brimmed hat; $r=0.31$).

Table 6.2.2: Item means, standard deviations, item total correlations and Cronbach's alpha scores for the original set of 46 bushfire preparedness items (across 5 sections) included with the Bushfire Preparedness scale. Note that values coloured red indicate items with low response variance that were subsequently removed from the scale.

Item	Response Mean	Standard Deviation	Item Total Correlation	Alpha if Item Deleted
Vegetation				
Cleared fuels (e.g., leaves, twigs and long grass) for a distance of at least 20m around the house	1.79	0.41	.39	.88
Maintained a minimum two metre gap between your house and tree branches or shrubs	1.69	0.46	.17	.89
Moved flammable and combustible materials such as firewood, boxes, gas cylinders, and wooden garden furniture away from the house	1.65	0.48	.16	.89
Ensured that leaf litter and twigs under trees are raked throughout the fire season	1.66	0.47	.48	.88
Ensured that long grass and dense scrub is cut and well-watered	1.92	0.27	.15	.89
Trimmed under fences and removed bushes and plants overgrowing them	1.69	0.47	.41	.88
Conducted controlled burning on your property to reduce fuel load	1.52	0.50	.31	.88
Ensured that all the trees on or near your property are away from overhead utility lines, or that lines are buried and not susceptible to fire	1.74	0.44	.32	.88
Cleared vegetation along the boundary of your property to create a fire break	1.81	0.40	.34	.88
Removed shrubs and small trees under and between larger trees	1.43	0.50	.24	.89
Ensured that tree branches up to 2m off the ground are pruned	1.52	0.50	.37	.88
Removed any timber, rubbish, and old junk lying around	1.61	0.49	.51	.88
House				
Checked that all roof coverings fit tightly so that there are no openings for sparks	1.73	0.45	.21	.89
Ensured that external house timbers all have a sound coat of paint	1.78	0.42	.20	.89
Placed metal fly-wire mesh on all vents to keep sparks and embers out	1.35	0.48	.12	.89
Installed gutter protection	1.24	0.43	.13	.89
Covered all gaps and vents to reduce the risk of embers entering the house or cavities (e.g. floor spaces, in the roof space, under eaves, external vents, skylights, evaporative air conditioners, chimneys, and wall claddings)	1.53	0.50	.35	.88
Covered underfloor spaces to prevent embers and flames from entering	1.75	0.43	.35	.88
Installed a roof-mounted sprinkler system	1.11	0.32	.20	.89
Installed shutters to all external windows	1.03	0.18	.05	.89
Installed a fire-resistant roof on your house (e.g. metal, tile, composition)	1.92	0.27	.17	.89
Evacuation				
Selected a suitable planned destination for evacuation	1.82	0.39	.49	.88
Mapped out an evacuation route	1.75	0.43	.53	.88

Ensured that everyone in the family knows the evacuation route to be used	1.76	0.43	.53	.88
Decided what documents and personal effects you would take with you if you left the house	1.85	0.36	.28	.88
Considered atypical or unexpected situations (e.g., family members not all being at home, or in the same location, or other friends/family visiting who are not physically fit enough to defend), and have ensured our household has an appropriate	1.67	0.47	.53	.88
Stored relevant documents and personal effects (e.g. passport, birth certificate, deeds etc.) in an appropriate place for evacuation, off-site, or in a fire safe compartment	1.74	0.44	.21	.89
Packed an evacuation box containing blankets, water, and first aid kit and medications	1.27	0.45	.54	.88
Listed the items that you would need to take with you if you were to evacuate (e.g. Medication, important documents, passports)	1.51	0.50	.54	.88
Listed the items that you would want to take with you if you were to evacuate (e.g. photos, laptops, cameras)	1.53	0.50	.49	.88
Plan				
Formed a household bushfire emergency plan	1.73	0.44	.62	.88
Thought carefully about what each person in your household would need to do in the event of a bushfire	1.77	0.42	.52	.88
Ensured that your home and contents insurance is adequate	1.94	0.23	.32	.88
Ensured that all household members are aware of the fire plan	1.78	0.41	.56	.88
Made a list (written or typed on computer, phone, etc.) of important things to do and remember in case of a fire	1.41	0.49	.41	.88
Ensured that all of your family members are comfortable with the intended fire plan	1.83	0.37	.59	.88
Informed your relatives about the intended fire plan of your household	1.48	0.50	.49	.88
Defend				
Obtained and prepared equipment to put out spot fires and sparks, such as metal buckets, rakes, shovels, and mops	1.74	0.44	.33	.88
Acquired ladders that are long enough to allow you to check the roof cavity and eaves and put out spot fires and sparks on the roof	1.93	0.25	.17	.89
Acquired long hoses that can reach all parts of your house and garden	1.91	0.29	.43	.88
Ensured that your fire-fighting equipment is operational within the past month	1.48	0.50	.39	.88
Acquired a power source independent of the mains (e.g., a generator) that can be used to power the pump	1.44	0.50	.29	.88
Acquired full length protective clothing (wool, cotton) including gloves, eye protection, work boots, and a broad brimmed hat)	1.72	0.50	.29	.88
Prepared a kit of personal protective clothing for each member of the household	1.29	0.45	.53	.88
Acquired ample supplies of drinking water to prevent dehydration during the fire	1.80	0.40	.38	.88
Obtained woollen blankets	1.69	0.46	.14	.89

6.3 The Final Scale

Upon removal of the items discussed in the section above, the final short form of the Bushfire Preparedness Scale featured 27 items across five sections (see Table 6.2.1 above). The final scale maintains, as closely as was practical, the ratio of questions across the five sections, as was contained in the initial 46 item version.

Comparisons Between Long and Short Forms

Utilising the original pilot dataset of 254 respondents who answered the full set of 46 original items, it is possible to compute total scores for both the original and short forms of the questionnaire. Both total scores were computed in an identical fashion. Total scores were computed by dividing the number of 'true of my property' responses by the number of items answered either 'true of my property' or 'not true of my property' (i.e. excluding those items for which respondents answered 'NA'). A number of respondents were eliminated from this dataset as they failed to answer a sufficient number of preparedness questions (75%). Respondents who answered fewer than 21 out of 27 questions on the short version, or 35 out of 46 questions on the original version were not computed a total score. One additional respondent was removed from the analysis as a result of answering the majority of questions as 'NA'.

Total scores on both versions of the scale were very similar with the mean score for the original scale being 63.91 (SD 16.35) and for the short version being 60.44 (SD 17.36). The slightly higher scale score for the original scale probably being the result of the removal of a number of items with low response variance for which almost all respondents indicated having completed the actions. The distribution of preparedness scores from both questionnaires appeared roughly normally distributed, though only the short version passed traditional tests of normality⁷ (see Figure 6.3.1).

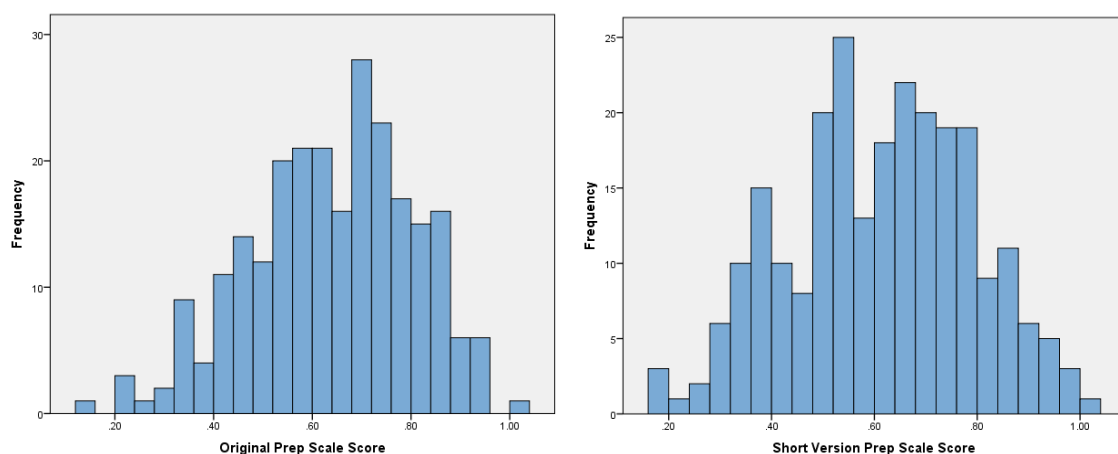


Figure 6.3.1: Histograms of total scores on both the original version (left) and the short version (right) of the bushfire preparedness scale for 254 respondents.

⁷ Kolmogorov-Smirnoff test statistics for the original scale (K-S(247)=0.068, p=0.007) and for the short version (K-S(246)=0.05, p=0.2).

Correlations between the total score on the original version of the scale, and total scores computed on the short version of the scale were very high ($r = 0.954$), suggesting that individuals scoring at a particular level on one form, were highly likely to score similarly on the other form.

Scale Properties of the Short Form

The Cronbach's alpha (internal consistency) of the 27 item short version of the preparedness scale was high ($\alpha = 0.80$, compared to an alpha of 0.89 for the original 46 item version) demonstrating that the items functioned well as a single scale.

Principal Components Analysis indicated that the responses to the 27 items loaded strongly on to two factors (however accounting for only 27.56% of the variance in responses). A further seven factors had eigenvalues greater than one (with the collective nine factors accounting for 63.03% of the variance), though inspection of the scree plot and factor loadings for these items did not reveal meaningful patterns of responses (see Figure 6.3.2). The two factor solution, following oblique rotation (direct oblimin) demonstrated that items relating to vegetation management and the preparations for an active defense loaded strongly and positively on Factor 1, while items related to planning and evacuation loaded strongly but negatively on Factor 2. A number of items, particularly those with relatively low response variance failed to load on either of the two factors (see Table 6.3.1 below). This factor structure is interesting in that it appears to describe two differing patterns of response. The first response set may be described as active defence; identified by those keen to undertake actions to prepare the house and property to survive fire and to procure the necessary equipment to undertake an active defense. The second response set may characterise a second group that appears to have embraced the 'leave' decision, and is thus likely to focus more on planning for a possible evacuation in the event of a bushfire. We assume two groups here simply because the response sets seem incompatible and antithetical to each other.

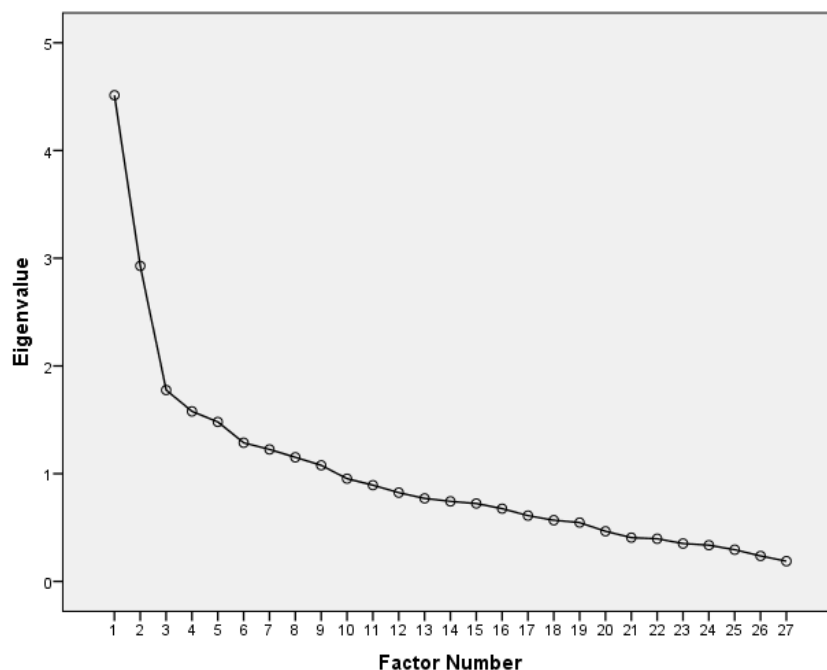


Figure 6.3.2: Scree plot of Eigenvalues for factors derived from the 27 items of the short version of the Bushfire Preparedness Scale.

Table 6.3.1: Factor loadings on two factors derived from Principal Components Analysis, for all 27 items in the short version of the Bushfire Preparedness Questionnaire. Factor loadings below 0.3 have been suppressed.

Item	Factor 1: Defend	Factor 2: Plan/Leave
Vegetation		
Cleared fuels (e.g., leaves, twigs and long grass) for a distance of at least 20m around the house	.534	
Maintained a minimum two metre gap between your house and tree branches or shrubs	.486	
Moved flammable and combustible materials such as firewood, boxes, gas cylinders, and wooden garden furniture away from the house	.310	
Ensured that leaf litter and twigs under trees are raked throughout the fire season	.509	
Conducted controlled burning on your property to reduce fuel load		
Ensured that all the trees on or near your property are away from overhead utility lines, or that lines are buried and not susceptible to fire	.307	
Ensured that tree branches up to 2m off the ground are pruned	.535	
Removed any timber, rubbish, and old junk lying around	.361	
House		
Ensured that external house timbers all have a sound coat of paint		
Installed gutter protection	.357	
Covered all gaps and vents to reduce the risk of embers entering the house or cavities (e.g. floor spaces, in the roof space, under eaves, external vents, skylights, evaporative air conditioners, chimneys, and wall claddings)	.409	
Installed a roof-mounted sprinkler system		
Installed a fire-resistant roof on your house (e.g. metal, tile, composition)		
Evacuation		
Mapped out an evacuation route		-.559
Decided what documents and personal effects you would take with you if you left the house		-.581
Stored relevant documents and personal effects (e.g. passport, birth certificate, deeds etc.) in an appropriate place for evacuation, off-site, or in a fire safe compartment		-.551
Packed an evacuation box containing blankets, water, and first aid kit and medications		-.521
Listed the items that you would want to take with you if you were to evacuate (e.g. photos, laptops, cameras)		-.722
Plan		
Formed a household bushfire emergency plan		-.645
Thought carefully about what each person in your household would need to do in the event of a bushfire		-.617
Made a list (written or typed on computer, phone, etc.) of important things to do and remember in case of a fire		-.690
Informed your relatives about the intended fire plan of your household		-.635
Defend		
Obtained and prepared equipment to put out spot fires and sparks, such as metal buckets, rakes, shovels, and mops	.621	
Ensured that your fire-fighting equipment is operational within the past month	.616	
Acquired a power source independent of the mains (e.g., a generator) that can be used to power the pump	.567	
Acquired full length protective clothing (wool, cotton) including gloves, eye protection, work boots, and a broad brimmed hat)	.484	
Acquired ample supplies of drinking water to prevent dehydration during the fire	.427	

6.4. Feature: Ph.D. Candidate Jessica Stacey (Psychological Preparedness)

The Development and Validation of the Bushfire Psychological Preparedness Scale (BPPS)

Background and rationale

Bushfires are stressful situations which require individuals to respond quickly and accurately to ensure their safety and survival. However, high levels of stress (distress) can impair people's cognitive functioning and see them respond in unpredictable ways. Numerous studies investigating stress and coping in other contexts (e.g. military, NASA, academia, sports) have found that psychological preparedness can help maintain an effective response during stress inducing tasks/situations/events (e.g. Johnsen et al., 2007). Therefore, it is expected that psychological preparedness could help individual's respond effectively during a bushfire.

Additionally, psychological preparedness could also help mitigate the development of long term psychological problems (e.g. depression, anxiety, and post-traumatic stress) that result from the event itself, social effects (e.g. displacement) or physical effects (e.g. property damage or destruction). However, despite the important role that psychological preparedness could play in mitigating these immediate and long terms consequences, it remains an under-researched area in the bushfire context. One of the first steps to improving the research in this area is to develop a reliable and valid measure that can help pave the way for the development and evaluation of theories dedicated to shaping and promoting bushfire safe behaviours.

PhD Aim

To develop and validate a self-report tool that can be used to measure an individual's psychological preparedness for a bushfire.

Study 1 aims to synthesis the research on psychological preparedness in the bushfire context, with a specific focus on evaluating the conceptualisation of psychological preparedness and the current measures of psychological preparedness. It was found that attempts to define psychological preparedness are limited and no valid measure is available in the bushfire context.

Study 2 aims to conceptualise psychological preparedness and to develop and refine a large item pool to operationalise this concept. Psychological preparedness was conceptualised as a combination of resources (cognitive, personal and social) possessed by an individual that uniquely influence their emotional and cognitive response during and after a stressful event such as a bushfire. A total of 172 items were developed which was reduced to 132 following expert review.

Study 3 aims to empirically investigate the structure of the model and to refine the scale using exploratory factor analysis and item analysis. A preliminary analysis resulted in the deletion of 58 items and found a five factor model for the attitudinal items (social support, proactive coping, negative coping, optimism, and coping self-efficacy). However, the results for this study still need to be finalized, so these results should be taken as preliminary only.

Study 4 aims to retest the model using the refined item pool from study 3 which includes both new and revised items. It also aims to confirm the model using confirmatory factor analysis.

7. Western Australian Communities Questionnaire

7.1 Communities and Bushfire Preparedness

As discussed in Chapter 3, it is important, especially in designing fire mitigation programs, to separate community and individual influences on the willingness to prepare for the possibility of bushfires. Unlike the voluminous research in epidemiology and criminology (Kawachi et al., 2008; Sampson et al., 2002), systematic analysis of the separate effects of individual and community characteristics (and their interaction) is lacking. This gap in the research literature and evidence that communities do appear to differ substantially in fire preparedness (Brenkert-Smith et al., 2006; Jakes et al., 2007) as well as in other, potentially causal characteristics (e.g. social capital) confirm the need for a comprehensive examination of an extended range of variables likely to be major influences on fire preparedness.

It is evident that variations in individual preparedness stem from both from those characteristics unique to a particular individual (Spittal, 2003) as well as from shared community experiences (Bushnell et al., 2007; Gavilanes-Ruiz et al., 2009; Johannesdottir & Gisladottir, 2010). For example, how people judge the risk of fire may depend not only on any personal experience with fire but also on the views of a person's social group (Lion et al., 2002) and the society at large. There are clearly many possible dimensions along which communities vary and which may influence individual preparedness. On the basis of a comprehensive literature review (Chapter 3) and the interviews undertaken in the qualitative phase of the study (Chapter 5), we selected a range of individual and demographic variables and four community attributes - Social Capital, Place Attachment, aggregated perceptions of risk and the vigilance of local government in enforcing by-laws relevant to bushfire prevention - as suitable candidates for further, in depth study.

One of the recurrent problems in research of this kind is that variables derived from aggregating individual reports to arrive at descriptions of community characteristics may operate as both individual and community level influences. For example, an investigation of the effects of participation in community organisations could measure both the number of organisations to which each individual belongs (an individual-level variable) and, using the same reports, the percentage of people in the community who belong to at least one organisation (a group-level derived variable). An appropriate multi-level analytical framework is required to separate these effects and to allow for an "integrated and simultaneous analysis of variables at both levels" (Oberwittler, 2004, pp 214) in order to disentangle individual and community effects (Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007). To achieve this end we have employed Hierarchical Linear Modelling.

The aims of this study were:

- To establish whether there are reliable differences between communities in aggregate preparedness levels and various predictor variables;
- To explore the extent to which community characteristics influence individual perceptions of risk and fire preparedness;
- To identify how much of the variation in individual fire preparedness can be explained by community characteristics as opposed to individual level characteristics, and
- To determine the best combination of community level and individual characteristics to predict fire preparedness.

7.2. Feature: Ph.D. Candidate Charis Anton (Place Attachment)

Place Attachment and Bushfire Preparedness

Place attachment has been theorised to predict individuals' bushfire preparation. If people are highly attached to their homes, they might be more inclined to implement preparedness measures to help protect their homes from the impacts of a natural disaster. This has been supported by the results of quantitative studies which have shown that place attachment is a motivating factor for fire preparation (Paton, 2012), a predictor of property-based fire mitigation (Kyle, Theodori, Absher, & Jun, 2010), and a predictor of flood preparedness on the flood plains in Orissa, India (Mishra, Mazumdar, & Suar, 2010). Qualitative studies have also identified place attachment as a factor contributing to preparedness. Jakes and colleagues' (2007) case studies in several bushfire prone areas in the United States suggested that people's attachment to place inspired them to improve their fire preparedness.

We examined place attachment and bushfire preparation in two samples; one rural and one urban-fringe. Participants' place attachment to their homes and local areas, socio-demographic characteristics and bushfire preparedness were measured. Hierarchical regression showed that place attachment to homes predicted bushfire preparedness in the rural sample but not in the urban-fringe sample. The results suggest that place attachment is a motivator for preparation only for people living rurally. Reminding rural residents of their attachment to home at the beginning of bushfire season may result in greater preparedness.

A second study was conducted which explored the relationships between place of residence and the subsets of place attachment: place identity and place dependence. It has previously been theorised that people only become aware of their sense of place when that place is threatened (Proshansky et al., 1983). The study hypothesised that people living in bushfire-prone areas would report greater place attachment than people in low-risk areas.

Data were collected from people living in rural and urban areas and was drawn both from places with a high- and low-bushfire risk. Results revealed a significant effect of place of residence on place identity with rural residents reporting higher place identity than urban dwellers. For place dependence, there was a significant interaction between place of residence and living in a fire prone area. Urban dwellers reported lower place dependence than rural dwellers except when they lived in a fire prone area, in which case their place dependence was on par with that of rural residents.

From previous research, we know that people who are strongly attached to a place are more likely to work together (Brown, Reed, & Harris, 2002) and will protect the social and physical aspects of their neighbourhoods that they feel are threatened (Mesch & Manor, 1998). Framing potential bushfires as threats to the physical aspects of the area could activate people's place attachment and lead to greater preparedness.

This study also explored the factors that predict attachment to one's local area. Belonging to clubs and living in a place for its physical attributes were significant predictors. We could try to increase people's place attachment and thus possibly increase preparedness by working to highlight the physical attractiveness of places and through encouraging locals to join groups or clubs in the area. These clubs can range from formal bushfire brigades to sporting clubs or book clubs as they all work to increase people's social ties and attachment to the area.

7.3. Questionnaire Development and Composition

The final questionnaire surveyed respondents about a range of concepts including their attachment to the place they live, the levels of social capital they perceive within their community, their perceptions of the risk of bushfire, any precautions they have taken to protect their homes from bushfire as well as their perceptions about the actions of their local government authority. The questionnaire utilised a number of existing scales with known psychometric properties (e.g. to assess Place Attachment and Social Capital) as well as featuring some newly constructed items whose properties we assess (e.g. covering Local Government Confidence, Bushfire Education Materials, and Bushfire Hazard Reduction Inspections).

Demographic Variables

Respondents were asked a series of demographic questions on variables found to be related to bushfire preparedness in previous research. The questionnaire included questions required to locate the respondent within one of the targeted communities (i.e. postcode and suburb/location; apart from these questions each returned questionnaire was de-identified unless the respondent included their address on the final page, acknowledging that they would like to be included in further studies). A range of demographic variables related to the individual respondent including questions on gender (male/female), age, highest educational attainment, employment status and income⁸. A further set of demographic questions asked for the respondents' residence including assessing the block size, the length of residence (both town and property), the respondents' ownership status of that property, their use of that property for farming or to derive a livelihood, and the property's proximity to bushland.

Prior Exposure to Bushfire

Two questions were included regarding respondents previous exposure to bushfire as this variable has been shown to affect preparedness behaviours across multiple disaster types including earthquakes,

⁸ Note that employment status was also asked of the respondents' spouse (if applicable) and income was taken as 'household' income. The income question made no mention of whether income referred to pre or post-tax income and as such it is unclear which respondents provided.

volcanic eruptions and bushfire (Enders, 2001; Johnston et al., 1999; Prior, 2009; Russell, Goltz, & Bourque, 1995). Respondents were asked whether they had ever previously been personally affected by bushfire, and if so, when. A second question assessed whether someone they knew had ever personally been affected by bushfire, and when⁹.

Place Attachment

The Place Attachment scale utilized in the present questionnaire is a minimally altered version of that utilized by Williams and Vaske (2003). Their 12 item scale was constructed from a larger pool of 61 items potentially assessing Place Attachment (both Place Identity and Place Dependence) created by Williams and Roggenbuck (1989) and Williams et al. (1992). Questions assessing Place Dependence each included a 'functional' aspect, while questions assessing Place Identity tapped emotional or attitudinal aspects of the particular place. Each item was measured on a five point scale from 'strongly agree' to 'strongly disagree' (examples below).

"I wouldn't substitute any other area for doing the type of things I did here" (Place Dependence)

"This place means a lot to me" (Place Identity)

Across a number of studies utilizing a variety of subsets of the abovementioned 61 items, a two factor structure of Place Attachment has been reliably observed indicating that each item was associated with each Place Identity or Place Dependence. Furthermore, the particular levels of Place Attachment recorded have been shown to influence the way individuals view a variety of natural resource management issues (Vaske & Kobrin, 2001; Vorkinn & Riese, 2001).

The current questionnaire utilizes 11 of the 12 questions assessed by Williams and Vaske (2003), leaving out the question: "The things I do at 'X' I would enjoy doing just as much at a similar site". This question, assessing Place Dependence, was removed as it was shown by Williams and Vaske (2003) to have only a small relationship with Place Dependence¹⁰. For the purposes of the present questionnaire, each item was modified so as to apply to the respondent's 'home'. Despite each resident rating their own property, it was expected that the similarity of properties/experiences within a community would offer considerable consistency amongst ratings within the same community/town, and these might reliably differ from those of residents of other communities. As such, an aggregated level of Place Attachment (and possibly Place Dependence and Place Attachment) could be computed for each community. The following questions represent an example of a Place Dependence and Place Identity question, respectively:

"I wouldn't substitute any other area for doing the types of things I did at home" (Place Dependence)

"My home means a lot to me" (Place Identity)

Perceptions of Bushfire Risk

Perceptions of bushfire risk have traditionally been seen to be comprised of two main sub-components, namely the perceived likelihood of the threat occurring and the perceived severity of the threat, should it occur (Lindell & D.J., 2000; I. M. Martin et al., 2007; W. E. Martin, Martin, & Kent, 2009). Generally speaking, individuals are considered to be unlikely to take many preparedness

⁹ No further information was provided to respondents about what constituted 'affected'. This decision was left open to respondents and it is conceivable that different people interpreted it in different ways. Some may have seen smoke in the distance and considered themselves affected, while others may have been evacuated, with the fire reaching an outer paddock of their property, and not consider themselves affected.

¹⁰ Confirmatory Factor Analysis across three locations demonstrated factor loadings of between 0.28 and 0.45.

actions on their property if they think that the chances of a bushfire affecting their area is exceedingly small, or if the likelihood of severe damage to their property in the event of a fire is judged very minimal. Previous research has shown the perception of risk to be an important influence on preparedness across a range of different hazards including bushfires (I. M. Martin et al., 2007; W. E. Martin et al., 2009), earthquakes (Lindell & D.J., 2000; Paul & GBhuiyan, 2010; Solberg, Rossetto, & Joffe, 2010) and volcanos (Paton, Smith, Daly, & Johnston, 2008).

Six questions assessing perceptions of risk were included in the present questionnaire. The six items include, and are based on two similar items from previous studies by our research group (McNeill, Dunlop, Heath, Skinner, & Morrison, 2013). Three of these six items tap the likelihood of bushfire, while a further three tap the concept of severity. Additionally, three of the questions relate specifically to the respondents' own property, while the remaining three assess the respondents' views of risk towards their town or suburb. All questions were presented along with a 7 point Likert response scale, anchored at 1; 'definitely won't happen' or 'not severe at all' and 7; 'definitely will happen' and 'extremely severe'. For the full text of the items utilized, please see APPENDIX C.

Social Capital

Social capital was assessed using a subset of the items of the Onyx and Bullen Social Capital Scale (Bullen & Onyx, 1998). Concepts underpinning the Onyx and Bullen social capital scale were originally derived as a result of a workshop presented as part of the Australian and New Zealand Third Sector Research Conference in New Zealand in 1996. The discussions identified a range of characteristics of communities with high stocks of social capital including¹¹:

- "Individual human life is valued because of its humanness, not because of any achievement or category of race, gender, age or social status."
- "There is a strong commitment to shared social values, a discourse of ethics..."
- "There are high levels of social trust. People trust each other, including strangers..."
- There are effective informal means of social control. The norm of reciprocity is strong..."
- "There are strong lateral social networks. People feel connected with other people..."
- "There is a high rate of participation in formal and grass-roots community organizations..."
- "The organizations within the community are characterized by participatory democratic process and bureaucratic ones..."
- "People volunteer time and resources to the common good, not simply on a 'cash and carry' basis..."
- "Basic needs/rights are met. There is adequate food, clothing, shelter, health, safety and education for all."
- "There is the potential for social actions for the common good. It is easy to mobilize community resources around a perceived need or threat..."
- "Public controversy is accepted and valued. It is safe to voice dissent without the threat of violence or ostracism."
- "There is an openness to the new, an acceptance of diversity, a willingness to take risks..."

Based on these characteristics an initial series of 68 draft questions were developed and pilot tested on 1211 student and community respondents in mid 1996. Based on further analyses of these data set, eight distinct elements were discovered that appeared to define social capital:

- A. Participation in local community
- B. Proactivity in a social context
- C. Feelings of trust and Safety
- D. Neighbourhood connections

¹¹ These points are derived from: (Bullen & Onyx, 1998)

- E. Family and friends connections
- F. Tolerance of diversity
- G. Value for life
- H. Work connections.

Four of these categories relate to participation and connections in the community, while the other four relate to what Bullen and Onyx (1998) describe as the 'building blocks of social capital'. The final questionnaire featured 36 items, each of which related to the general social capital factor and/or one of the 8 factors listed above. Further revisions detailed in Onyx and Bullen (2000) refined this set down to 34 items, excluding two items which did not load satisfactorily on to one of the above 8 factors.

The Western Australian community bushfire preparedness questionnaire incorporated 24 items from the final set of 34 items listed in Appendix A of Onyx and Bullen (2000). All items in sections A, C¹², D, and E were utilized. In the interests of keeping the complete final questionnaire to a size that would maximize the response rate, sections F and G were not included. These sections demonstrated the lowest correlations with other factors of social capital, as shown in Onyx and Bullen (2000). Furthermore, five items comprising the section 'Work Connections' were left out of scale as these items are only applicable to those in the workforce and did not apply to all respondents. All questions were scored on a four point Likert scale ranging from 1 (No, not much, or No, not at all) to 4 (Yes, definitely or yes, frequently).

Community Level Preparedness Involvement

A single dichotomous response item initially asked respondents whether they were engaged in 'community level bushfire preparedness activities'. While no examples or information was provided on exactly what constituted community level bushfire preparedness activities, a further dichotomous response item requested participants to indicate which of a list of community level activities they were part of; including a 'bushfire ready group', a 'volunteer bushfire brigade' and an 'emergency management committee'. Respondents were also given the option of selecting 'other' and listing further community level preparedness activities in which they participated/

Bushfire Preparedness Actions

In total 27 questions regarding a variety of bushfire preparedness actions were included in the final questionnaire. These questions were drawn from the larger set of preparedness items compiled by Dunlop et al. (2014). The complete list of bushfire preparedness questions included in the questionnaire can be found at APPENDIX C. Respondents were given three response options; 'yes', 'no' and 'N/A' and were instructed to indicate which of the activities had been completed at the time that they started filling out this questionnaire. The derivation of these questions is extensively discussed in Chapter 6.

Identical to Dunlop et al. (2014), an additional question was included to assess respondents intended actions in the event of a bushfire affecting their town or suburb. The item asked respondents which of a variety of actions they were most likely to do. The statements were all variations on the stay vs leave decision and included the following options:

- Stay and protect your property.
- Do as much as possible to protect your property but leave if the fire directly threatens it/ reaches your property.
- Wait and see what the fire is like before deciding to stay and defend or leave.
- Wait for the police, fire or other emergency services to tell you what to do on the day.

¹² One item from Section C "If someone's care breaks down outside your house, do you invite them into your home to use the phone?" was inexplicably omitted from the 24 items included in the WA Bushfire Preparedness Questionnaire.

- Leave as soon as you know there is a fire threatening your town or suburb.
- You would not be at home because you intend to leave your property and stay somewhere else on days of extreme and catastrophic fire danger.
- Haven't thought about it.

Bushfire Prevention Enforcement

In this section a series of items assessed the frequency of local government property inspections for hazard reduction and respondents views regarding these inspections. Additionally three yes/no questions assessed whether a range of negative consequences had befallen respondents as a result of not complying with Local Government hazard reduction regulations. The three consequences assessed were:

- Have you ever received an infringement notice for failure to comply?
- Have you ever been fined for failure to comply?
- Have you ever had to pay the Shire for the work of contractors sent to your property to carry out fire prevention work?

In relation to hazard reduction regulation compliance inspections, respondents were asked about both the frequency and thoroughness of these inspections on a four point response scale ('not aware of inspections', 'Rarely/No Superficially', 'Occasionally/Somewhat Thorough' and 'Frequently/Yes, thoroughly'). Four additional items assessed respondents' views as to the nature of these inspections, including items targeting the clarity of recommendations, the informativeness of the officers, the feasibility of recommended actions, and whether the inspectors made a return visit to check for compliance. The full text of these items can be found at APPENDIX C.

Bushfire Education Materials

A single dichotomous (yes/no) item assessed whether respondents received annual firebreak, fuel hazard reduction or bushfire preparedness educational materials from their local government (the primary agency responsible for their delivery in Western Australia).

Following this, a series of 10 items assessed the educational materials sent out by the local government and respondents' views of the messages contained within these materials. Questions in this section can be split into two main components; those that assess the education materials directly, and those that assess respondents' views regarding the messages the materials contain. For the educational materials, questions assessed the clarity of the content, the consistency of the content with the information being provided by other sources, and the timeliness of the information. Questions assessing respondents' views of the messages inherent in such material assessed respondents' ability to carry out the actions suggested in the materials, the appropriateness of the actions, the effect the actions would have on the aesthetics of their property, and their general beliefs about the importance of complying with the suggested actions. Items from both sections were presented in a random sequence, and all items were assessed on a 5 point Likert scale from 'Strongly Agree' to 'Strongly Disagree' with a 'Neutral' midpoint.

Perceptions of Government and Emergency Services

A series of 34 items were created to assess respondents' confidence in government and emergency services organisations to manage the threat of bushfire. In total, five such agencies were assessed including the Department of Fire and Emergency Services (DFES; 5 items), the Department of Environment and Conservation (DEC; 4 items), the State Government (4 items), the local Volunteer Bushfire Brigade (1 item) and the Local Government (20 items).

Items assessed a number of different actions and qualities of the respective organisations. In order that respondents' knowledge of agencies did not limit their ability to respond, all questions asked for the respondents' 'confidence' in the agencies to perform the particular action, or hold the particular

value in question. For all agencies, with the exception of the local volunteer brigade, items assessed; the ability of agencies to work well alongside one another, the ability of agencies to communicate with the public, and the perceived capability of agencies to suppress fire. A number of items were repeated across the various agencies. Additional questions were asked about the actions of the respondents' Local Government as this level has the primary responsibility for fire mitigation and suppression in Western Australia. Additional questions of the local government assessed their knowledge of the local area, the quality of their staff, their willingness to enforce hazard reduction bylaws and their ability to manage local forests and fuel loads. The complete list of 34 items is presented at APPENDIX C. All items were presented on a seven point Likert response scale anchored at 'Very Unconfident' and 'Very Confident' with a 'Neutral' mid-point.

7.4. Selection of Communities & Responses

Selection of Communities

Given the projects' particular focus on community level variables and their effect on individual bushfire preparedness, the selection of appropriate communities for questionnaire distribution was deemed crucial. Even within the geographic definition of community utilized here, decisions are required regarding the size and location of the communities as well as the selection of households within a community. Initially, it was determined that communities would be derived from separate local government areas. In Western Australia, local government has the primary responsibility for the mitigation and prevention of bushfire and as result is likely to feature significant homogeneity of service provision to its residents. In other words, the rates of property inspections and the provision of bushfire preparedness materials are likely to be more similar for residents within a particular local government area than across multiple areas.

Additionally, the selection of communities as well as the individuals within those communities was linked to the types of statistical analyses that were planned. Initial estimates indicated that upwards of 100 responses per community would be required for adequate statistical power. The selection of small townships and villages, while likely to feature stronger community ties, would simply provide insufficient responses to permit robust analysis. Previous research indicates that the response rates to questionnaires received 'cold' varies between 10% and 20% depending on the perceived relevance to the respondent and the questionnaire's length. As a result the definition of community had to be, at the very least, equivalent to a moderate sized township with approximately 1000 attainable addresses. In most cases Western Australia local government areas feature a single regional capital (often synonymous in name with that of the local government area) which fits the above definition and formed the center of each community for the purposes of this study.

Records (home addresses and resident names) have been sourced through a company, Prospect Unlimited, based in Queensland. This company provides records of contact details including addresses and phone numbers, for a fee. This method has a number of advantages and disadvantages:

- Allows for random sampling of a given area – records can be randomly sampled from Prospect's total record pool for a given area.
- Ensures that researchers are not involved with the selection of households thus maintaining research integrity.
- The process is rapid – once details of the desired areas/townships are provided to Prospect, a spread-sheet of records is delivered within two working days.
- Attaining addresses allows for a postal questionnaire to be sent to potential respondents ensuring that age, financial status, residency type and access to internet communications is not a limiting factor of participation. In particular, when compared to using a survey panel,

the present method is likely to result in sampling closer to Bureau of Statistics demographic data.

- The downside of this approach is the substantial financial costs associated with attaining records, printing questionnaires and both outgoing and incoming postage costs.

As Prospect's database does not include all residents within a given town, the availability of records represents a further limitation on the size of townships that can be selected.

In order to maximise variability between communities, five highly prepared/proactive communities and five poorly prepared communities were chosen based on available data. As individual fire readiness is the dependent variable of interest, sampling based on community preparedness is likely to result in maximum differences between communities on those variables found to relate to preparedness. In addition, it was deemed important to include communities at varying levels of proximity to Perth, as such proximity may relate to levels of community attachment and preparedness. Information regarding the preparedness of local governments was obtained through consultation with the Department of Fire and Emergency Services (DFES) who provided information of at risk communities from their Bush-Fire Threat Analysis (BFTA) system. Additionally, data from a recent West Australian government survey of Local Governments "Bushfire Risk Identification and Mitigation Project" was utilised in the selection of communities.

This study focuses on the most fire prone areas of Western Australia; the South West. Selection data revealed that a number of additional communities were deemed to be poorly prepared but were left out of the current study as they were not deemed to be in areas at significant risk of bushfire. Originally, we were provided with the following information:

- Outer-Metro High Prepared: Armadale (6112), Bunbury (6230), Gingin (6503), Toodyay (6566)
- Rural High Prepared: Busselton (6280), Denmark (6333), Donnybrook (6239)/ Balingup (6253)
- Outer-Metro Low Prepared: Chittering, Canning, Mandurah
- Rural Low Prepared: Nannup (6275), Manjimup (6258), Collie (6225) Boyup Brook (6244) , Dardanup (6236), Capel (6271)

Within both groups (high and low preparedness), the selection of communities was limited to 2 communities from the outer metropolitan area (<150km from GPO) and 3 communities from rural areas (>150kms). Of the communities presented above, a number were excluded. The City of Canning was excluded on the basis of it being almost entirely a residential inner-suburban area of which only a very small proportion of bushland and deemed to be at risk of bushfire. Gingin, Toodyay, Boyup Brook, Dardanup and Capel were omitted on the basis of having smaller populations with only limited scope to obtain sufficient records to permit analysis.

In order to attain the most succinct definition of 'community' it was decided that sampling would occur around the regional centres within each local government area and would only be expanded if sufficient records could not be obtained to achieve the desired response rate (20%). Households in the centre of large regional towns were excluded as these houses were typically residential lots and in many cases deemed to be at little risk of bushfire. In many cases these initial parameters did not produce sufficient records and it was deemed necessary to expand the search area significantly and take in outlying townships/suburbs or other regional centres (e.g. both Pemberton and Manjimup within the Shire of Manjimup). The finest level of granularity for sampling was the suburb/township level. The complete list of suburbs that were sampled, and the number of records attained in each area is presented in Table 7.4.1 below.

Once the requested addresses were obtained these details were forwarded to the printers who organised the mail-out of the questionnaire to households. Questionnaires were sent out in white A4 envelopes carrying the University logo and addressed to the name of the home owner. In total 8346 questionnaires were mailed out to households. Questionnaires were delivered in early January 2013 (9th or 10th) and were accompanied by a reply paid DL envelope with the request that they be returned prior to February 6th 2013.

Table 7.4.1. Localities within each local government area from addresses were sought for questionnaire mail-out. Localities are based on postcode. Localities in the centre of large regional towns have been omitted from selection.

Shire	Locality								Total Number Of Records	
City of Armadale	Roleystone (6111)	Wungong (6112)	Bedforddale (6112)						1000	
Shire of Bunbury	Dalyellup (6230)	Dardanup West (6236)	Gelorup (6230)	Picton East (6229)	Picton (6229)	College Grove (6230)	Waterloo (6228)		1000	
Shire of Busselton	Quindalup (6281), Yallingup Siding (6282)	Quedjinup (6281), Yelverton (6280)	Walsall (6280), North Jindong (6280)	Acton Park (6280), Jindong (6280)	Kalgup (6280), Boallia (6280)	Marybrook (6280), Chapman Hill (6280)	Ambergate (6280), Reinscourt (6280)	Carbunup River (6280), Yallingup (6282)	Sabina River (6280), Siesta Park (6280)	866
Shire of Denmark	Denmark (6330)	Denmark has only one postcode							1000	
Shire of Donnybrook	Kirup (6251)	Mullalyup (6252)	Balingup (6253)	Donnybrook (6239)					794	
Shire of Chittering	Wannamal (6505)	Muchea (6501)	Mooliabeebee (6504)	Bindoon (6502)	Lower Chittering (6084)	Chittering (6084)			678	
City of Mandurah	Furnissdale (6209)	Ravenswood (6208)	Herron (6211)	Baragup (6209)	Parklands (6180)	Stakehill (6181)	Bouvard (6211)		899	
Shire of Nannup	Peerabeelup (6260)	Donnelly River (6258)	Nannup (6275)						135	
Shire of Manjimup	Pemberton (6260)	Manjimup (6258)								974
Shire of Collie	Collie (6225)	Collie has only one postcode							1000	

Response Rates

While the original specified return date was the 1st of February, 2013, delays in mailing out questionnaires to recipients meant that had we adhered to the deadline, participants would have had less than a month to respond. A significant number of questionnaires were received after this date and all of them have been included in the analysis up until the new cut-off date of April 1st. Presumably a number of the questionnaires received later in the period were from respondents who only lived on their property part-time and did not receive the questionnaire until visiting their properties during the 2013 Easter break.

There appears to be a reasonable amount of variation in the response rates across the 10 areas (see Table 7.4.2), with the highest rate of returns being achieved in Armadale (20.1%) and Denmark (20.9%) and the lowest in Manjimup (11.5%), Collie (11.7%) and Busselton (11.8%). These response rates appear to be directly correlated with the perceived level of bushfire risk in these communities ($r=0.79$). It seems probable that respondents in communities who feel themselves to be at risk of bushfire are more willing to fill out and return the questionnaire than those who do not feel at risk. This cannot be conclusively ascertained however, as we have no method of determining the perceived levels of risk of those who did not return the questionnaire.

The overall response rate of 16.1% is consistent with that of other large scale 'cold' questionnaires administered in Australia previously. In total there were 695 questionnaires returned having not reached their intended destination ('return to sender'). These included questionnaires for which the addressed resident no longer resided at that address, as well as a number of returns for which the address no longer existed on the postal register. The latter are likely to be rural blocks that do not feature a residential dwelling but are listed in the name of an individual. As always with such a figure, it is impossible to know how many more did not reach their intended recipient but were not returned. The true response rate (the number returned divided by the total number sent out minus those that did not reach their intended address) was 17.5%.

For the 10 communities under investigation, the sampling rates allow for confidence in the generalizability of results. Throughout many of the smaller communities in the study, more than 20% of the total number of households present in the local government area were sent a questionnaire (based on ABS statistics). While for the four larger communities (Armadale, Bunbury, Busselton and Mandurah), proportions appear much smaller, it may be because the large town centres were not included in the survey area.

Eight respondents did not fill in the question asking their postcode or suburb, so no allocation can be made of these individuals. Similarly 11 respondents put down their address as being outside one of the study areas. Presumably, these people had received the questionnaire as a result of either previously living in one of the study areas, being the landlord of a house in a study area, or having the questionnaire passed on to them from someone else in the family residing in the study area.

Table 7.4.2: Mail-out and response statistics across ten local government areas surveyed.

Area	City/Shire	No. Sent Out	No Received	%Received	Households in LGA	Prop. LGA Surveyed
1	Armadale	1000	201	20.10%	25045	3.99
2	Bunbury	1000	148	14.80%	14769	6.77
3	Busselton	866	102	11.80%	15848	5.46
4	Denmark	1000	209	20.90%	1437	69.59
5	Donnybrook	795	143	18.00%	2453	32.41
6	Chittering	677	128	18.90%	1892	35.78
7	Mandurah	899	139	15.50%	35372	2.54
8	Nannup	135	24	17.80%	857	15.75
9	Manjimup	974	112	11.50%	4931	19.75
10	Collie	1000	117	11.70%	3943	25.36
Other	(undisclosed)	0	19			
Total		8346	1342	16.10%	106547	7.83

7.5 Results and Analysis

Owing to delays in the mail-out of questionnaires, returned surveys were accepted until the start of April 2013. All returned questionnaires were manually coded into a statistics package (SPSS V21) for analysis. In total, 19 questionnaires were received from locations outside of the ten communities of interest. These data points were removed from all further analysis.

General Demographic Information

Age, Gender & Time on Property

In each of the communities sampled the mean and median ages of respondents are substantially higher than that reported for the communities as a whole from Australian Bureau of Statistics census data (Table 7.5.1 below). In all likelihood this feature is due to older individuals having more time to fill out surveys as a result of no longer being active in the workforce. Nevertheless, the pooled data contains respondents across the entire age range from 18 to 98 years of age¹³ (Figure 7.5.1).

While there is a substantial amount of variation between communities with in the male/female gender ratios, the overall gender breakdown is very close to a perfect male/female split (49.8% female). Busselton had the lowest proportion of female respondents (34.6%) while Manjimup had the highest proportion (64.3%).

While the majority of communities appeared quite similar in the average duration of residence (both at that address, and in that suburb), three communities stood out as having residents who had spent substantially more time in their respective areas: Armadale, Manjimup and Collie. Interestingly, at a community level these data did not correlate with the ages of residents, with Armadale, Manjimup and Collie each reporting a mean age slightly below, or similar to, the total community average. At the level of the individual however, this correlation exists with older respondents being associated with

¹³ Although the data appears to be roughly normally distributed (Figure 1 below), it fails traditional tests of normality (Shapiro-Wilks = 0.99, $p < 0.001$).

having lived for longer at the surveyed address¹⁴, and having lived for a longer period of time in the surveyed suburb¹⁵.

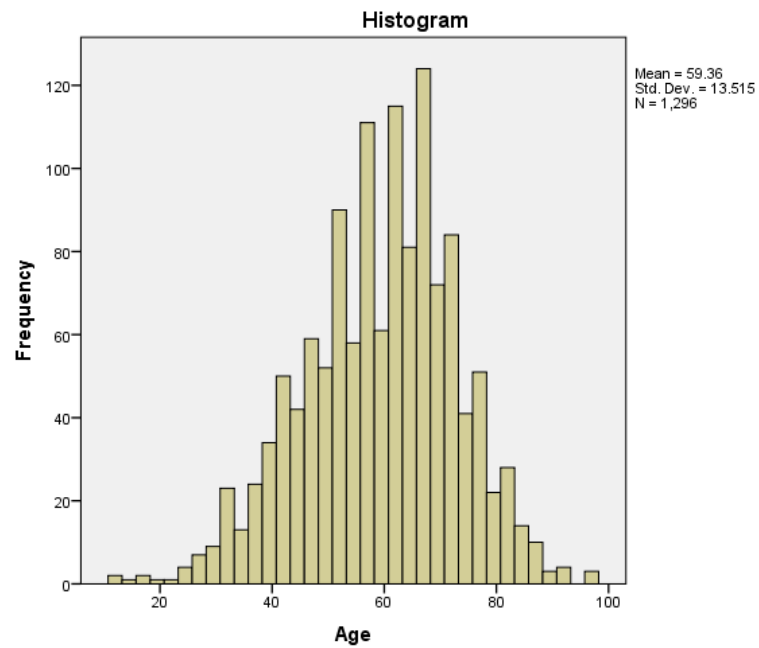


Figure 7.5.1: Histogram of the ages of respondents pooled across all ten communities. The data appears to approximate a normal distribution.

¹⁴ Pearson's correlation ($r=0.30$, $p<0.001$)

¹⁵ Pearson's correlation ($r=0.22$, $p<0.001$)

Table 7.5.1: Demographic statistics for respondents across all ten communities sampled.

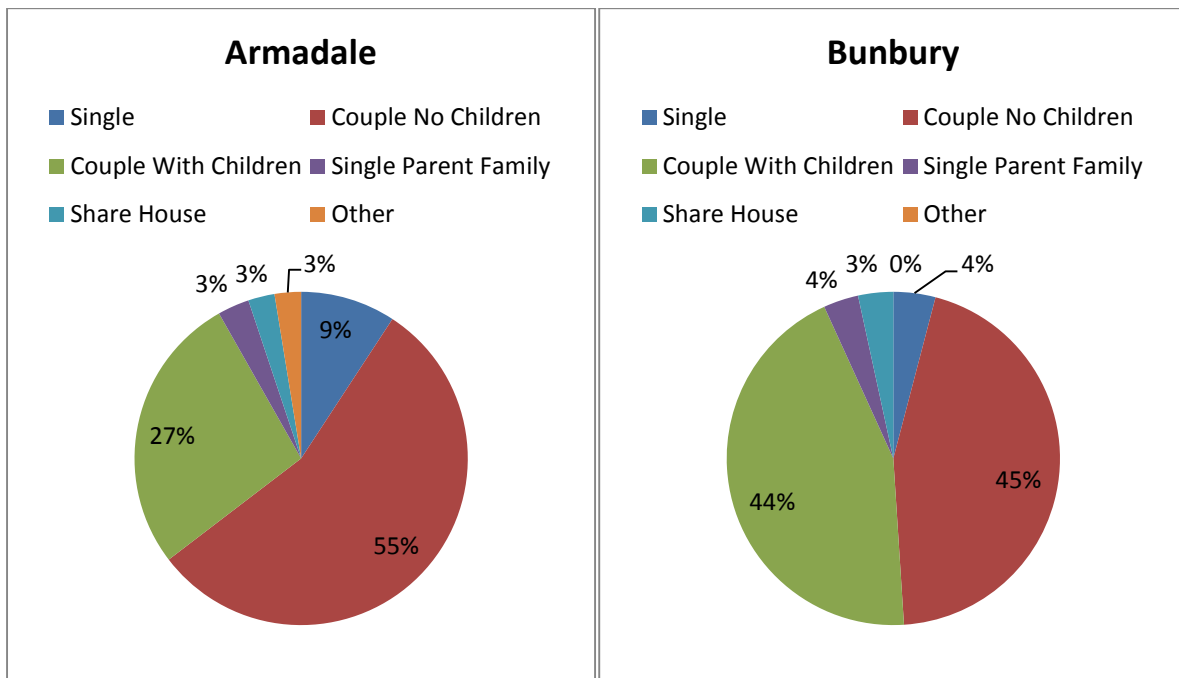
Area	City/Shire	Mean Age	Median Age	Median Age ABS	% Female	Prop. Residential	Prop. Income > 52,000 p.a.	Prop. Retired	Time on Property (years)	Time in Suburb (years)	Proportion Personally Affected	Prop. In Community Prep
1	Armadale	59.70	62.0	34.0	54.6%	0.75	0.60	0.42	18.47	22.18	0.40	0.33
2	Bunbury	55.40	55.0	39.0	50.0%	0.77	0.74	0.26	12.19	15.80	0.22	0.11
3	Busselton	58.98	59.0	39.0	34.6%	0.33	0.61	0.40	14.29	19.82	0.26	0.36
4	Denmark	62.64	63.0	47.0	46.9%	0.61	0.45	0.52	13.19	17.99	0.32	0.27
5	Donnybrook	59.58	61.5	44.0	50.3%	0.45	0.43	0.41	13.59	18.92	0.18	0.20
6	Chittering	59.63	61.5	42.0	51.6%	0.10	0.48	0.40	12.98	16.40	0.32	0.09
7	Mandurah	62.59	64.0	42.0	44.8%	0.43	0.53	0.52	13.67	15.50	0.28	0.33
8	Nannup	58.54	59.5	49.0	45.8%	0.43	0.32	0.33	13.09	16.85	0.54	0.17
9	Manjimup	55.18	57.0	42.0	64.3%	0.85	0.46	0.25	16.28	28.92	0.19	0.09
10	Collie	59.07	60.0	39.0	50.4%	0.91	0.55	0.39	21.38	37.84	0.12	0.22
Other	(undisclosed)	51.42			66.6%							
Total		59.36	61.0	41.7	49.8%	0.59	0.53	0.41	15.09	16.75	0.27	0.22
ANOVA						F(9,1267) =42.02, p<0.0001		F(9,1231) = 4.74, p<0.0001	F(9,1262) = 7.83, p<0.0001	F(9,1235) = 25.79, p<0.0001	F(9,1266) =6.29, p<0.0001	F(9,1270) =8.29, p<0.0001

Household Composition

As evidenced by the graphs in Figure 7.5.2. below, the most commonly reported household composition was that of “couple family, with no children or other dependents”, accounting for 48.8% of respondents. Many of these respondents are likely to be retired as can be determined from both the mean age and answers to a further question assessing employment status: 57% of respondents were retired couples.

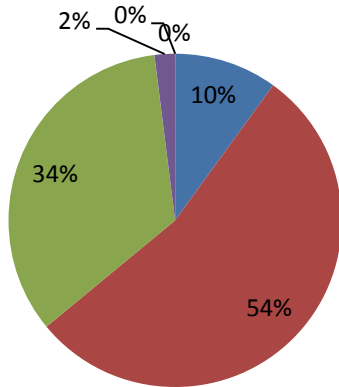
For most communities, the second largest household composition category was that of a “couple family with children or dependents”. This demographic tended to be younger than “couple families without children or dependents” (47.6 years compared to 64.6 years), and was more likely to be in part-time or full-time work.

Finally, only in Denmark, Nannup and Donnybrook was the number of respondents selecting “single” as their household composition greater than the number of couple families with children. These single individuals were often elderly (Mean age of 65.5 years), retired (58%), and with the lowest income of any household composition category.



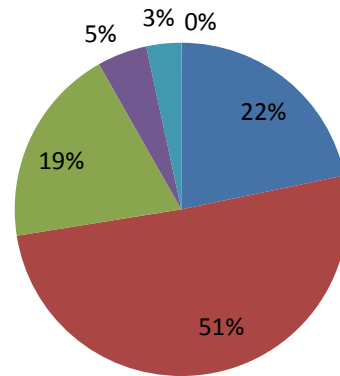
Busselton

- Single
- Couple No Children
- Couple With Children
- Single Parent Family
- Share House
- Other



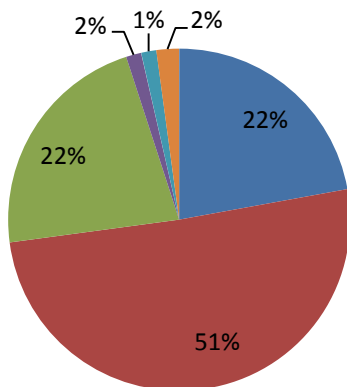
Denmark

- Single
- Couple No Children
- Couple With Children
- Single Parent Family
- Share House
- Other



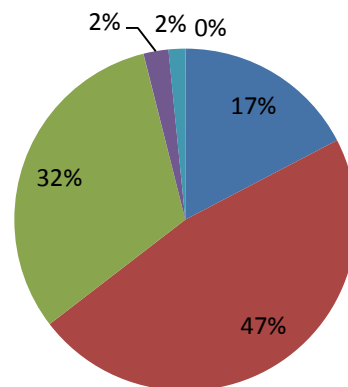
Donnybrook

- Single
- Couple No Children
- Couple With Children
- Single Parent Family
- Share House
- Other



Chittering

- Single
- Couple No Children
- Couple With Children
- Single Parent Family
- Share House
- Other



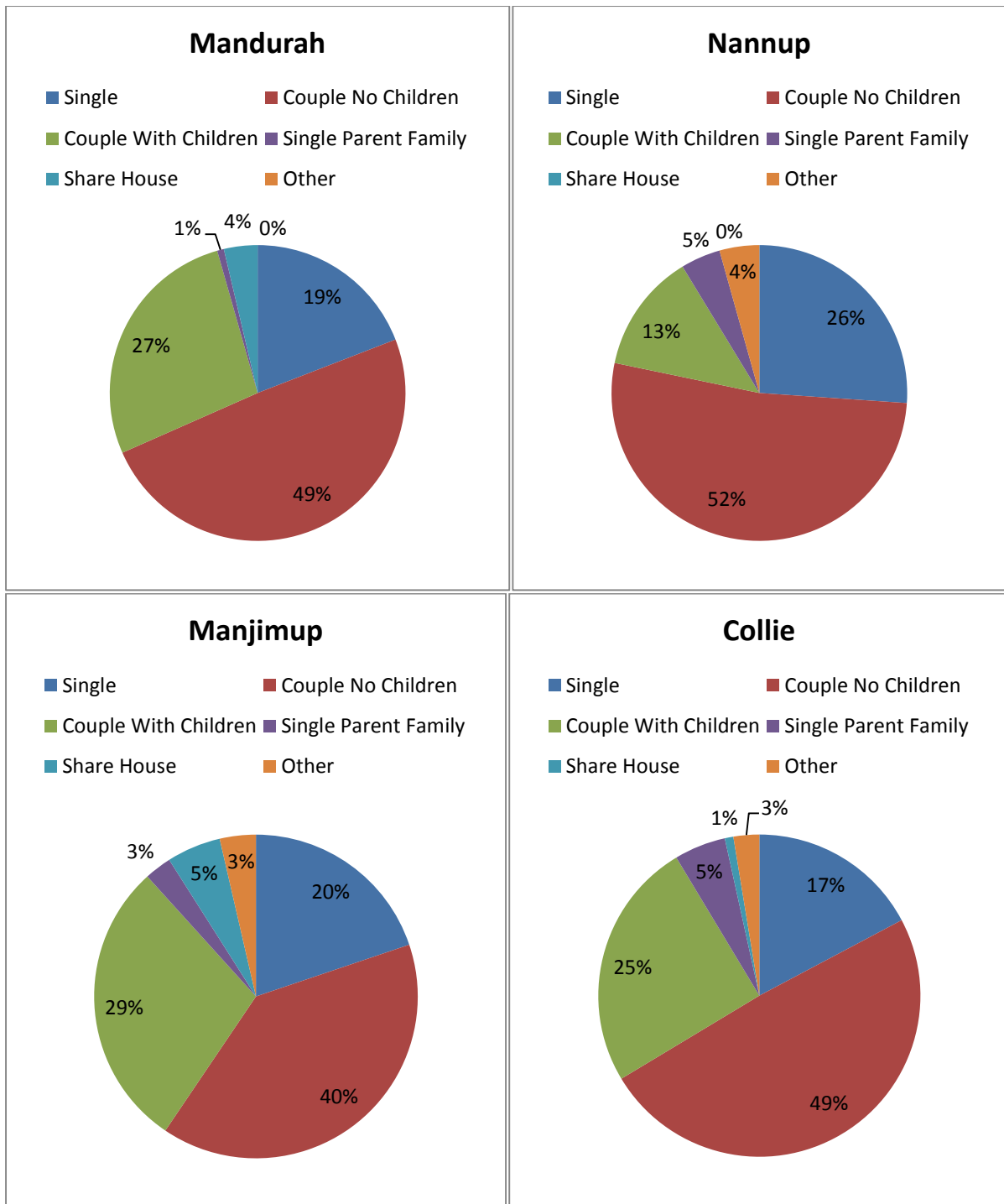


Figure 7.5.2: Breakdown of Household composition for respondents across ten local government areas surveyed.

Property Type

As mentioned in the previous section, the questionnaire was distributed to households outside of the main town sites in each local government area so as to maximise the number of households that are in danger of being affected by bushfire. In hindsight, it would have been desirable to be able to verify the number of respondents living on small residential blocks under 1000sqm in each community, though the smallest category in the survey was households up to 2 acres in size. While this was the

most popular category across all respondents (58.8%), it was not the most common block size across all communities with Busselton, Chittering and Mandurah reporting a greater number of small hobby farms between 2 and 99 acres in size. The full breakdown, shown as a proportion of the total respondents in each community, can be seen in Table 7.5.2 below.

Across all respondents, large farms over 100 acres in size were rarely reported (6.7%), though 20% of the respondents in Busselton reported being on such a property, while 13% of the respondents in Chittering also resided on large farms. While Chittering comprises generally low density and large property sizes, the high number of larger properties in the Shire of Busselton suggests that the strategy of sampling around major town sites has been successful.

Table 7.5.2. Proportion of respondents from each of the ten sampled communities separated by block size.

Area	House on residential Block (<2 acres)	House on Hobby Farm (2 to 99)	House on Large Farm (100+)	Land with no House	Total
Armadale	0.76	0.24	0.00	0.01	1
Bunbury	0.77	0.22	0.01	0.00	1
Busselton	0.33	0.46	0.20	0.01	1
Denmark	0.61	0.26	0.12	0.00	1
Donnybrook	0.46	0.42	0.12	0.00	1
Chittering	0.10	0.78	0.13	0.00	1
Mandurah	0.44	0.55	0.01	0.00	1
Nannup	0.43	0.48	0.09	0.00	1
Manjimup	0.85	0.09	0.04	0.02	1
Collie	0.91	0.08	0.01	0.00	1

Income

Income appears to vary substantially between communities surveyed. In the present study income was coded as a categorical variable and therefore exact mean and median income values cannot be provided. Nevertheless, as the category numbers increase with increasing income, the means are to some extent still informative. The larger population centres of Bunbury, Busselton and Armadale had the highest household income (Means of 3.04, 2.84 and 2.84 respectively) while more isolated rural communities such as Nannup and Donnybrook had the lowest income levels (2.09 and 2.24 respectively). A more comprehensive breakdown of this data as well as an indication of the actual income associated with each category is displayed in Figure 7.5.3.

The data from the present survey is difficult to compare with ABS income statistics as means and medians are unattainable for categorical data. Nevertheless, a significant correlation exists between the Australian Bureau of Statistics mean income values and average survey income categories for each community sampled, suggesting substantial similarity between the two sets of results¹⁶ (Figure 7.5.4). Interestingly, it appears that the three highest income communities based on ABS data (circled red in Figure 7.5.4) are under-represented in the categorical survey data suggesting perhaps a lack of responses from some of the highest income households in these areas. Alternatively, the

¹⁶ Spearman's rank order correlation between the ABS mean income values and the community average income categories gives a correlation of $r=0.56$

practice of sampling households from the fringe of population may possibly have excluded a number of the higher income earning households in those local government areas.

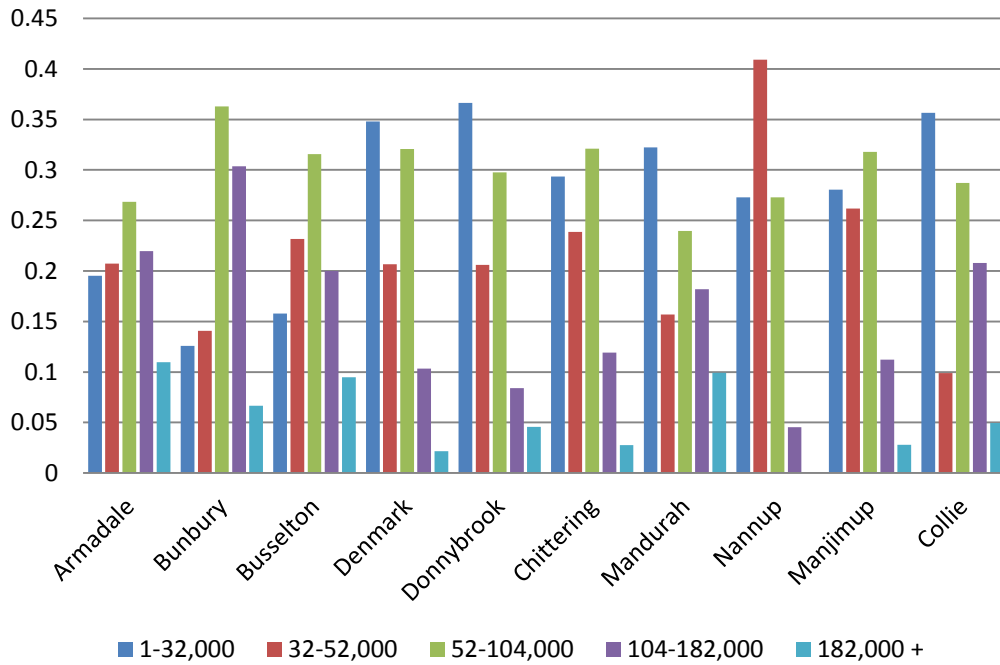


Figure 7.5.3: Average household income for respondent across ten local government areas. Note that as the numbers of respondents differ across areas, these statistics represent the proportion of respondents that fall into each income bracket within each area.

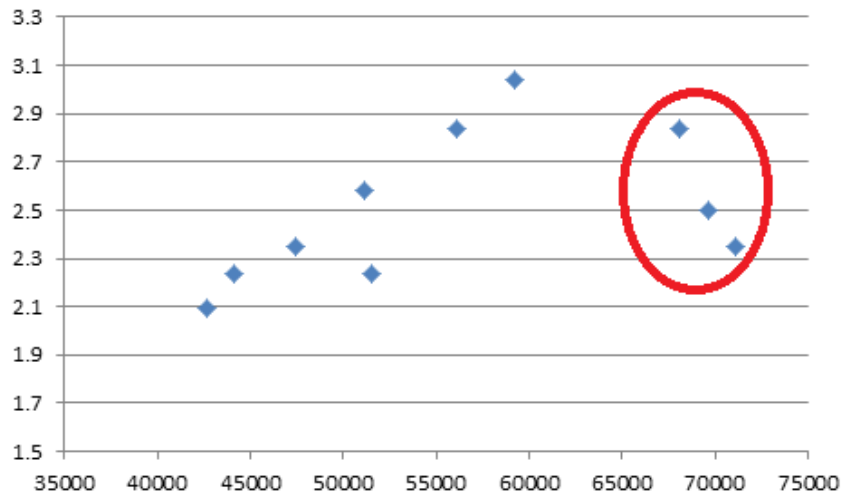


Figure 7.5.4: Graph of average household income data (ABS) against the average categorical income bracket in the survey across the ten communities ($r=0.47$). The red circle encompasses three communities where incomes are under-represented in comparison to ABS figures.

Education

As shown in Table 7.5.3, education appears to differ significantly across the ten communities¹⁷, with Armadale and Denmark showing the highest proportion with university education. Grouped together, there does not appear to be a great difference between rural and urban fringe communities in terms of educational attainment with both rural and urban communities showing similar levels of low educational attainment (i.e. Collie and Chittering have only 15.1% and 16.8% tertiary degree attainment respectively). Similarly, both rural and urban fringe communities demonstrate examples of high educational attainment (i.e. Denmark and Armadale have 40.7% and 36.3% tertiary degree attainment respectively).

Table 7.5.3: Education level attained by the respondent across the ten local government areas surveyed. Note that as the numbers of respondents differ across areas, these statistics represent the proportion of respondents that fall into each education category within each area.

Area	Secondary Yr. 10 or less	Secondary Yr. 12	Tertiary (TAFE or Ed College)	Tertiary (Uni. Bachelor's)	Postgraduate
Armadale	17.9	16.8	28.9	22.6	13.7
Bunbury	23.3	10.3	30.1	24	12.3
Busselton	22.2	16.2	27.3	23.2	11.1
Denmark	15.2	15.2	28.9	25.5	15.2
Donnybrook	21.3	14	36	18.4	10.3
Chittering	28	27.2	28	9.6	7.2
Mandurah	30	16.9	28.5	15.4	9.2
Nannup	21.7	13	47.8	8.7	8.7
Manjimup	33.6	15	31.8	10.3	9.3
Collie	44.2	13.3	27.4	12.4	2.7
Total	24.7	15.9	30	18.6	10.7

Individual and Community Bushfire Preparedness (Dependent Variable)

Respondents were given the options of answering either 'yes', 'no' or 'N/A' to 27 questions assessing the completion of bushfire preparedness activities around their property. Total scores on the dependent variable, Preparedness, were derived by dividing the number of 'yes' responses by the total number of questions answered either 'yes' or 'no'. Questions in which participants answered 'N/A' were not included in the calculation of an individual's total Preparedness score. Following an analysis of responses as well as statements added by respondents, two questions were removed as their wording frequently made them ambiguous. Only participants who had answered ('yes', 'no' or 'N/A') to twenty or more of the remaining 25 preparedness questions were computed a total score. Of 1323 questionnaires, 30 (2.3%) were removed from further analysis on the above criteria, leaving a dataset of 1293 responses that were used for all further analyses. Preparedness scores have been multiplied by 100 for ease of interpretation. Overall, Preparedness scores appeared normally distributed with individual scores ranging from 0 to 100 with an average preparedness score of 56.36 (Figure 7.5.5.). Figure 7.5.6. shows the mean preparedness scores across all ten sampled

¹⁷ Chi-square analysis of educational category selection across ten communities ($\chi^2 (36) = 92.88, p < 0.001$).

communities. Preparedness scores differed significantly between communities¹⁸, ranging from 48.55 in Collie, to 61.07 in Chittering – the best prepared community in our sample.

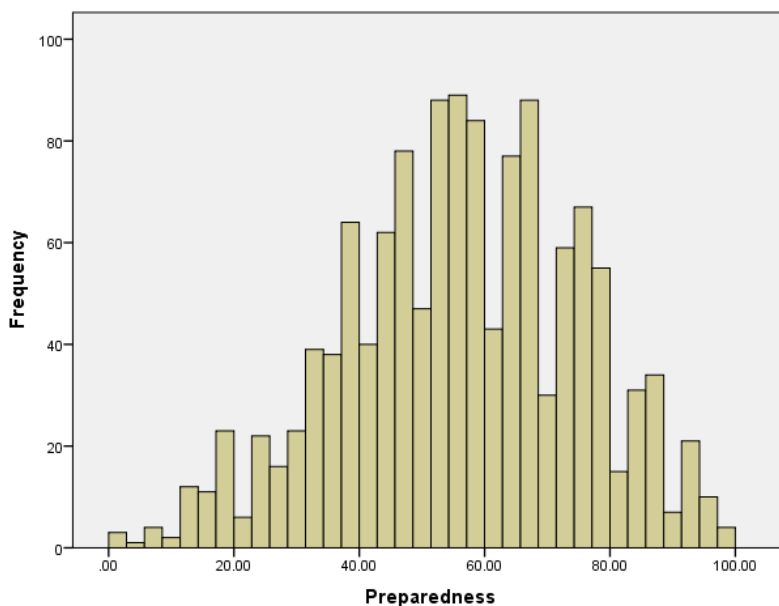


Figure 7.5.5: Histogram showing the approximately normal distribution of preparedness scores across all respondents from all communities.

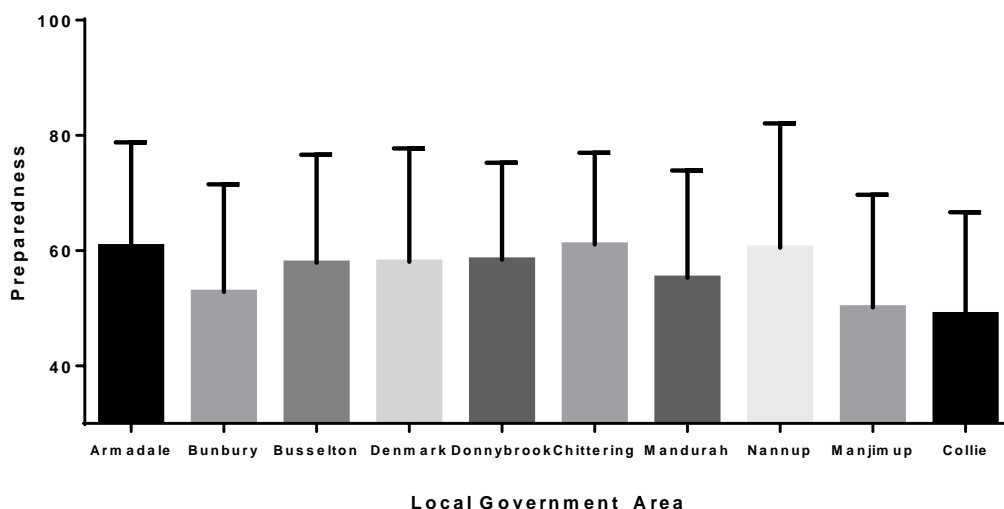


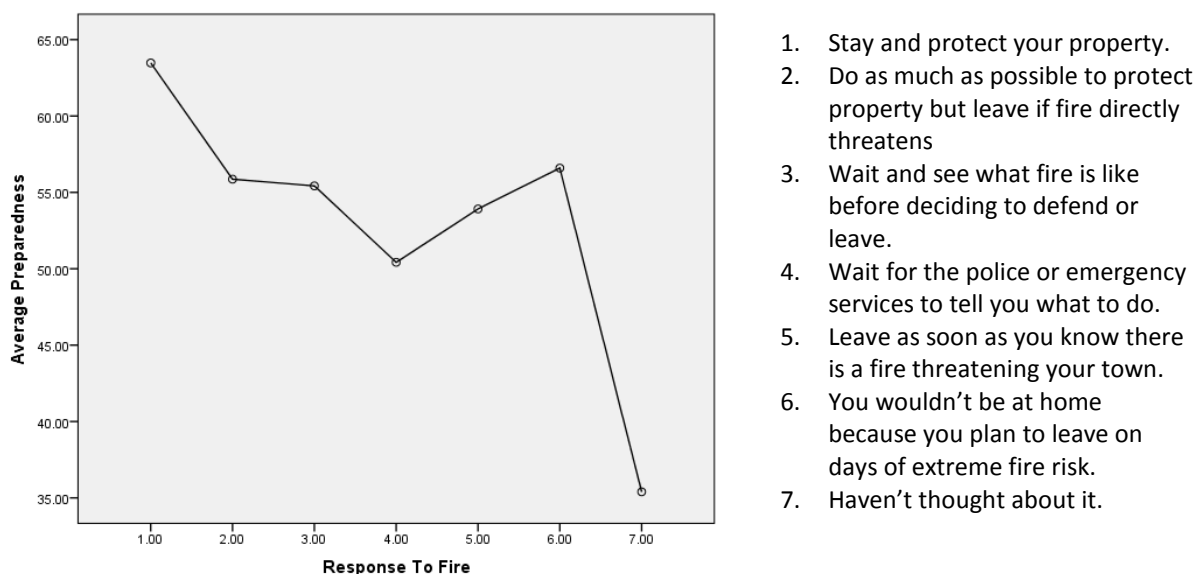
Figure 7.5.6: Mean preparedness inventory score for all respondents across the ten sampled communities. Note that error bars indicate standard deviation. Differences between communities were statistically significant ($F(9,1283) = 6.86, p < 0.001$).

Along with a measure of preparedness, an additional question about residents' actions in the event of a bushfire emergency was asked. Analyses revealed significant differences in preparedness based on residents' intended actions in the event of a bushfire¹⁹. As expected, those intending to stay and defend their homes were the most prepared ($M = 63.47, SD = 17.41$), while the small fraction of

¹⁸ A one-way ANOVA demonstrated a significant difference existed between the levels of preparedness across communities ($F(9,1283) = 6.86, p < 0.001$).

¹⁹ One way ANOVA of preparedness across seven different responses to the threat of bushfire ($F(6,1175) = 14.15, p < 0.0001$).

respondents (N=23) indicating that they 'hadn't thought about it' were the least prepared (M = 35.40, SD = 16.40). While these two groups appeared significantly more or less prepared than those selecting the other response options, no differences were observed between the remaining categories (see Figure 7.5.7. below).



1. Stay and protect your property.
2. Do as much as possible to protect property but leave if fire directly threatens
3. Wait and see what fire is like before deciding to defend or leave.
4. Wait for the police or emergency services to tell you what to do.
5. Leave as soon as you know there is a fire threatening your town.
6. You wouldn't be at home because you plan to leave on days of extreme fire risk.
7. Haven't thought about it.

Figure 7.5.7: Average bushfire preparedness scores across seven different responses to the imminent threat of bushfire.

Community Level Variables

Mean scores for a range of measured community level variables are presented in Table 7.5.4 below. The derivation and interpretation of these scores is discussed individually in the sections below.

Table 7.5.4: Mean scores across communities for a range of community variables including risk perception, place attachment, social capital and agency confidence.

	Perceived Risk to Town /100	Place Attachment /100	Social Capital /100	Proportion Properties Inspected	Local Government Confidence
Armadale	80.73	79.95	67.39	0.17	3.75
Bunbury	68.95	79.83	69.75	0.27	4.34
Busselton	74.65	81.07	73.70	0.58	4.16
Denmark	80.26	78.25	74.73	0.45	4.16
Donnybrook	72.57	80.60	71.80	0.26	4.36
Chittering	75.14	79.04	72.11	0.43	4.25
Mandurah	70.69	81.02	67.95	0.41	4.12
Nannup	78.57	79.92	75.64	0.54	3.88
Manjimup	70.72	79.31	70.79	0.06	4.43
Collie	68.31	82.55	69.31	0.08	4.48
Average	74.42	80.03	70.89	0.31	4.19
ANOVA	F(9,1256) =15.07, p<0.0001	F(9,1223) =.85, p=.575	F(9,1256) =8.32, p<0.0001	F(9,1235) =18.71, p<0.0001	F(9,1210) =5.29, p<0.0001

Social Capital

Total scores on the Onyx and Bullen Social Capital Scale were computed as the average score (1 – 4) across all questions answered. Participants were only allocated a total score on this scale if they answered more than 20 of the 24 questions in the scale. Of the 1293 valid questions mentioned above, only 27 (2.1%) were excluded in calculations involving this variable, having failed to meet the above criteria.

Analyses revealed significant differences in social capital across the ten communities sampled²⁰. The lowest levels of social capital were recorded in the communities of Armadale (Mean = 67.39) and Mandurah (Mean = 67.95) while the highest levels were reported for Nannup (Mean = 75.64) and Denmark (Mean = 74.73, see Figure 7.5.8). Analyses suggested that while most communities appeared similar in levels of social capital, Armadale, Mandurah and Collie showed lower than average levels of this construct. Three communities (Armadale, Mandurah and Chittering) are within close (<100km) proximity to the Perth metropolitan area and can be classed as urban-fringe communities, while the remaining communities are more appropriately classed as rural. The mean ratings of social capital in urban fringe communities (Mean = 68.82) was significantly lower than the mean ratings in rural communities²¹ (Mean = 72.02) in line with previous research into social capital.

Correlation analysis suggests that measures of social capital were unrelated to the amount of time spent living either on the property²², or in the suburb²³, respondents' age²⁴ or their income²⁵. Social capital was significantly, but only loosely related to the size of the property²⁶ (with respondents on larger properties reporting higher social capital), to ratings of place attachment²⁷ (higher social capital associated with higher place attachment) and prior experience of living through bushfire²⁸ (higher social capital associated with having had prior experience of bushfire).

²⁰ A one-way ANOVA indicated a significant difference in social capital across the ten communities sampled (F(9,1256)=8.32, p<0.0001, Figure 7.5.8.).

²¹ T-test on levels of preparedness between urban-fringe and rural communities (t(1264)=5.02, p<0.0001).

²² Pearson's Correlation (r = 0.00, p=0.99)

²³ Pearson's Correlation (r = 0.01, p=0.87)

²⁴ Pearson's Correlation (r=0.02, p=0.43)

²⁵ Pearson's Correlation (r=0.04, p=0.19)

²⁶ Pearson's Correlation (r=0.07, p=0.02)

²⁷ Pearson's Correlation (r=0.08, p=0.01)

²⁸ Pearson's Correlation (r=0.12, p<0.0001)

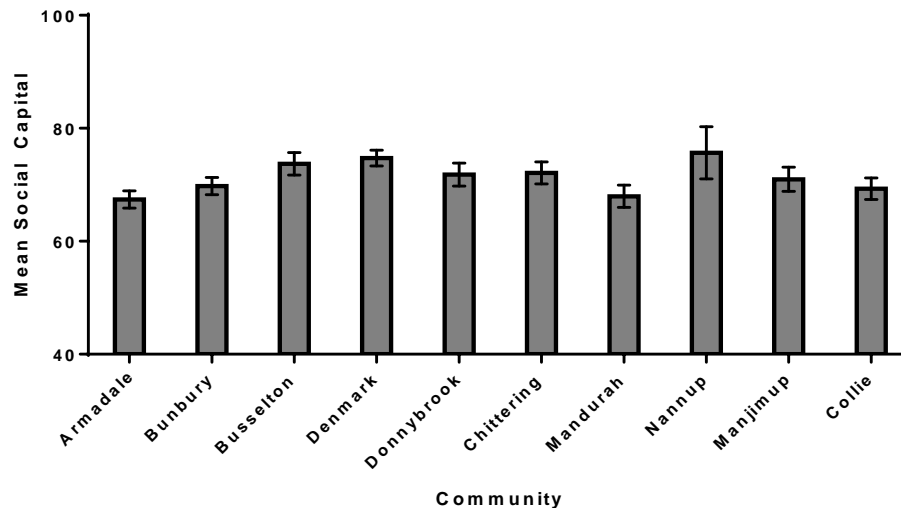


Figure 7.5.8: Mean social capital across the ten communities sampled. Error bars denote the 95% Confidence Interval around the mean.

Place Attachment

Total scores for Place Attachment were calculated by taking the average scores (1 – 5) on individual items. However, only respondents who answered at least nine of the 11 Place Attachment questions received a total score²⁹. This resulted in the exclusion of 35 respondents for calculations involving this variable. Scale scores have been converted to scores out of 100 for clarity of interpretation.

Place Attachment scores were all highly positive with respondents on average agreeing with the statements. Furthermore, across all communities, ratings of Place Attachment were consistently high with no significant differences being observed between the communities on this variable³⁰.

On further analysis (see Appendix E) the eleven items used to assess place attachment were found to be measuring two distinct, but related concepts, namely Place Identity (about whether the respondents' home was crucial to their sense of identity) and Place Dependence (whether the home was important to the things they do and how they live). Even at this level, analyses did not suggest that there were significant differences between the communities on either of these sub-components³¹. Given the commonly cited link between place attachment and the extent of contact an individual has with a particular place, it was perhaps surprising that residents of Collie did not demonstrate substantially higher levels of place attachment to that of other communities, given respondents in this community reported having lived there almost twice as long as respondents in other communities. Nevertheless, across all communities a significant correlation did exist between place attachment and length of residency suggesting that the longer a person lives at a particular property/town, the more attached they will be to that place³².

²⁹ The 11 Items comprising the Place Attachment scale showed generally high inter-correlations and the scale as whole demonstrated a Cronbach's alpha of .945, suggesting high internal consistency.

³⁰ A one-way analysis of variance indicated no significant community differences on Place Attachment ($F(9,1223)=0.85, p=0.58$).

³¹ One-way ANOVA: $F(9,1231) = 0.69, p=ns.$, and $F(9,1243) = 0.90, p=ns.$ for place identity and place dependence respectively.

³² Significant Pearson's correlations exist between place attachment and length of residence, both at their current address ($r=0.213, p < 0.001$) and for the total time spent residing in that suburb/town ($r=0.227, p < 0.001$).

Aggregated Perceptions of Risk

Total scores for the six items assessing perceptions of bushfire risk were computed by summing scores across all six questions. Total scores were converted to values out of 100 for ease of interpretation. Across all respondents the average perception of risk was 69.51, indicating that the majority of residents felt at moderate bushfire risk (individual scores ranged between 19.05 and 100). Analyses revealed significant differences in total perceptions of bushfire risk across communities, with two communities (Armadale and Denmark) having significantly higher perceptions of risk than the remaining communities³³.

Further inspection of the data revealed that the 6 items assessing risk perception could be further separated into two related concepts; 'perceptions of bushfire risk to the town/suburb' and 'perceptions of the bushfire risk to the residents' own property'. Each of these sub-scales comprises questions related to likelihood, severity of consequences and vulnerability, but differ on whether the subject of those questions is the respondents' surrounding township, or their own personal property (for further information see Appendix E).

As aggregated perceptions of bushfire risk were considered an important community level variable, summated scores for the three items comprising the "Risk to Town/Suburb" sub-scale were computed. Analyses indicated that communities differed significantly in their perceptions of bushfire risk to their town or suburb³⁴. The local government areas of Armadale and Denmark once more perceived the greatest risk of bushfire with scores of 80.73 and 80.26 respectively, while Collie and Bunbury perceived the lowest average perception of bushfire risk (68.31 and 68.95 respectively).

Local Government (Perceptions and Actions)

Inspections

Respondents were questioned regarding the frequency with which the local government carried out property inspections to ensure compliance with fire regulations (Note, in Western Australia this is the responsibility of local government). A series of four yes/no questions assessed whether their properties had ever been inspected for compliance, as well as whether a range of negative consequences had ever befallen them as a result of not having complied with fire regulations. Individual yes/no responses were then compiled as proportions of respondents across each of the local government areas agreeing with the statements.

The proportion of residents who stated that they were aware of their properties having been inspected for compliance in the last five years varied significantly between communities sampled³⁵. Collie and Armadale reported the lowest rates of inspection with only 8% and 17% of respondents having been inspected. Conversely, many residents of Busselton (58%) and Nannup (54%) reported having been inspected, consistent with the claims of vigilance provided by these shires.

However, to some extent the proportions reported above are influenced by demographic factors. Rates of inspection vary significantly with property type³⁶, with small residential lots having lower rates of inspection compared to small rural (<100 acres) and large rural (>100 acres) properties (see

³³ A one-way ANOVA of risk perceptions across 10 communities revealed significant difference in risk perceptions ($F(9,1229) = 9.54, p < 0.0001$). Bonferroni post-hoc comparisons indicated that the communities of Denmark and Armadale scored significantly higher than the remaining communities on risk perception.

³⁴ One-way ANOVA between 'risk to town' and community ($F(9,1256) = 15.07, p < 0.0001$).

³⁵ One-way ANOVA between community and rates of property inspection for bushfire compliance ($F(9,1235) = 18.71, p < 0.0001$).

³⁶ One-way ANOVA between property size and the reported rates of inspections ($F(3,1225) = 64.15, p < 0.0001$).

Figure 7.5.9). While this goes some way towards explaining the low rates of inspection in the Shire of Collie (from which 91% of respondents were living on residential blocks), differences in inspections were still present after controlling for block size³⁷.

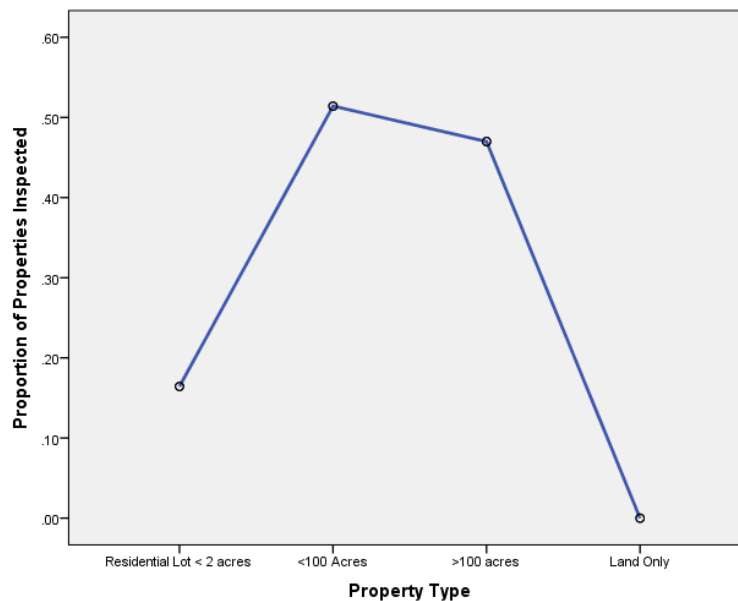


Figure 7.5.9: Average rates of inspection across four different categories of property size. Note, the low reported rates of inspection for lots without a house likely reflects a lack of awareness on the part of owners rather than a lack of inspections.

Further questions asking whether respondents had been issued with infringement notices (5.5%), had been fined for failure to comply with regulations (1.94%), or had been forced to pay contractors sent by the local government to carry out mitigation on their properties as a result of failure to comply (0.08%) received too few responses to permit robust analysis between communities. Analyses suggested that those who had previously been given an infringement notice were no less prepared for bushfire than those who had received no such notice³⁸. Whether these figures represent the true rates for these variables, or are under-reported as a result of associated stigma is difficult to ascertain from these figures alone.

Perceptions of Government and Government Agencies

A range of questions were asked about respondents' perceptions of their local and state governments as well as a number of government and community agencies including the Department of Environment and Conservation (DEC), the Department of Fire and Emergency Services (DFES), their local volunteer fire brigade. In each case, questions were phrased so as to ask for the respondents' 'confidence' in the agency in question to undertake the particular action or have a particular trait. Similar questions were asked of each agency type, examples of which can be seen below:

How confident are you that 'Insert Agency Name' works effectively with 'Insert Alternative Agency Name'?

³⁷ Analysis of covariance with proportion of inspections as the dependent variable, community as the independent variable and property size as a covariate ($F(9,1214)=10.36$, $p<0.0001$, partial eta squared = 0.07). Note that the variable 'property size' was reduced to three levels for the purposes of this analysis ('residential <2 acres', 'small rural <100 acres', and 'large rural >100 acres').

³⁸ Independent samples t-test between 'preparedness' and 'received infringement notice' (yes/no): ($t(1242)=1.52$, $p=0.13$).

How confident are you that the 'Insert Agency Name' works effectively with the local community to reduce bushfire risk?

How confident are you that 'Insert Agency Name' is adequately prepared to handle a major bushfire?

High correlations were observed between responses for all questions and analyses revealed that for each agency, respondents were not able to make the fine-grained distinctions between the different actions of an agency inquired about in the questions. Instead, the data revealed that participants were responding to each question with their overall impression or satisfaction with the agency in question. This pattern of results was similar across all agencies (i.e. DFES, DEC, volunteer bushfire brigades) as well as both levels of government (local and state). For further information on these analyses, see Appendix E. It appears possible that respondents simply do not possess a detailed enough understanding of the agencies in question to enable them to make nuanced decisions regarding their capabilities. As a result, average scores were calculated across all questions for each agency. Average scores were only calculated if respondents had answered all questions with respect to the particular agency, or at least 16 out of 20 questions related to their Local Government. Given a seven point Likert response scale was employed, across all communities respondents appeared neither favourable nor unfavourable towards the capabilities and capacities of their governments and government agencies with regards to bushfire mitigation and suppression (Table 7.5.4. above).

When confidence in local government is broken down by community, significant differences in confidence were observed across the different locations (Figure 7.5.10.)³⁹. Further comparisons revealed that respondents from Armadale had significantly less confidence in their local government than respondents from Denmark, Chittering, Mandurah, Manjimup and Collie. No other significant differences between communities were observed. Significant damage was caused to numerous homes throughout the City of Armadale during the recent 2011 Kelmscott/Roleystone fires, memory of which may have impacted on respondents' perceptions of the local governments' capabilities.

Despite few differences between communities, substantial differences in local government confidence exist between individual respondents. However, those respondents who indicated above average local government confidence (> 4.19) were not found to have significantly higher levels of bushfire preparedness than those with lower levels of confidence⁴⁰. All local government confidence questions showed low correlations with preparedness suggesting that there was no association between high confidence in government and high preparedness. The highest correlation was derived from arguably the most broad question, "How confident are you that your local government makes fire prevention a high priority", but despite being significant, was only small⁴¹.

³⁹ One-way ANOVA between 'community' and 'local government confidence' (F(9,1210)=5.29, p<0.0001) with post-hoc Bonferroni comparisons.

⁴⁰ Independent samples t-test between 'preparedness' and 'local government confidence' (low/high mean split): (t(1262)=1.87, p=0.061).

⁴¹ Pearson's correlation coefficient (r=0.107, p=0.001). A one-way ANOVA conducted between this item and the different communities surveyed showed significant differences in local government confidence (F(9,1022)=3.29, p=0.001). Post-hoc comparisons once again demonstrated significantly lower levels of confidence for residents of Armadale compared to residents of Bunbury, Busselton and Donnybrook, similar to previous comparisons. Interestingly, this single item demonstrated higher correlations with preparedness than the average scale score mentioned above.

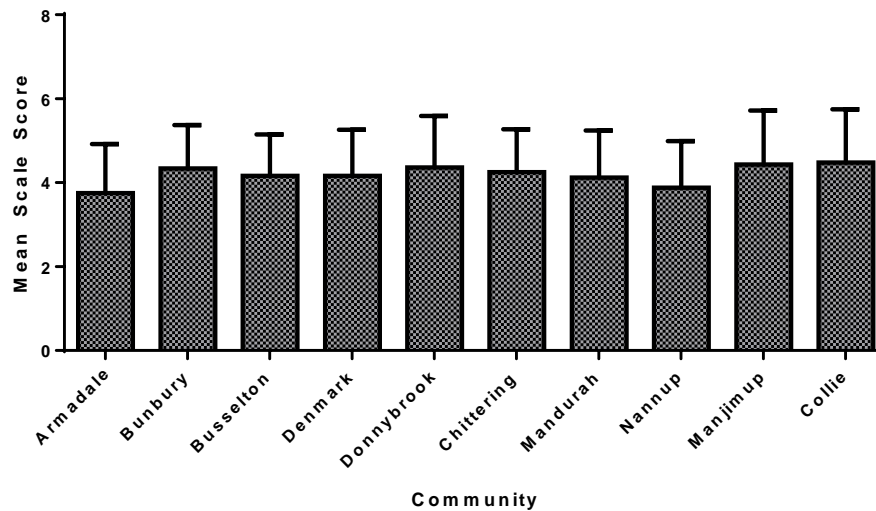


Figure 7.5.10. Mean Scale Scores for confidence in local government with regards to bushfire mitigation and suppression across the 10 communities sampled. Error bars denote standard deviation.

Individual Level Variables

Variables considered under the heading of individual level variables are those variables pertaining to the individual which do not capture a community level attribute. For example, while a community can have a particular amount of social capital, it is not a concept that can usefully be observed for an individual. Typically, most demographic variables also constitute individual level variables. Table 7.5.1. provides descriptive statistics for a range of individual level variables measured in the present study across the ten communities sampled.

Property Size

Respondents were allowed only four choices of property size including residential (<2 acres), small acreage or hobby farm (<100 acres) large farm/property (>100 acres), and land without a house. Only 4 respondents indicated that their property was without house, and as such this category offered too few responses to permit analysis. Significant differences in bushfire preparedness were however observed between the remaining property sizes⁴², with analyses suggesting that residents on residential blocks (Mean = 52.49) were significantly less prepared than both small (Mean = 61.59) and large (Mean = 62.43) rural properties. The size of non-residential properties did not appear to influence preparedness. While it is possible that respondents living on residential blocks are complacent about bushfire risk to their property, it may be that some of the questions comprising the preparedness scale, particularly related to vegetation management, are somewhat biased towards larger properties. An investigation into the number of questions respondents felt were applicable (i.e. answered 'yes' or 'no' but not 'N/A') did suggest that those living on residential blocks answered fewer questions than those on small and large rural properties⁴³. This difference did not however appear to account for the entirety of the difference between property sizes.

⁴² One way ANOVA of preparedness across three four levels of property size ($F(3,1273)=27.1, p<0.0001$) with Bonferroni post-hoc comparisons.

⁴³ One way ANOVA of the number of questions answered 'yes' or 'no' across three levels of property type ($F(3,1273)=29.69, p<0.0001$).

Employment and Home Ownership

Respondents were asked about the employment status of both themselves and their partners (where applicable). Though any member of the household over the age of 18 could fill in the questionnaire it cannot be determined which of these questions was answered by the highest wage earner. Correlation analyses suggested there was a strong relationship between the two questions suggesting that respondents' partners were frequently in a similar employment category to them⁴⁴. Responses to the two questions were highly similar, with analyses suggesting that for both questions bushfire preparedness varied with employment type⁴⁵. For both questions, those respondents indicating that they were unemployed were the least prepared (Means of 47.69 and 52.88 respectively) while those indicating that they were retired were the most prepared (60.11 and 62.14 respectively). In both cases, further analyses⁴⁶ suggested that while retirees were significantly more prepared than other groups, few differences were observed between the other levels of employment including unemployed, casual, part-time, full-time or managerial positions (see Figure 7.5.11. below).

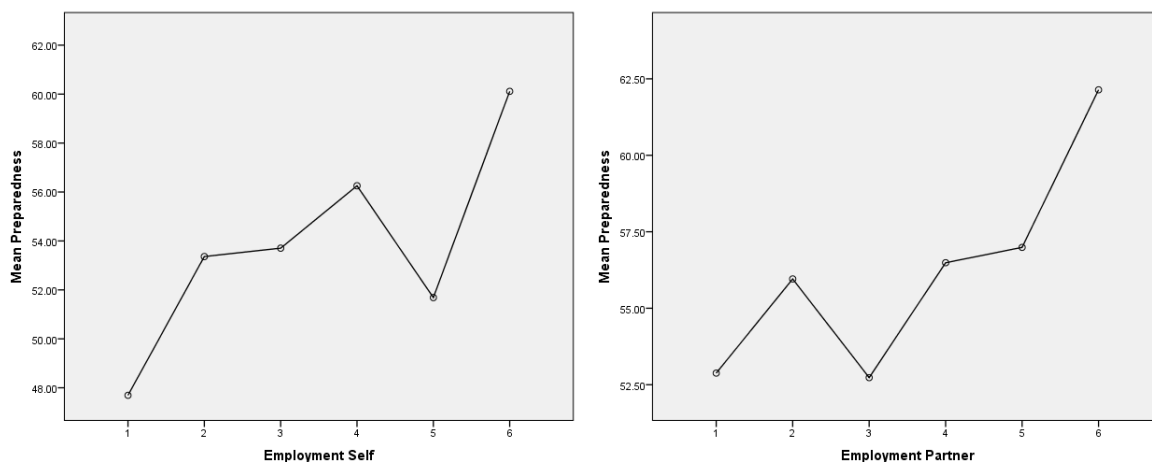


Figure 7.5.11: Mean preparedness across six employment categories for both the respondent and their partner (if applicable). In ascending order numbers refer to: 1. Unemployed, 2. Part-Time or Casual, 3. Full-Time, 4. Business Owner/Manager, 5. Not in Workforce (e.g. studying), and 6. Retired.

The majority of questionnaires returned were from home owners, with very few from respondents indicating that they were renting the property, either as a family or a share-house with other adults, and only one respondent selected 'other' noting that the accommodation was company supplied as a result of their position. As there were only small differences in preparedness between respondents indicating that they rented as a family and those indicating that they rented as a share-house, both categories were combined. A comparison between home owners and those renting indicated that home owners were significantly more prepared for bushfire (Means of 56.83 compared to 48.20) than those renting⁴⁷. It seems possible that respondents who rent are unwilling to invest money into bushfire preparedness for an asset that they do not own, or alternatively are unwilling to commit substantial time towards undertaking preparedness activities if they are not intending to reside at that location for any length of time.

⁴⁴ While correlation is not strictly appropriate given the categorical and non-ordinal nature of the data, a correlation of $r=0.62$ ($p<0.0001$) was observed between the two questions.

⁴⁵ One-way ANOVA indicated significant differences in bushfire preparedness across different levels of employment status ($F(5,1235)=8.17$, $p=0.0001$, and $F(5,999)=9.03$, $p<0.0001$ for self and partner respectively).

⁴⁶ Bonferroni post-hoc comparisons

⁴⁷ Independent Samples T-test of preparedness between two categories ('renting' and 'owning'; $t(1273)=3.82$, $p<0.0001$).

Length of residence

Residents were asked both about the length of time they had resided at that particular property as well as the length of time they had resided in that particular town or suburb. Pearson's correlation revealed that these estimates were highly related⁴⁸, suggesting the questions were largely interchangeable. The average length of residency in the town or suburb, varied greatly between communities⁴⁹. As shown in Figure 7.5.12. below, residents of Manjimup (Mean = 29.54) and Collie (Mean = 37.96) had substantially longer durations of residence than respondents in other areas (Mean across all areas = 20.75). Despite Collie having been previously shown to have high numbers of respondents living on residential blocks, this statistic appears unlikely to account for the differences observed. The average length of residence for respondents on residential blocks is 22.12 years. While respondents on small rural blocks did demonstrate a significantly shorter period of residence⁵⁰ (Mean = 16.77), it was in fact the respondents from large rural blocks who had the longest duration of residence (Mean = 28.45), though only one such resident was from the Collie area.

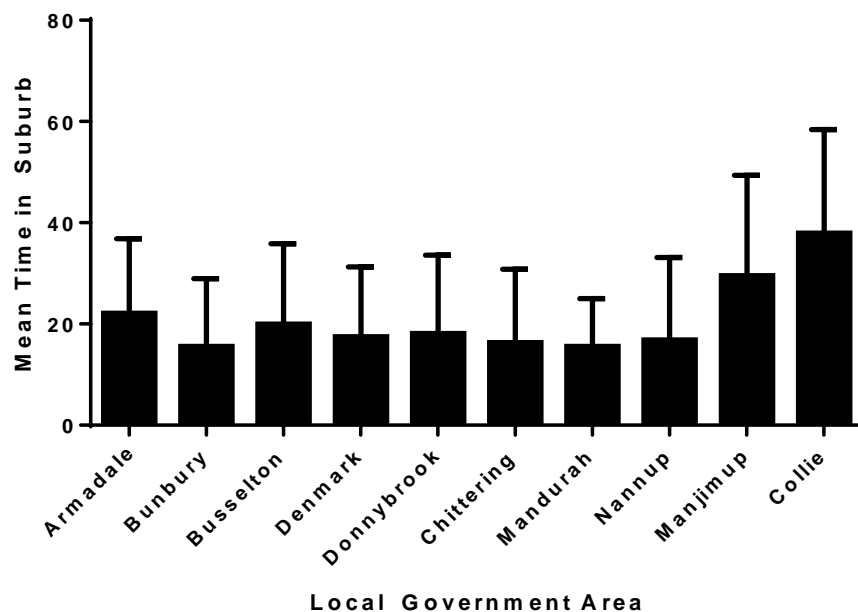


Figure 7.5.12: Mean duration of residence in the indicated town or suburb across ten Local Government Areas surveyed.

Previous Bushfire Experience

Respondents were asked about their previous experience of being affected by bushfire across two binary response items. The first related to their own personal previous fire involvement while the second asked about whether any of their friends or family had previously been affected by bushfire. In each question, if the respondent indicated that they had previously been affected, the year of the most recent event was requested.

Across all respondents, 26.48% recorded having previous personal experience of living through bushfire, while 49.20% knew a friend or family member who had been previously affected. When

⁴⁸ Pearson's correlation $r = 0.74$, $p < 0.0001$

⁴⁹ One way ANOVA of length of residency (in years) across ten different communities ($F(9,1235)=25.79$, $p < 0.0001$).

⁵⁰ One way ANOVA of length of residency (in years) across four categories of property size ($F(3,1263)=16.31$, $p < 0.0001$).

separated by local government area, significant differences between communities were observed⁵¹. In particular, residents of Nannup reported having the highest previous personal experience with bushfire (54.2%) followed by Armadale (40.2%) and Chittering (32.3%). By contrast, the communities with the least previous experience of living through bushfire were Collie (11.5%), followed by Donnybrook (17.8%) and Manjimup (19.3%).

The recency of previous bushfire experience also appears to impact on respondents' preparedness activities (Figure 7.5.13 below)⁵². As might be expected, respondents who had not previously been affected by a bushfire had the lowest average levels of preparedness (Mean = 54.34). Amongst those reporting that they have been previously affected by bushfire, preparedness levels appear to be highest among respondents affected within the previous two years (Mean = 65.97). While being better prepared than those reporting no previous bushfire experience, having been affected more than two years prior appears to confer no additional benefit in preparedness over more distant experiences

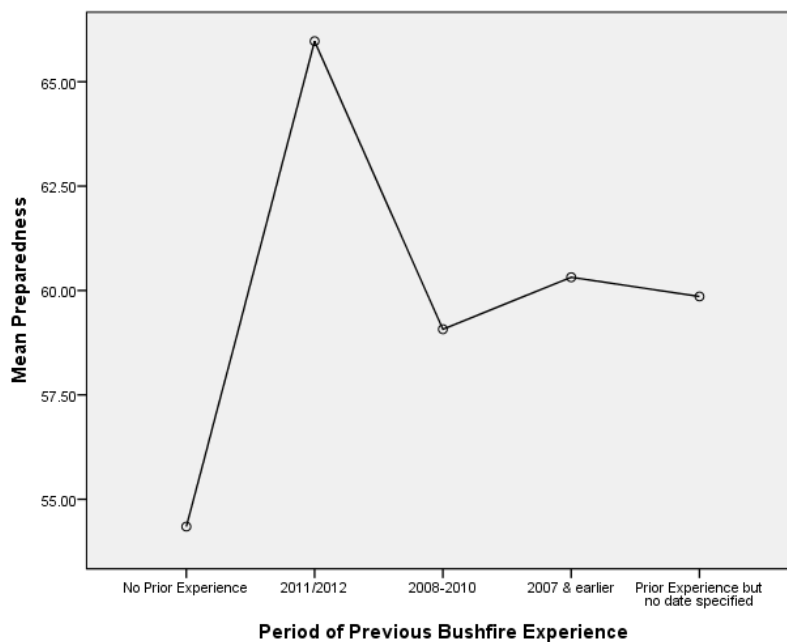


Figure 7.5.13. Mean preparedness scores across all respondents across the periods in which prior involvement with bushfire was indicated.

Involvement with Bushfire Safety Organisations

Four questions were asked in relation to respondents' involvement in community organisations designed to mitigate or manage bushfire risk and response. The first umbrella question asked whether the respondent was participating in one or more such organisations while the following three questions ask more specifically about membership to particular organisations in this category including 'Bushfire Ready Groups', 'Volunteer Bushfire Brigades' and 'Emergency Management Committees'. The proportions of respondents indicating membership to these groups are shown in Table 7.5.5. below.

⁵¹ One way ANOVA of proportion with previous bushfire experience across ten communities sampled ($F(9,1266) = 6.42, p < 0.0001$).

⁵² One way ANOVA of preparedness across five temporal periods in which bushfire's were experienced ($F(4,1271)=10.69, p<0.0001$).

Table 7.5.5: Proportion of respondents across all communities indicating membership of a variety of Community Preparedness Activities.

Activity	Percent
Community Preparedness Activity/Organisation (all)	22.42%
Bushfire Ready Group	9.30%
Volunteer Bushfire Brigade	12.19%
Emergency Management Committee	1.80%

Separating community preparedness activity involvement between communities suggests significant differences in involvement across communities⁵³ (Figure 7.5.14. below). The communities of Armadale, Busselton and Nannup demonstrate the highest level of involvement while Bunbury, Mandurah and Collie have the lowest levels of involvement with only about one person in ten indicating membership of a community preparedness organisation/activity.

Correlations between community preparedness, organisation involvement and personal bushfire preparedness suggests that as involvement in community organisations increases, so does personal preparedness⁵⁴. Similarly, as community preparedness organisation involvement increases, so does the likelihood of those respondents having been previously affected by bushfire⁵⁵. Nevertheless, it must be acknowledged that it cannot be determined from these analyses whether prior bushfire involvement leads to involvement in preparedness organisations or vice versa.

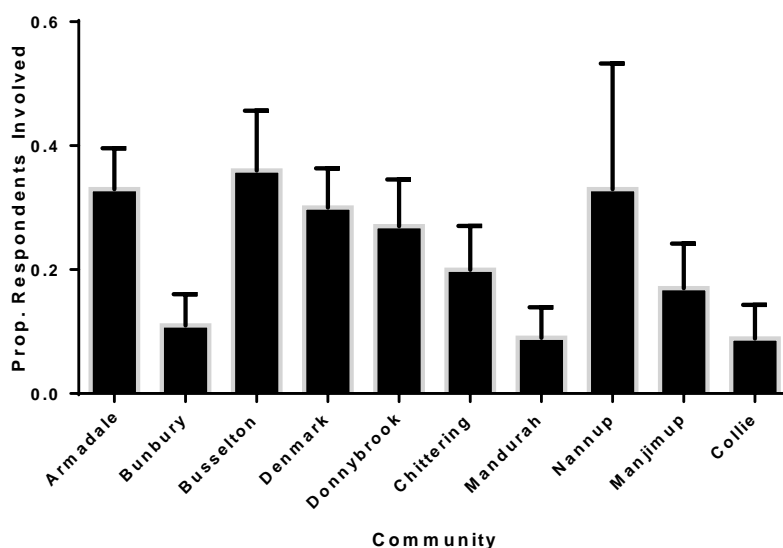


Figure 7.5.14: The proportion of respondents across ten communities indicating having current personal involvement in community preparedness activities/organisations.

Regression Analyses

Hierarchical Linear Modeling

In an attempt to disentangle individual and community level influences on preparedness and to assess their relative importance, it was decided to employ Hierarchical Linear Modelling which appears to

⁵³ One way ANOVA of involvement in community preparedness activities across ten communities sampled ($F(9,1270)=8.29$, $p<0.0001$).

⁵⁴ Pearson's correlation coefficient $r=0.289$, $p<0.0001$.

⁵⁵ Pearson's correlation coefficient $r=0.186$, $p<0.0001$.

have an advantage over more traditional regression methods for the analysis of nested data and multilevel research questions such as ours.

Unit of Analysis

Investigations of factors that lead to differences in community preparedness are by their very nature hierarchical, as individuals are nested within communities, which can themselves be nested within larger units (e.g. local government areas and even states). Such studies involve a search for associations between factors measured at the level of the community on one hand, and variables measured at the level of the individual, on the other. Prior to the development of Hierarchical Linear Modeling (HLM) techniques, data were analysed at only one of these levels; either at the level of the community, or the level of the individual, but not both.

Traditional approaches (either ordinary least squares regression, or ANOVA) utilised with hierarchical data will lead to one of two problems. If data were analysed at the individual level, then each individual would be given a score that represents the average of their community's score. This method would inaccurately assume that the scores of each individual in a community were influenced identically by their community. Conversely, if data was analysed at the community level, analysts would simply aggregate the scores of individuals within that community. This approach would ignore the substantial variability that exists in the dependent variable as well as the independent variables. By contrast, HLM allows researchers to treat both the individual and the community as important levels of analysis through the use of multilevel data.

Stages of Analysis

Typically, Hierarchical Linear Modeling is conducted in three stages. In the first stage, also termed the 'null model', the researcher partitions variance in the dependent variable (preparedness in this case) into two or more components depending on the number of levels in the dataset. In the present study these two levels correspond to the proportion of variance that lies between individuals within the same community (pooled over communities), and the proportion of variance in the dependent variable that lies between communities. This model is fully unconditional in the sense that there are no additional variables entered at either level to account for variance in the dependent variable.

The amount of variance in the dependent variable between different communities is also called the Intra-class Correlation Coefficient (ICC). This value is important as it provides a measure of whether sufficient variance in the dependent variables exists at the community level to warrant Hierarchical Linear modeling over standard regression. A χ^2 (Chi-square) test on the residual variance indicates whether the Level 2 (between community) variance is significantly different from zero. It is only when this value is not trivial, that an analyst would need to consider multi-level analysis. Additionally, the calculation of the null model also allows computation of a deviance statistic; a baseline against which later models can be compared. In the current study, the null model addresses the question 'Is there a (Level 2) community effect on the (Level 1) intercept of preparedness score, which represents the mean score?' If there is a community effect, then ordinary regression models will suffer from correlated error, making some form of linear mixed modelling necessary.

The second stage of analysis involves the construction of the Level 1 model consisting of the estimation of within-community (individual) effects. Finally, at the third stage of analysis (Level 2 HLM model) the modeling of community level effects occurs. At this level, the preparedness outcome, adjusted for individual characteristics included in the Level 1 model, is investigated as a function of community characteristics. These characteristics include things such as the aggregated level of risk, the amount of Social Capital, and the vigilance of local governments in conducting property inspections to assess adherence to bylaws.

Correlation Matrices

Table 7.5.6 (below) displays Pearson's 'r' correlation coefficients between all major variables considered for inclusion in the Hierarchical Linear Models computed below, as well as between these variables and the dependent variable (bushfire preparedness). Higher correlation coefficients (closer to 1 or -1) represent stronger associations between the two variables in question. All variables demonstrated significant correlations with the dependent variable 'bushfire preparedness'.

Table 7.5.6: Pearson's correlation coefficients and significance for all variables included in Hierarchical Linear Modelling and bushfire preparedness scale scores. Note that for variables subsequently included as community-level predictors, correlations presented here have been conducted on individual responses rather than aggregated community-level values.

Variable	Affected Personally	Retired	Residential Block	Com. Prep. Act.	Social Capital	Risk To Town	Place Attachment	Property Inspected
Preparedness	.16***	.16***	-.24***	.28***	.23***	.12***	.20***	.18***
Affected Personally	1	.23	-.09**	.18***	.11***	.13***	-.00	.07*
Retired		1	.07**	-.04	.03	-.10***	.10***	.05
Residential Block			1	-.25***	-.04	-.09***	-.03	-.36***
Com. Prep. Activity				1	.25***	.20***	.03	.18***
Social Capital					1	.11***	.08**	.09***
Risk to Town						1	.02	.05
Place Attachment							1	.02
Property Inspected								1

* p<0.05, ** p<0.01, *** p<0.001

The Null Model

The presence of community level differences was investigated using Hierarchical Linear Modelling. Before investigating which community level variables are significant predictors of preparedness, it is important to explore the conditions associated with Hierarchical Linear Modelling. The null model was investigated in order to determine the existence of systematic within and between community variance. The χ^2 test on the null model ($\chi^2 = 61.92$, $df. = 9$, $p < 0.001$) indicated that individual preparedness varied significantly depending on the community in which respondents lived, satisfying this condition. The Intra-class correlation (Hoffman, 1997) indicated that a small but statistically significant 4.58% of the variance in individual preparedness lies between communities. The remaining proportion (95.42%) of the variance is potentially accountable by individual level factors (See Table 7.5.7 below).

Table 7.5.7: Random Effects Only (Null) Model of community level differences in bushfire preparedness ($n=1293$) in HLM.

Model	Variable	Coefficient	SE	t-ratio	Significance
Random Effects Only	Constant	56.159	1.41	39.96	$p < 0.001$
	<i>Community Variance</i>	16.457			
	<i>Residual Variance</i>	342.780			
	ICC	0.0458			

Level 1: Individual Level Variables

In the second stage of the analysis individual-level covariates were added to control for any community related differences in these variables (Table 7.5.8). Four individual level variables were entered, including whether the respondent had been previously affected by fire (yes/no), a dichotomized employment variable asking whether the respondent was retired (yes/no), a dichotomized block size variable asking whether the respondent lived on a residential sized block (yes/no) and a question asking whether the respondent was involved in community level preparedness activities (yes/no). These four variables were chosen as each accounted for large differences in preparedness as shown in the previous analyses.

Table 7.5.8: Individual level covariates Model ($n=1216$)

Model	Variable	Coefficient	SE	t-ratio
Individual – level covariates	Constant	54.595	1.21	45.10***
	Affected Prior Y/N	3.612	1.14	3.17**
	Retired Y/N	6.902	1.02	6.77***
	Residential Block Y/N	-7.910	1.12	7.06***
	Involved in Community Prep Y/N	9.888	1.25	7.88***
	<i>Community Variance</i>	4.171		
	<i>Residual Variance</i>	294.161		
	<i>Incremental Prop of Community Explained</i>	0.747		
	<i>Incremental Prop of Residual Explained</i>	0.142		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

All individual level covariates entered into stage 2 of the analysis were significant predictors of individual preparedness. Individuals who had indicated that they had been previously affected by bushfire undertook significantly more preparedness behaviours, as did those who indicated that they were retired and no longer in the workforce. Conversely, those residents indicating that they lived on

residential sized blocks of less than 2 acres were significantly less prepared for bushfire. Finally, respondents who were involved in community preparedness activities were significantly more prepared than those with no involvement, though whether involvement led to preparedness or preparedness to involvement is difficult to say. The addition of these four variables to the model accounted for 14.2% of the total residual variance, indicating that substantial individual variance remained unexplained. Interestingly, the addition of these four individual level variables also reduced the total community level by variance by 74.7%, though remaining variance at the community level remained significant ($\chi^2 = 24.62$, $df. = 9$, $p < 0.01$).

Level 2: Community Level Variables

In the final stage of the analysis, community-level constructs (Social Capital, Aggregated Perceived Risk towards the Community, Proportion of Properties Inspected by Local Government) were included in the model. Place attachment was not included in this stage of analysis as prior analyses revealed this variable did not significantly differ across levels of the dependent variable (preparedness) and as a result cannot function as a significant community level predictor. This is further supported by the predictors' low intra-class correlation coefficient (ICC(1); Table 7.5.9). ICC's indicate the proportion of observed variance in ratings due to systematic between-community differences compared to the total variance in ratings (LeBreton & Senter, 2008). Furthermore, inter-rater reliability scores for all aggregated community level predictors (R_{wg}) were inspected prior to analysis and deemed sufficiently reliable (i.e >0.80 , Table 7.5.10). All community level variables, being interval scale scores, were grand mean centered prior to inclusion in the model.

Table 7.5.9: Intra-class correlation coefficients for four aggregated community-level predictor variables.

Variable	ICC(1)
Social Capital	0.062
Place Attachment	0.000
Aggregated Risk to Town	0.044
Prop. Of Properties Inspected	0.336

Table 7.5.10: $R_{wg(j)}$ Inter-rater reliability statistics for three community level variables of interest across each of the ten communities sampled. In each case R_{wg} has been computed by comparing observed reliability against a square/uniform null distribution of reliability expected by chance⁵⁶. Note that reliability statistics for the 'Proportion of Properties Inspected' has not been included as this variable does involve the aggregation of individual opinions but rather the proportion of a definite event (being inspected) observed in a community.

Community	Social Capital	Place Attachment	Risk to Town
Armadale	.88	.93	.91
Bunbury	.89	.93	.83
Busselton	.91	.94	.82
Denmark	.91	.92	.90
Donnybrook	.85	.92	.85
Chittering	.87	.92	.85
Mandurah	.84	.91	.80
Nannup	.89	.94	.84
Manjimup	.84	.91	.80
Collie	.84	.94	.89
Average	.87	.93	.85

Table 7.5.11: Individual-level covariates and community level predictors (Full) model (n=1216).

Model	Variable	Coefficient	SE	t-ratio
Individual – level covariates	Constant	54.806	1.06	51.42***
	Affected Prior Y/N	3.408	1.14	2.98**
	Retired Y/N	6.763	1.02	6.63***
	Residential Block Y/N	-8.142	1.14	7.16***
	Involved in Community Prep Y/N	9.643	1.26	7.66***
Community – level predictors	Social Capital	-0.346	0.30	1.14
	Aggregated Risk to Town	0.456	0.15	3.10*
	Prop. Properties Inspected	-1.176	5.02	0.23
<i>Community Variance</i>		1.178		
<i>Residual Variance</i>		294.179		
<i>Incremental Prop of Community Explained</i>		0.182		
<i>Incremental Prop of Residual Explained</i>		0.000		
* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$				

Of the three community level variables entered into the model at stage 3 (Table 7.5.11), only the aggregated perceptions of the bushfire risk towards the respondents' town was found to be a significant predictor of individual preparedness. Over and above the individual level covariates, certain communities perceived their town to be at significantly more risk than others, and this resulted in residents within these communities undertaking additional preparedness behaviours. Neither the amount of Social Capital, nor the proportion of properties inspected by local government predicted a significant amount of variance in individual preparedness at the community level. The χ^2 test of intercepts in the full model suggested that following the inclusion of these four variables, the remaining variance between communities was no longer significant ($\chi^2 = 7.79$, $df. = 6$, $p = 0.25$).

⁵⁶ In all cases the variance of a square/uniform null distribution for an item with 'A' number of response options can be determined by the formula: " $(A^2 - 1)/12$ "

7.6 Discussion

The present study represents what is, to the authors' knowledge, the first large-scale quantitative attempt to investigate individual and community level factors involved in the determination of bushfire preparedness within an Australian context. While the existence of variables exerting an influence on bushfire preparedness at a community-level have been substantially discussed in previous research, until now there has been little information regarding the size of the community-level influence and its relation to individual-level variables, which have received more widespread research interest.

In the present study, of the total variance in individual bushfire preparedness, individual-level variables accounted for 95.42%, leaving only 4.58% to be accounted for by community-level variables. Accounting for this relatively small amount of community level variance is the comparatively small differences between communities in terms of preparedness. While there were statistically significant differences between communities, the differences were not on the scale that was initially expected. Communities were, on the whole, moderately well prepared for bushfire based on the preparedness scale developed in Chapter 6 and utilised in the present study. While only one community scored below the half-way point of scale (48.55, Collie), no communities scored higher than 61.07 (Chittering) suggesting substantial improvements are both still possible and warranted. While differences were statistically significant, the lack of substantial *variability* between communities by necessity equated to the lower than expected influence of community level factors. What community level variance there existed was predominantly accounted for by a single community-level variable: the aggregated community perceptions of the risk of bushfire to their town/suburb, discussed in more detail below.

As indicated by the substantial variance component accounted for by individual-level predictors, substantial variability was observed in bushfire preparedness, and individual scores covered the full range of the preparedness scale. At the individual level, there were a number of variables that were found to be important predictors of bushfire preparedness, many of which have been previously identified in the preparedness literature including variables related to the respondents' property, their employment status and their previous experiences with bushfire.

Individual level variables

Property size, and in particular whether respondents lived on a rural block, was strongly linked to preparedness. Regardless of whether respondents lived on small or large rural properties, they were likely to have undertaken significantly more preparation than residents living on a residential sized block (i.e. a block less than 2 acres in size). While future work should investigate the applicability of the scale between residential and non-residential respondents, the difference in preparedness between these two groups does not appear to be a result of some vegetation reduction items being less applicable to residential respondents. Determining why residential respondents undertake fewer actions is, however, difficult. While all surveyed communities were chosen because they were at high risk of bushfire, results suggested that residential respondents perceived the risk of fire to be lower than their non-residential counterparts.

Perceptions of risk appear also to account, at least in part, for the difference in preparedness seen between respondents with and without prior experience of bushfire. Having been previously affected by bushfire was associated with substantially higher levels of preparedness, though this effect appears to diminish somewhat over time; more recent fire experiences proffer more benefit in terms of preparedness. Once more, those respondents indicating previous experience with bushfire appeared to rate the risk of fire as being greater than those without previous bushfire experience.

Those respondents with previous experience of bushfire were also dramatically over-represented amongst those involved in community preparedness activities, including belonging to a bushfire related organization. While only 17.5% of respondents with no previous experience of fire had signed up to a community preparedness activity, more than 33% of respondents with previous bushfire experience were members of bushfire preparedness organizations. Across all respondents, participation in a community preparedness activity was associated with significantly higher levels of bushfire preparedness, and this appeared to be the case regardless of the particular activity type. Unfortunately, with the possible exception of those with previous fire experience, it is impossible to determine the causal direction between these variables from the information collected. It is possible either that respondents who are well prepared decide to join a community preparedness activity because preparedness is an important part of their self-identity, or that taking part in community fire preparation leads them to acquire knowledge which reinforces the need to prepare on their own property. Further longitudinal research would be needed to answer these questions.

At the individual level, employment status and, in particular, being retired was found to be associated with better preparedness around the home. Despite being an older population and potentially less physically able to undertake certain actions such as vegetation management, available time, rather than income appears to determine preparedness in this group. Employment status and income exhibit a complex relationship in accounting for bushfire preparedness. While the unemployed appear the least prepared for bushfire, it is those in the middle income brackets that exhibit poorer preparedness than either of the two income extremes. The lower end of the income spectrum is made up of many retirees who, while lacking the financial resources to prepare for bushfire, probably have more time. By contrast, people in the highest income bracket are mainly in full-time work and, despite having less time, perhaps have the financial resources to complete expensive preparedness activities (i.e. roof mounted sprinklers) and/or to pay contractors to undertake them. The full extent of the relationship between income and preparedness may have been obscured by the lack of responses from those who rented the homes they were living in. Renters, likely to be disproportionately represented in lower income groups than those owning their homes) indicated having undertaken fewer preparedness activities on their properties. While a large portion of this effect may be a result of the unwillingness of renters to invest money in a property they do not own, lower levels of disposable income may also have played a part.

The four variables discussed above (i.e. previous bushfire experience, block size, employment status and community preparedness involvement) collectively accounted for 16.95% of the total available variance in bushfire preparedness observed in the present study.

Community Level Variables

As previously discussed, the distinction between an individual-level variable and a community-level variable is a difficult one to make. Many of the variables discussed above, while being properties of individuals that make them more or less likely to undertake preparedness activities, are also community-level variables when considered in aggregate. As a result, many of the differences in preparedness that we see across communities are the result of variations in the proportions of particular individuals and property types contained within them. These 'structural' aspects of communities are perhaps usefully distinguished from other types of community-level variables that, by contrast, describe aspects of a community that can only be collaboratively or collectively obtained. Social capital perhaps most accurately falls into this category. Even though it may be individually measured, no one individual can possess social capital in the absence of others, and the aggregate of individual perceptions is clearly a community-level variable. Still other variables fall somewhere in between. Risk for example, can be usefully interpreted at both levels. At the individual level, respondents can perceive the risk of fire to their own properties, including their house and gardens. At a community level, aggregated perceptions of risk explore community held notions regarding the

vulnerability of a particular geographic region to fire. While individuals may be independent of others in determining their own property's level of risk, it is likely that at a community level, members discuss perceptions of fire risk as it relates to their area, and collectively held notions of community risk may be more than simply the aggregate of individual property evaluations.

The results from the present study indicate substantial differences between communities on a number of aggregated 'structural' variables described in the 'individual variables' section above. Communities differed significantly in relation to the number of residents who had been previously affected by fire, the proportion of respondents who indicated that they were retired from the workforce, the proportion living on residential sized blocks, and the proportion involved in community bushfire preparedness activities. Unfortunately, as a result of limited statistical power in the hierarchical linear models constructed, we were not able to enter all of these variables into the final analyses. According to Hofman (1997) the present dataset, featuring a small number of communities (10) but with a large number of individuals in each (approximately 130) is more suited to the determination of individual-level, rather than community-level effects. A greater number of communities would have enabled greater statistical power to identify community-level effects. In an effort to remedy this potential drawback, the national study presented in Chapter 8 incorporates a greater number of communities.

Nevertheless, while statistical power to detect the influence of community level variables was low, we do not feel that the results were materially affected by this omission. Inspection of the data suggests that the influence of these 'structural' variables is complex, and many appear to have only a modest relationship with preparedness across different communities. For example, while Armadale, Nannup and Chittering appeared to be the best prepared communities, each differed substantially in the number of respondents living on residential sized blocks (75%, 43%, and 10% respectively) and in respondents' involvement in community bushfire preparedness activities (33%, 17% and 9% respectively). A similar pattern was also observed for the proportion of respondents who indicated being retired from the workforce. While significant differences existed between communities, these differences did not appear to be related to community levels of bushfire preparedness. Clearly, while these variables appear to be important at an individual level, they are substantially less significant when aggregated to the community level.

The clear exception to this was the proportion of respondents from each community who had been previously affected by bushfire. At an individual level, having been affected by bushfire, and at a community level, having many residents previously affected by bushfire, were related to higher levels of preparedness. At the community level, the proportion of respondents previously affected by fire was highly correlated with perceptions of the bushfire risk to their town. While these variables are only weakly correlated at the individual level ($r=0.13$, $p<0.0001$), the correlations were so high ($r=0.78$, $p<0.007$) at the aggregated community level as to prohibit using them both in hierarchical linear modeling because of the problem of multi-collinearity. As a result, only the variable, "aggregated perceptions of bushfire risk", was included in the analysis at the community level though it may be that experience with fire is one of the key factors leading to individual's perceptions of bushfire risk.

Two other community-level variables were not included in the final hierarchical linear model since they differed little between communities. Residents' attachment to place did not differ significantly across the ten communities studied, or even between 'rural' and 'urban fringe' communities, despite these differences having been previously observed in the literature. Across all communities, residents' attachment to place was high (mean scores of around 80 out of 100). Because there was restricted variation in both place attachment and community preparedness, place attachment cannot be ruled out as an important community-level variable. It may be that communities with distinctly higher or lower levels of preparedness to those studied here might show correspondingly high, or low, levels of place attachment. Further research could clarify this point.

Similarly, perceptions of the local government's capabilities in fire mitigation differed only modestly across communities. With the exception of the respondents from the City of Armadale, who reported significantly lower levels of confidence in their local government, respondents from all other communities reported moderately high levels of local government confidence. The somewhat lower levels of government confidence in the City of Armadale may be as a result of recent, and damaging, fires in this region (see Chapter 4). Unlike other communities, in which respondents' assessments of government capabilities are to a degree prospective, perceptions in the City of Armadale may have been retrospective - influenced by memories of the damage recently sustained. It seems likely that these same experiences resulted in the high proportion of respondents in the Armadale community with previous bushfire experience, high ratings of bushfire risk, and correspondingly high preparedness.

Three community level variables were entered into the hierarchical linear model to account for the relatively small community-level variance component discussed above. Of the three variables, only the aggregated perceptions of bushfire risk to the town/suburb was found to be a significant predictor of preparedness, while neither the levels of social capital, nor the proportion of properties in each community inspected for compliance with bushfire regulations proved to account for significant variance in preparedness. While large differences were observed between communities in relation to the vigilance of local governments in conducting property inspections, the reported rates of these inspections did not appear to account for a significant proportion of the variance in bushfire preparedness. While the two poorest prepared communities also demonstrated the lowest rates of property inspections (Collie 8.11%, and Manjimup 5.45%), a number of well-prepared communities including Armadale (17.01%) were also infrequently inspected.

The present questionnaire asked respondents only whether their property had been inspected and asked no further questions relating to the nature of this inspection. Judging by the rates reported in some communities, as well as from written responses provided, it appears likely that reported rates include both comprehensive property inspections as well as a range of more superficial inspections related to bylaws associated with the maintenance of fire-breaks, including 'drive-by' and 'aerial' inspections. While these types of inspections are undoubtedly important, they may function only to improve rates of compliance with fire-break legislation and may do less to encourage further preparedness related to vegetation management around the home, structural/building modifications, or planning behaviours as assessed in the present preparedness scale. A more accurate understanding of the role that property inspections play would require more specific questioning related to the nature of these inspections, as undertaken in the national study (Chapter 8).

Social capital, hypothesized to be an important factor in emergency preparedness, did not account for a significant proportion of community-level variance in preparedness. In the present sample, while social capital varied between communities, being high in social capital did not go hand in hand with better community preparedness for bushfire: Communities highest in bushfire preparedness demonstrated high (Nannup), moderate (Chittering) and low (Armadale) levels of social capital. Once more, as with a number of variables previously discussed, the community of Armadale stands out as an exception; being well prepared for bushfire, but with low levels of Social Capital. As previously discussed, it may be the case that levels of social capital are low in this community as a result of the significant damage caused by recent fires to this area. It is possible that the resilience required to overcome a bushfire and rebuild in the aftermath erodes considerable reserves of social capital that may have been present prior to the fire. We cannot rule out the possibility that events such as this may have skewed the overall importance attributed to some community-level, and individual-level variables in this study.

Conclusion

Contrary to initial expectations, the present analyses indicate that the majority of the variance in bushfire preparedness lies between individuals rather than between communities. Despite selecting communities specifically with the intention of maximizing community differences, the community level accounted for only a very small percentage of the total variance in bushfire preparedness.

Western Australia may be unique in the Australian context, and community variability may be much greater in other states such that replication of these findings in other locations is needed. Nevertheless, the legislative framework present in Western Australia, where the primary responsibility for bushfire prevention and mitigation lies with the individual local governments, seems likely to create more, rather than less between-community variability in preparedness. Perceptions of the risk of bushfire accounted for nearly all of the community-level differences in preparedness, with some evidence indicating that perceptions of bushfire risk were highly related to the amount of surrounding bushland.

In contrast, the present study suggested that the vast majority of variance in preparedness lay at the individual-level, of which approximately 16% was able to be accounted for with the variables included in the present hierarchical linear models. While the analyses reported in the present chapter have been important in that they have replicated the significance of well-known individual-level variables such as property characteristics, employment and prior bushfire exposure, the majority of individual-level differences remain unaccounted for. While considerations of sample size and statistical power limited the inclusion of all individual-level variables originally surveyed, the addition of further variables was unlikely to have accounted for substantially more of the inter-individual differences.

The present questionnaire was heavily focused on the measurement of concrete variables (i.e. demographics or inspection data), and perceptions of the quality of the place and community (i.e. place attachment and social capital), but focused relatively less on individual attitudinal differences. Substantial inter-individual differences may be accounted for with the inclusion of items assessing respondents' attitudes towards preparing for bushfire, including their perceived capabilities, the influence of preparedness on the aesthetic appeal of their properties, as well as general environmental beliefs. Additionally, the presence and influence of social norms related to preparedness may account for additional individual-level variance. These components are collectively assessed within the Theory of Planned Behaviour, and have been incorporated in a further national level study presented in the following chapter.

8.1 Communities and Bushfire Preparedness Across Three States

The aims of this study are:

- To further explore the impact of community level variables on preparedness and determine whether the key findings from the W.A study are replicated across different states with differing legislative frameworks.
- To explore additional theoretical concepts, in particular, the usefulness of the Theory of Planned Behaviour in explaining differences in individual preparedness.
- To apply the findings about the strength and weakness of various questions to improve the measurement of variables and to allow the exploration of relationships such as those between people's proximity to bush-land and perceptions of risk, and trust in government agencies and preparedness.

In the present chapter we report on the work which extends the research reported in Chapter 7 on individual and community level variables related to the propensity for individuals to undertake preparedness activities on their properties. While the previous questionnaire was distributed to ten communities within a single state, here we extend this work to cover eighteen communities across three states (six per state), covering both a greater number of states, as well more communities overall. In addition to proving greater statistical power for analyses, the present structure allows the study of the potential impact of a range of different state legislative frameworks, as well as the impact of a greater range of landscapes, vegetation types, and community attributes. By administering the present questionnaire to three further states we aim to capture greater community variability and to attempt to verify the importance of variables identified in the previous West Australian questionnaire.

Community Level Differences Across States

A principal aim of the present study is to investigate the importance of community-level variables including Place Attachment, Social Capital, and the perceptions of the capabilities and actions of state fire and emergency services, and to determine whether these differences are comparable to those observed across communities in Western Australia. As has previously been mentioned, Western Australia is unique within the Australian fire and emergency services landscape. Unlike Western Australia in which the primary responsibility for the mitigation of bushfire is vested in the individual local governments, Australia's eastern states coordinate these responsibilities centrally via a state-level fire and emergency management agency. While legislative differences do exist between states, in most cases some powers are then further delegated to regional divisions. Nevertheless, it may be imagined that significant similarities are likely to exist between communities within a state as media campaigns and operational directives are likely to be coordinated in many cases at a state level. Indeed, these higher order, state-level policies may themselves influence community and individual preparedness, and provide the third (state) level of analysis.

While the abovementioned similarities suggest a possible homogeneity of community bushfire preparedness both within and across states, legislative similarities may be more than offset by differences in the location and physical makeup of communities. Even within a single state communities vary widely in terms of their characteristics. Results from the previous questionnaire suggests that a range of individual level variables including past bushfire experience, block size and employment status may be critically related to preparedness, and that when communities are, on aggregate, high in one of these variables, community preparedness may also be affected. It is for this reason that the current study purposely aimed for maximal differentiation of community types within the three states studied (South Australia, Victoria and Tasmania). It was hypothesized that the wider

variety of community types included in the present study may, in fact, lead to greater, rather than fewer community differences in the present project.

The Theory of Planned Behaviour

In an attempt to further understand what motivates people to prepare for bushfires we have employed the general theoretical framework provided by the Theory of Planned Behaviour. The theory is designed to predict and explain human behaviour in *specific* contexts by highlighting the relationship between Attitudes, Subjective Norms and Perceived Behavioural Control and their role as *causal* agents in determining intention and subsequent performance of the behaviour under scrutiny. Support for the theory is summarised in a meta-analysis (Armitage & Conner, 2001) and extensive literature reviews (Conner & Sparks, 1996; S. Sutton, 1998) and recent revisions (Rivis & Sheeran, 2003; White, Smith, Terry, Greenslade, & McKimmie, 2009). The TPB is frequently used to predict complex social behaviour by highlighting the role of personal values and the influence of significant others on decision making. The theory has been applied in numerous contexts to explain health and social behaviours.

The TPB is premised on cognitive self-regulation and is an extension of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975). Within the TPB framework, human behaviour is guided by (i) *behavioural beliefs* (beliefs about the likely consequences of the respective behaviour, in this case fire risk and its consequences), (ii) *normative beliefs* (beliefs about the normative expectations of others regarding the behaviour) and (iii) *control beliefs* (beliefs about the ability or inability to engage in the behaviour and successfully achieve the desired outcome). According to (Ajzen, 2006), behavioural beliefs about the value of the outcome result in a favourable or unfavourable *Attitude* toward the behaviour. Normative beliefs are said to result in a perceived *Subjective Norm* and motivation to comply and is relevant to this study since strong community expectations are argued to be critical in terms of compliance. Similarly, control beliefs predict the level of *Perceived Behavioural Control* the individual has over the specific behaviour; Feelings of competency and control, arguably, are influenced by self-appraisals of knowledge and ability which in turn affect perceptions of behavioral control over the outcome and thus the selected course of action itself. A recent meta-analysis by (Rivis & Sheeran, 2003) highlighted the additional predictive power of the model when *descriptive norms*, beliefs about the behaviours of significant others, are included.

In the present context we expect that the more local agencies, such as local fire-fighter brigades, are embedded into the local community and the more integrated the community, the more appropriate the fire preparation and response will be. Moreover, we expect that proactive community agencies will engender a sense of control and certainty with respect to which course of action should be taken. In turn we expect that the quality of decision making will be better in such communities as individuals will not only be better educated about risk but also more accurately able to judge their ability to influence the outcome given their emotional and physical resources. A schematic of the theory of planned behaviour and the contextual influences hypothesised to influence decision making can be seen in Figure 8.1.1 below.

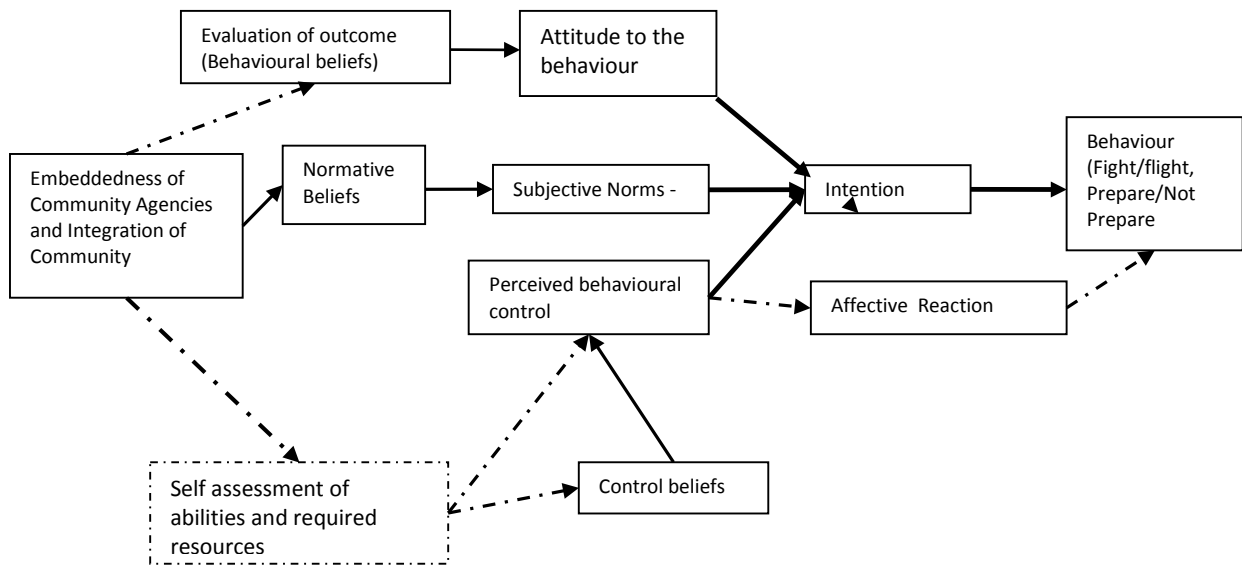


Figure 8.1.1. The Theory of Planned Behaviour (with hypothesised additions added in dashed lines)

8.2. Feature: Ph.D. Candidate Andrew Chapman (Person/Community Fit)

Understanding Community and Preparedness: Building Towards Bushfire Prepared Individuals

How individuals in at-risk areas prepare for bushfires (or wildfires) is an integral component in the protection of lives and property (Killalea & Llewellyn, 2010). A basic tenet within the bushfire (and wider hazard) literature is that for an individual to be motivated to prepare for a hazard they must perceive a risk and also judge the likely outcomes of this risk (Martin, Bender, & Raish, 2007; McFarlane, Mc Gee, & Faulkner, 2011; Paton, Smith, Daly, & Johnston 2008; Paton & Johnston, 2001; Rogers, 1975; Sjöberg, 2000; Sjöberg, 2001). Extant research into bushfire preparedness has focused on the individual and community factors that mediate the relationship between risk perception and preparedness behaviours (Beatson & McLennan, 2010; Bright & Burtz, 2006; Martin et al., 2007; McFarlane et al., 2011; Paton, Burgelt et al., 2008; Paton & Johnston, 2001). However, little attention has been paid to the interaction that may occur between these individual and environmental level factors.

This research project aims to address this gap in our knowledge by answering the following questions:

1. “How do individuals understand/interpret the concept of community in relation to bushfire risk; and how do possible individual differences in this understanding relate to preparedness?”
2. “How do individual and community level factors interact in their influence on preparedness behaviour? More specifically, can a person-environment fit (PE; Kristof-Brown & Guay, 2011; Muchinsky & Monohan, 1987; Terborg, 1981) approach be used to explain the interactions between individual level factors and community level factors, and their influence on preparedness?”
3. “Do these interactions differ in their influence on different types of performance (e.g., proficient, pro-active performance; Griffin et al., 2007)?”

In order to initially assess the predictive power of PE-fit a meta-analysis of the PE-fit literature within an organisational context was conducted. Person environment (PE) fit research is the study of behaviour resulting from the interactions between individuals and their environment; however, the majority of this research has been conducted within an organisational setting (Kristof-Brown & Guay, 2011; Muchinsky & Monohan, 1987; Terborg, 1981).

Results from the meta-analysis of 66 effect sizes from 43 different sources indicated that the different ways individuals fit into their environment are related to different types of behavioural outcomes. Individuals who demonstrate similarity with the environment more likely to behave proactively, while individuals who meet the requirements of the environment likely to behave proficiently.

A second study was conducted to apply the above findings to a bushfire preparedness context. Two-hundred-and-five participants completed survey packages on their understanding of the term community, their PE-fit with their community, and their preparedness behaviours. Results indicated that PE-fit positively predicted participants' preparedness behaviours for bushfires. However, there was no discernable pattern of preparedness behaviours into proficient and proactive dimensions.

A final study is planned for the spring period of 2014 to assess the relationship between PE-fit and bushfire preparedness while controlling for pre-existing relationships with both individual and community level factors. It is hypothesised that PE-fit will contribute unique variance to the explanation of bushfire preparedness while controlling for both individual and community level factors.

8.3. Questionnaire Development and Composition

The following section describes the derivation of items covering a range of content areas included in the national bushfire preparedness questionnaire. Many of these questions are identical to those used in the previous Western Australian Questionnaire. This questionnaire was extensively discussed in chapter 7.3 to which the reader is referred for full details.

Demographic Variables

On the whole, demographic items were asked in a similar fashion to those in the previous Western Australian questionnaire. A number of questions have been altered slightly from their original format. These include:

- An additional category was added to the question regarding acreage. Previously respondents had been given the option of 'residential' (<2 acres), 'hobby farm or small acreage' (<100 acres), 'large farm or other large property' (>100 acres) and 'land without a house'. The revised question separates 'hobby farm or small acreage' into two further categories: 'Hobby farm or small acreage (2.1-20 acres)' and 'moderate sized rural property' (20-100 acres).
- The item regarding the proximity of bushland has been altered to refer to the distance of bushland from the respondents' 'house' rather than their 'property' so as to avoid confusion for residents with bushland ON their property.
- An additional item has been added asking respondents to rate within their local government area 'approximately how much bushland is there?'. Respondents were provided with a slider scale featuring 25 increments with anchors: 'very sparse; little or no bushland to be seen' and 'thick bushland covering the majority of the area'. This item was considered useful in

investigating the relationship of bushland to perceptions of risk in a manner unrelated to the individual's property, but rather as a community level variable.

- An additional response category has been added to the item assessing the living arrangements of the respondents. The option 'company supplied/care-taker' was added to the other options including owning and renting in order to cater for a number of respondents in the previous questionnaire indicating that they did not fit into the available categories.

Prior Exposure to Bushfire

Items related to respondents' prior experience of bushfire were asked in a similar manner to those in the previous Western Australian Questionnaire. In the present questionnaire only one item was included; asking residents to indicate whether they had previously been personally affected by bushfire, and if so, to indicate the respective year in which they were affected.

Place Attachment

Once more, Place Attachment was assessed using a scale adapted from that of Williams and Vaske (2003), featuring 11 items assessing both Place Dependence and Place Identity. As before, respondents were restricted to a five-point response scale ranging from 'strongly agree' to 'strongly disagree' with a 'neutral' point of 3.

In the present questionnaire, Place Attachment questions have been altered to refer to the respondents' 'district/suburb' rather than their 'home'. It was considered possible that the lack of differences on the variable of Place Attachment observed between communities in the Western Australian sample was related to the location reference of the questions. As Place Attachment is seen as a community level variable, it was considered more appropriate that respondents rate their attachment to the community, rather than their own house/property, which may be influenced by additional individual factors including income, ownership, and location. The wording 'district/suburb' was chosen so as to apply equally to those in regional towns, rural areas, and metropolitan fringe locations and is consistent with the wording used throughout other sections of the questionnaire.

Perceptions of Bushfire Risk

Six questions, identical to those in the Western Australian questionnaire, were used to assess perceptions of risk (see Chapter 7.3). The six items include, and are based on, similar items from previous studies by our research group (McNeill et al., 2013). Three of these six items tap the likelihood of bushfire, while a further three tap the concept of severity. Additionally, three of the questions relate specifically to the respondents' own property, while the remaining three assess the respondents' views of risk in their town or suburb. All questions were presented along with a 7 point Likert response scale, anchored at 1; 'definitely won't happen' or 'not severe at all' and 7; 'definitely will happen' and 'extremely severe'. For the full text of the items utilized, please see APPENDIX C.

Social Capital

Items assessing Social Capital were asked in an identical manner to those in the previous Western Australian questionnaire. Once more, 24 items were asked across 5 sections (sections A,B,C,D and E as discussed in Chapter 7.3 and as listed in Onyx and Bullen (2000)). Only minor changes were made to the wordings of these items for the purposes of clarity (i.e. providing examples of local community events or local organizations, and making explicit reference in the item related to community emergency action involvement that it need not be specific to bushfire). Each item was once again provided with a 4 point Likert response scale as discussed in Chapter 7.3.

Community Level Preparedness Involvement

Items assessing involvement in community level preparedness activities were asked identically to the previous questionnaire, although a number of additional questions were added. As was done previously, respondents were initially asked whether they were involved in community level bushfire preparedness activities (yes/no) before being given the option of more specifically indicating, from a list, the particular activities they were involved in. The selection options differed slightly in this questionnaire as a result of previous feedback and as a result of different programs being given different names in different states. Across all three states respondents had the option of selecting 'volunteer bushfire brigade', 'emergency management group/committee' and 'neighbourhood phone tree'. A fourth option varied in name across the states, being variously named 'Community Safety Group (e.g. Community Fireguard)' (Victoria and South Australia) and 'Community Safety Group (e.g. Bushfire ready Neighbourhood)' (Tasmania). Respondents were given the option of selecting whether the activities were engaged in 'currently' or 'in the past'.

As a result of a number of written responses by respondents in the previous questionnaire indicating that they were a trained fire-fighter or in a bushfire mitigation role, two additional items were included. The first asked respondents whether they were, or anyone else in their household was 'professionally employed in a bushfire mitigation role (e.g. career or trained fire-fighter or employee of an agency with responsibility for bushfire)?' The second item asked whether the respondent had friends who were members of the local bushfire brigade. Each of these questions used a dichotomous response format.

Bushfire Preparedness Actions

Only minimal changes were made to the 27 items assessing bushfire preparedness between the Western Australian questionnaire and the present questionnaire. Once more, respondents were given three response options, although in the present version these responses were 'true of my property', 'not true of my property' and 'N/A' as was originally described in Chapter 6⁵⁷. In this questionnaire, a number of small changes were made to the wording of some items to improve clarity, including:

- Reference to gas cylinders has been removed from the item pertaining to the removal of flammable materials (e.g. firewood, boxes, wooden furniture) from around the perimeter of the house. As many rural properties receive gas from bottled sources only, this item had previously caused considerable confusion for respondents.
- Specific mention was made that reserve supplies of water could not include mains water: 'You possess ample supplies of drinking water to prevent dehydration during the fire (i.e. not mains water)'. Many respondents had previously indicated the mains as their supply of water, though this source cannot be relied on in the event of a large scale bushfire.

Bushfire Prevention Enforcement

In an effort to further enlarge on the information collected about property inspections, an expanded series of items was created allowing for the sequential exploration of the frequency, type and quality of these inspections. Respondents were initially asked when was the last time that their property had been 'inspected for compliance with bushfire management requirements' (month, year and 'has not been inspected'). Further items then assessed whether they were home at the time of the inspection (yes/no) and the manner in which the inspection had been undertaken (drive-by inspection, aerial inspection, physically entered the property, unsure). In order to gain information about the modal frequency of inspections rather than simply the most recent event, an additional item asked respondents how frequently they believed their property was inspected for compliance.

⁵⁷ Note that the previous Western Australian questionnaire had unintentionally changed this format to 'yes', 'no' and 'N/A' making the wording of two of the 27 questions ambiguous.

An extra block of three items, identical to those employed in the previous questionnaire, assessed whether there had been any negative consequences for respondents as a result of their failure to comply with hazard reduction requirements. Respondents were asked whether they had ever 'received a notice requiring bushfire hazards to be removed', 'been fined for failure to comply with the notice', or 'had to pay for the work of contractors sent to your [sic] property to remove bushfire hazards'. In order to overcome the possible reluctance of respondents to admit to receiving such notices or reprimands, an item was included asking whether they were aware of friends or neighbours having been fined for a failure to comply with such a notice.

Finally, a set of four items assessed the quality of bushfire regulation compliance inspections. These four items were worded in a very similar fashion to those utilized in the previous questionnaire and can be found in Appendix D.

Bushfire Education Materials

Items assessing whether residents receive bushfire education materials and residents' perceptions of the quality of these materials were asked in a similar fashion to those in the Western Australian survey. An initial item assessed whether respondents had received such information. The wording of this item was changed somewhat from the previous questionnaire in order to correctly recognize the agencies responsible for the distribution of such information in Australia's eastern states. While in Western Australia this responsibility lies with the relevant local government, in the states surveyed by the current questionnaire, this responsibility lies with the state fire and emergency services agencies.

A further set of five items investigates the quality of these education materials and mirrors approximately those items used in the Western Australian questionnaire, albeit in a reduced form. The five items that make up this section are presented in Appendix D. They include items relating to the clarity of the information, its timeliness, its informativeness, and its relevance. The items employed in the present questionnaire include three items used in the previous questionnaire and two new items. Items that functioned well were retained, while new items were written so as to amalgamate similar items, and so that all items were positively worded (the previous questionnaire featured both positively and negatively worded items and this caused a number of difficulties during analysis).

A final "yes/no" item was added to the section on bushfire education materials in order to assess whether any member of the respondents' household had attended bushfire information evenings or community safety events in the past two years.

Perceptions of Government and Emergency Services

The present questionnaire uses an abbreviated number of items to assess respondents' perceptions of the quality and capabilities of government and emergency services agencies. The extensive list of items employed in the Western Australian questionnaire demonstrated that in most cases respondents were unable to differentiate either between agencies or between the various capabilities of a single agency across multiple facets/tasks. In most cases respondents answered similarly to all items included in the scale, providing the rationale for a substantial reduction in item number in the present questionnaire. The present scale features just eight items and asks these questions in relation to 'agencies responsible for bushfires in.... (Tasmania, South Australia or Victoria)'. Six items in the present scale are identical to those utilized in the previous questionnaire. Two additional items represent a rewording of items from the previous questionnaire so as to cover the full range of concepts with a reduced number of items. Those items that displayed the best psychometric

properties while also covering the full range of issues previously surveyed were retained. The items that make up this section can be seen in Appendix D.

Once more, in order that respondents' knowledge of agencies did not limit their ability to respond, all questions asked for the respondents' 'confidence' in the agencies to perform the particular action, or hold the particular value in question. Respondents were provided with a 7-point Likert scale ranging from 'Very Confident' to 'Very Unconfident' with 'Neutral' as the mid-point of the scale.

The Theory of Planned Behaviour (TPB)

Due to a lack of available TPB items relating to bushfire preparedness available in the literature, we followed the guidelines developed by Ajzen and Fishbein (1980) in order to formulate items. The questionnaire features 23 items used to assess the four aspects of the Theory of Planned Behaviour including: Attitude to the Issue (13 items), Subjective Behavioural Norms (3 items), Perceived Behavioural Control (3 items) and Self Identity (4 items). The section on Attitudes to the issue of bushfire was further split into three sections including: views relating to the efficacy of preparing (3 items), concerns for the environment (the short form of the New Environmental Paradigm scale; 6 items) and aesthetic concerns (4 items). All 23 items were presented along with a five point Likert response scale ranging from 'Strongly Disagree' to 'Strongly Agree'. The complete wording of these items can be found in Appendix D.

Attitudes towards preparing for bushfire were assessed using three sub-scales. We considered attitudes in relation to preparedness to be composed of general environmental values, concerns about the aesthetics of the house and garden, and beliefs around the benefits of undertaking preparedness activities. General environment values, likely to be inversely related to preparedness (i.e those with strong pro-environmental values may be unwilling to clear vegetation and may not believe in human intervention being positive for the landscape) were assessed using the short form of the New Environmental Paradigm (NEP) scale (6 items, $\alpha = 0.7$, Dunlap, Van Liere, Mertig, & Jones, 2000; Whitmarsh & O'Neill, 2010). Both the full version of the scale (Whitmarsh & O'Neill, 2010), as well as the short form (Fielding, McDonald, & Louis, 2008) have previously been used in studies utilizing the Theory of Planned Behaviour.

Concerns over the aesthetic implications of undertaking preparedness activities were assessed using four items created directly for the purpose of this questionnaire. Two items covered perceptions around the use of controlled burning as a mechanism for fuel-load reduction, while two further items assessed more directly whether respondents felt that undertaking preparedness actions on their properties would reduce the aesthetic appeal of their house and garden.

A final set of three items assessed directly respondents' beliefs in the efficacy of undertaking preparedness behaviours. While superficially appearing similar to the Perceived Behavioural Control items discussed below, attitudinal items assess the subjective probability that a behaviour will produce a certain outcome; in this case that undertaking preparedness actions will reduce the likelihood of losing one's house in the event of a bushfire.

Of the three Perceived Behavioural Control items used, two are based on the work of (Danes & Rettig, 1993) and the wording of one item is derived from Read, Brown, Thorsteinsson, Morgan, and Price (2013) and their work on perceptions of the acceptability of wind-farms. All three items have been adapted to bushfire preparedness to assess respondents' perceived ability to undertake preparedness activities on their properties.

A further three items assessed the strength of social norms in promoting individuals to undertake preparedness actions. These items are similar in nature to items used in Rimal and Real (2003), but

have been specifically altered to apply to bushfire preparedness. Two of the items assessed injunctive social norms (the coercion individuals experience to conform to group norms), while one item assessed descriptive social norms (beliefs about how widespread preparedness behaviours are).

Finally, four items were employed to measure the importance of preparedness to respondents' self-identity. Three items were positively worded while one item was negatively worded. All theory of planned behavior items were measured on a five point Likert response scale ranging from 'strongly disagree' to 'strongly agree'.

8.4. Selection of Communities & Responses

Selection of Communities

As in the previous study, since the present questionnaire aims to test 'community' variables, the definition of community is again of great importance. In the previous West Australian questionnaire, 'community' was defined geographically and the selected households were drawn from the outer periphery of large regional centers. This selection process was partly motivated by statistical concerns. Only around large regional towns was it possible to sample enough households to permit analysis. Similarly, households in the centre of towns were excluded since, for them, bushfires were not a significant threat.

Analysis of results from the previous questionnaire, indicated that the selection process was only partly successful. The selection of households for the previous questionnaire mail-out was affected by two separate but related issues:

1. The definition of 'community' and the resulting geographic dispersion of households within a community, and
2. Statistical concerns related to the number of households within a community sampled, and the number of communities sampled overall.

In the previous study, it appears that the selection of households within a community was too broad, with too great a distance between households. As it was expected that a large number of responses would be required (upwards of 100 per community), the regional center of a local government area was chosen as the basis of the definition of community. This definition was further supported by the fact that under W.A. legislation local governments have the primary responsibility for fire mitigation, ensuring all households within a local government area have similar service delivery. In effect, the 'communities' sampled were likely to have included multiple communities with the result being that community differences were potentially less obvious as a result of an averaging effect across several communities.

The second problem related more specifically to the statistical power of the analyses employed. Ten communities were chosen, with approximately 1000 questionnaires mailed out within each, giving a response rate of approximately 140 responses per community. From a statistical analysis perspective, these numbers were not optimal for Hierarchical Linear Modelling. Under this analysis technique, greater statistical power (as a result of more degrees of freedom) would have been achieved with the same number of responses had there been more communities with fewer responses from each. The two concerns mentioned above were related, in that the perceived necessity for large numbers of responses per community necessitated the excessively broad interpretation of 'community' that was employed.

The present questionnaire mail-out rectifies the above-mentioned limitations. A more narrow definition of community was employed. Similar to the previous mail-out, in order to ensure identical service delivery, all suburbs/towns within a distribution area were still derived from a single Local Government (though this is less of an issue for other Australian states who coordinate fire mitigation centrally). However, where the previous questionnaire had up to 35km of distance between households within a single distribution area, areas utilised in the present mail-out include no more than 20km between households, and in most cases far less.

In addition, more distribution areas have been selected; within each state, six distribution areas have been chosen, providing 18 areas in total (compared to 10 for the previous questionnaire). Within each area, fewer households were selected for distribution. In both Victoria and South Australia, 500 households had been selected in each distribution area. As a result of advice from the Tasmanian Fire Service indicating high level of functional illiteracy in rural Tasmania, 600 households were chosen in each of the six Tasmanian distribution areas so as to ensure similar response rates to other states. Based on the response rates from the previous study (about 17%), it was estimated that the present distribution numbers would result in approximately 85 responses per distribution area. It was calculated that a response rate of approximately 70 responses per area would provide sufficient statistical power for the desired analyses.

Three states were initially chosen for the present study. The selection of multiple states offers the ability to determine, through the use of Hierarchical Linear Modelling, the proportion of variance in individual preparedness accounted for by state specific factors in addition to community specific factors. While the previous West Australian questionnaire was only able to determine individual and 'community' level factors, the present study has the additional ability to determine state level factors related to individual preparedness. To our knowledge, this is the first study of its type to be in a position to do this. The selection of states was somewhat limited. Severe life-threatening fires predominantly affect southern states of Australia. New South Wales had recently been affected by an unseasonable but devastating bushfire and, apart from the heightened sensitivity of the residents, was also the subject of a major post-fire investigation by the Rural Fire Service. As a result it was deemed prudent not to target this state. Western Australia was excluded as it was the subject of the previous questionnaire. Tasmania, South Australia and Victoria remained; each with a long history of damaging bushfires.

The selection of communities was in each state guided by the advice from the relevant state fire and emergency services agencies. In each case, along with feedback on the questionnaire itself, agencies were asked to nominate a number of areas, both outer-metropolitan and rural that might be suitable for distribution of the questionnaire. In each case, the list of areas received detailed simply the rough geographic area or the main township within that area. Further work was then required to locate suburbs or localities within these areas and their respective postcodes. These localities and postcodes were then submitted to a private data company (Prospects Unlimited) who returned counts of the numbers of household addresses they were able to provide for each locality.

For those areas for which more than 500 addresses (or 600 in the case of Tasmania) were available, a random selection of 500 addresses was requested. For areas in which fewer than 500 households were available, further work was undertaken to add surrounding localities in order to reach this total. For some areas it became clear that there was no possibility of achieving the desired totals and these areas were correspondingly removed from consideration. It must be acknowledged that a number of communities with severe fire risks and interesting dynamics were unable to be studied as a result of statistical analysis limitations. In a number of cases, additional communities were chosen outside of those provided by the relevant state fire and emergency services agencies. Such communities were chosen on the basis of size, the availability of fire danger information for that community as well as

the proximity of bushland to households. Where possible, the suitability of these additional communities was checked with the relevant fire and emergency services for that state.

Within each state a similar range of communities was chosen. Each state featured a similar mix of outer-metropolitan and rural communities; approximately half from each category. Outer-metropolitan communities were considered to be those that were within 100km of a major urban centre (i.e. Adelaide, Melbourne, Hobart or Launceston). Rural communities were considered to be any community further than 100km from a major urban centre. In the selection of rural communities, care was taken to select communities across different geographical regions of each state. This was found to be quite difficult in the case of South Australia where very few communities of sufficient size were located across the west and north of South Australia. As a result, the majority of communities come from the Adelaide Hills, the Murray Darling Basin and the South East. The Outer-Metropolitan/Rural distinction was deemed important as it is possible that communities close to large metropolitan centres, and consequently the resources available via these centres, may be less self-sufficient in terms of their bushfire preparedness. Unlike the previous questionnaire in which the peripheries of moderately large towns were included, the present selection of communities did not include any such towns. That said, a number of outer-metropolitan areas were coextensive with adjoining metropolitan areas though this posed no problems. Tables one through 4 presented on the following pages provide a detailed breakdown of the areas chosen, as well as the localities included within each area and the respective counts of addresses attained from each.

Table 8.4.1: Combined areas for questionnaire distribution across three states including quantities distributed.

Area	Name	Quantity
Victoria Area 1	Gisborne	500
Victoria Area 2	Yarrambat	500
Victoria Area 3	Epsom	500
Victoria Area 4	Maryborough	500
Victoria Area 5	Bright	500
Victoria Area 6	Orbost	500
S.A. Area 1	Williamstown	452
S.A. Area 2	Aldgate	500
S.A. Area 3	Glenalta	500
S.A. Area 4	Ashton	363
S.A. Area 5	Clare Valley	500
S.A. Area 6	Millicent	500
Tasmania Area 1	New Norfolk	600
Tasmania Area 2	St Helens	471
Tasmania Area 3	Dodges Ferry	600
Tasmania Area 4	Risdon Vale	600
Tasmania Area 5	Margate	600
Tasmania Area 6	George Town	600
TOTAL		9286

Table 8.4.2: Detailed suburb/locality breakdown of questionnaire distribution for Victoria

Area (Victoria)	Name	Quantity
Area 1 (Gisborne)	Gisborne	427
Area 1 (Gisborne)	Gisborne South	41
Area 1 (Gisborne)	Bullengarook	32
Area 2 (Yarrambat)	Hurstbridge	296
Area 2 (Yarrambat)	Plenty	113
Area 2 (Yarrambat)	Yarrambat	91
Area 3 (Epsom)	Ascot	122
Area 3 (Epsom)	Epsom	378
Area 4 (Maryborough)	Maryborough	500
Area 5 (Bright)	Bright	394
Area 5 (Bright)	Freeburgh	13
Area 5 (Bright)	Germantown	3
Area 5 (Bright)	Wandiligong	10
Area 5 (Bright)	Porepunkah	80
Area 6 (Orbost)	Orbost	467
Area 6 (Orbost)	Bete Belong	15
Area 6 (Orbost)	Jarrahmond	18
TOTAL		3000

Table 8.4.3: Detailed suburb/locality breakdown of questionnaire distribution for South Australia

Area (South Australia)	Name	Quantity
Area 1 (Williamstown)	Williamstown	186
Area 1 (Williamstown)	Cockatoo Valley	13
Area 1 (Williamstown)	Lyndoch	176
Area 1 (Williamstown)	Rowland Flat	1
Area 1 (Williamstown)	Sandy Creek	6
Area 1 (Williamstown)	Kersbrook	70
Area 2 (Aldgate)	Aldgate	175
Area 2 (Aldgate)	Bridgewater	185
Area 2 (Aldgate)	Stirling	140
Area 3 (Glenalta)	Glenalta	114
Area 3 (Glenalta)	Belair	223
Area 3 (Glenalta)	Hawthorndene	163
Area 4 (Ashton)	Ashton	30
Area 4 (Ashton)	Summertown	79
Area 4 (Ashton)	Uraidla	82
Area 4 (Ashton)	Marble Hill	1
Area 4 (Ashton)	Basket Range	9
Area 4 (Ashton)	Carey Gully	23
Area 4 (Ashton)	Norton Summit	46
Area 4 (Ashton)	Cherryville	5
Area 4 (Ashton)	Piccadilly	65
Area 4 (Ashton)	Montacute	15
Area 4 (Ashton)	Forest Range	10
Area 5 (Clare Valley)	Clare	480
Area 5 (Clare Valley)	Watervale	7
Area 5 (Clare Valley)	Mintaro	3
Area 5 (Clare Valley)	Leasingham	1
Area 5 (Clare Valley)	Farrell Flat	9
Area 6 (Millicent)	Millicent	433
Area 6 (Millicent)	Tantanoola	17
Area 6 (Millicent)	Hatherleigh	2
Area 6 (Millicent)	Mount Burr	48
TOTAL		2815

Table 8.4.4: Detailed suburb/locality breakdown of questionnaire distribution for Tasmania

Area (Tasmania)	Name	Quantity
Area 1 (New Norfolk)	Magra	12
Area 1 (New Norfolk)	New Norfolk	568
Area 1 (New Norfolk)	Sorell Creek	20
Area 2 (St Helens)	Akaroa	19
Area 2 (St Helens)	St Helens	374
Area 2 (St Helens)	The Gardens	3
Area 2 (St Helens)	Binalong Bay	75
Area 3 (Dodges Ferry)	Carlton	101
Area 3 (Dodges Ferry)	Dodges Ferry	281
Area 3 (Dodges Ferry)	Lewisham	81
Area 3 (Dodges Ferry)	Primrose Sands	137
Area 4 (Risdon Vale)	Geilston Bay	359
Area 4 (Risdon Vale)	Risdon	24
Area 4 (Risdon Vale)	Risdon Vale	217
Area 5 (Margate)	Barretta	3
Area 5 (Margate)	Coningham	33
Area 5 (Margate)	Electrona	29
Area 5 (Margate)	Lower Snug	44
Area 5 (Margate)	Margate	380
Area 5 (Margate)	Snug	111
Area 6 (George Town)	George Town	493
Area 6 (George Town)	Kelso	23
Area 6 (George Town)	Low Head	84
TOTAL		3471

Response Rates

Similar to the previous Western Australian questionnaire, the present questionnaire mentioned a final return date of the 1st of February. As was done previously, questionnaires were accepted after this date, with a final date of inclusion of the 15th March, 2014. A significant number of questionnaires were received during the extended period. Aiding comparisons between the two surveys is the fact that both were issued at an almost identical time of the year, and both were open for return for a similar period.

Substantial variability in responses was observed across the 18 different study locations as well as across the three states studied (see Table 8.4.5. below). In total 1307 questionnaires were returned from a mail-out of 9286, giving an overall return rate of 14.07%; similar, but slightly lower than the previous questionnaire mail-out in Western Australia (16.10%). 11 questionnaires were returned where the respondent provided no indication of location, while a further 12 questionnaires were returned from locations other than those studied. These questionnaires have been removed from all further analyses. Of the three states, South Australia had the highest return rate (16.98%), while Victoria and Tasmania had similar, but lower rates of return (12.87% and 12.04% respectively).

With regards to the individual communities under study, the two highest rates of return were from Bright (21.00%) in Victoria and Aldgate (22.40%) in South Australia while the two lowest rates of return were from George Town (8.17%) in Tasmania and Millicent (9.00%) in South Australia. Once more, as with the Western Australian study, the response rate was found to be highly correlated with the perceived level of bushfire risk in these communities⁵⁸. While it seems likely that those respondents

⁵⁸ Pearson's Correlation of $r=0.64$ ($p=0.004$) between the response rate and perceived risk to town, across 18 communities.

who feel themselves to be at risk are more likely to return the questionnaire than those not at risk, this cannot be conclusively ascertained as we are unable to determine the levels of risk perceived by those who have not returned the questionnaire.

Once again, there were a substantial number of questionnaires returned that did not reach their intended destination ('return to sender'). These returns fell into a number of different categories including questionnaires mailed to addresses not on the postal register (in all likelihood rural pasture without a dwelling) and addresses for which the named recipient had passed away or no longer resided. Subtracting the 253 unsuccessful returns from the total sent out (9286) provides a true response rate of 14.47%. As always, it is impossible to know how many more questionnaires did not reach their intended target and were not returned.

Table 8.4.5: Mail-out and response statistics across 18 local government areas and three states.

Area	State	Town/Area	No. Sent Out	No Returned	%Returned
1	Vic.	Gisborne	500	63	12.60%
2	Vic.	Yarrambat	500	61	12.20%
3	Vic.	Epsom	500	54	10.80%
4	Vic.	Maryborough	500	55	11.00%
5	Vic.	Bright	500	105	21.00%
6	Vic.	Orbost	500	48	9.60%
7	S.A.	Williamstown	452	71	15.71%
8	S.A.	Aldgate	500	112	22.4%
9	S.A.	Glenalta	500	97	19.4%
10	S.A.	Ashton	363	69	19.01%
11	S.A.	Clare Valley	500	84	16.8%
12	S.A.	Millicent	500	45	9.00%
13	Tas.	New Norfolk	600	74	12.33%
14	Tas.	St. Helens	471	64	13.59%
15	Tas.	Dodges Ferry	600	66	11.00%
16	Tas.	Risdon Vale	600	65	10.83%
17	Tas.	Margate	600	100	16.66%
18	Tas.	George Town	600	49	8.17%
No Address		Undisclosed		11	
Other Location		Misc.		12	
Total			9286	1307	14.07%

State	No. Sent Out	No Returned	% Returned
Victoria	3000	386	12.87%
South Australia	2815	478	16.98%
Tasmania	3471	418	12.04%

8.5 Results and Analysis

All analyses below have been restricted to those respondents whose indicated place of residence was from one of the 18 targeted areas. Twenty three respondents were removed on this criterion providing a sample of 1284 respondents. All analyses involving the dependent variable 'preparedness' are limited to those respondents for whom a preparedness score was able to be computed (see

section below on 'Individual and Community Bushfire Preparedness (Dependent Variable)' for information on how this was conducted).

General Demographic Information

General demographic information for all 18 communities studied is presented in Table 8.5.1.

Age

The average age for respondents was 59.48 years (SD = 13.29). There appeared to be only small differences between the mean ages of respondents from the different states (Victoria: 58.73, South Australia: 60.06 and Tasmania: 59.53). At the level of the Local Government Area, significant differences were observed between the ages of respondents⁵⁹. Further comparisons revealed that four areas showed somewhat younger respondents: Gisborne (53.37), Yarrambat (55.93), Epsom (56.09) and Margate (55.85).

Gender

Overall 48% of respondents were male and 52% female. There were some slight differences between states in terms of the gender makeup as can be seen in Table 8.5.2 below. Once again, more substantial differences in the gender of respondents were observed at the level of the community.

Table 8.5.2: Gender breakdown across the three states sampled. Percentages in brackets denote proportions of respondents within each state for that gender.

	Victoria	South Australia	Tasmania	Total
Male	178 (46.2%)	236 (50.8%)	191 (46.6%)	605 (48%)
Female	207 (53.8%)	229 (49.2%)	219 (53.4%)	655 (52%)
Total	385 (100%)	465 (100%)	410 (100%)	1260 (100%)

Income and Education

Table 8.5.1 below provides data on the percentages of respondents in each community who fall in the lowest two bands on income and education. Low income here was defined as a pre-tax combined household income of less than \$900 per week, while low education was defined as being the completion of Year 12 or less. Analyses indicate the existence of significant differences between communities on both income and education⁶⁰. George Town (Tasmania) had the highest proportion of Low Income residents (71.1%) followed by Millicent (S.A., 69.2%) and Maryborough (Victoria 62.7%) while the lowest proportion of Low Income earning households were found in Gisborne (Victoria, 19.6%), Aldgate (South Australia, 24.8%) and Yarrambat (Victoria, 26%).

Employment

Analyses reveal significant difference in employment categories (ranging from unemployed through part-time and full-time work to retired) across both the 18 communities and across the three states studied⁶¹. Across all communities, the most reported employment category was 'retired', with 39.9% of respondents indicating being in this category, consistent with the high mean age of respondents. 17.2% of respondents indicated being in Part-time or Casual work, while 25.8% indicated being in full-

⁵⁹ One way ANOVA of mean age across 18 communities ($F(17,1259)=3.76$, $p<0.001$) with Bonferroni post-hoc comparisons.

⁶⁰ Chi-square comparison of income or education categories across 18 communities (Income: $\chi^2(68)=212.96$, $p<0.0001$, Education: $\chi^2(68)=242.45$, $p<0.0001$)

⁶¹ Chi-square comparisons of employment category (six categories) across 18 communities ($\chi^2(85)=135.48$, $p<0.0001$) and three states ($\chi^2(10)=24.69$, $p<0.0001$).

time work. As mentioned above, these statistics vary markedly across communities with over 50% of respondents in Bright (53.4%), Glenalta (52.1%) and New Norfolk (50.0%) being retired, compared to just 26.3% in Epsom and 30.6% in Gisborne. When viewed at a state level, these differences, while significant, appear somewhat smaller.

A comparison of employment status with income (low income vs not low income) demonstrates the expected pattern of results with those not in employment (either as a result of being retired, not in the workforce, or actively unemployed) having far higher rates of 'low income' status (see table 8.5.3 below)⁶².

Table 8.5.3. Percentages of Low Income earning households as a function of employment type of the primary questionnaire respondent.

	Employment Type					
	Unemployed	Part-Time/Casual	Full Time	Business Owner/Manager	Not in Workforce	Retired
Low Income	7.1%	59.9%	88.2%	74.5%	36.7%	28.5%
Not Low Income	92.9%	40.1%	11.8%	25.5%	63.3%	71.5%
Total	100%	100%	100%	100%	100%	100%

Acreage / Block Size

Despite targeting largely small rural townships and outer rural/metropolitan fringe suburbs, the vast majority of respondents across all areas indicated living on a residential sized lot of less than two acres in size (84.1% overall). While significant differences exist across the 18 communities sampled⁶³, only four communities can be considered to have reasonable numbers of respondents on small rural (2 – 20 acres), moderate rural (20-100 acres) or large rural lots (>100 acres). In Victoria, the communities of Gisborne and Yarrambat had substantial quantities of small rural lots (25.0% and 37.9% of respondents respectively). Similar rates of small rural properties were also seen in Ashton in South Australia (33.8%) and in Margate in Tasmania (27.8%). Interestingly, Margate also had the highest number of respondents from moderate sized rural properties with 7.2% of respondents indicating having such a property. Overall, only 12.5% of respondents indicated living on a small rural property, 2.4% on a moderate sized rural property and 0.9% on a large rural property. No significant differences in lot sizes existed across the three states sampled⁶⁴.

Living Arrangements, Pets and Livestock

Respondents were asked about their current living arrangements and were given the choice of four categories: 'Own or in the process of buying a house', 'Renting as a family household', 'Renting as a share house' or 'Company supplied/caretaker'. Across the 18 communities and the three states there were no significant differences in living arrangements⁶⁵, with the vast majority of respondents indicating being home owners (94.4% across all respondents). Indeed, this proportion appears so high

⁶² Chi-square comparisons between income (low income, not low income) and 6 levels of employment status demonstrate significant differences in income across employment (: $\chi^2(5)=306.13$, $p<0.0001$).

⁶³ Chi-square comparison between 5 categories of lot size and 18 communities ($\chi^2(68)=220.09$, $p<0.0001$)

⁶⁴ Chi-Square comparison of 5 lot sizes across three states ($\chi^2(8)=13.61$, $p=0.093$)

⁶⁵ Chi-Square comparison of 18 communities with 4 types of living arrangements ($\chi^2(51)=59.25$, $p=0.20$), and three states with 4 types of living arrangements ($\chi^2(6)=9.33$, $p=0.156$).

that it seems likely that those residents currently renting their house were less likely to respond to the questionnaire.

In respect to the ownership of Livestock, as would be expected residents living on non-residential lots were far more likely to own livestock, and the likelihood of owning livestock appeared to increase with the size of the property⁶⁶. This effect was not seen for the ownership of pets, which appeared almost equally likely for all block sizes⁶⁷ (see Table 8.5.4). Statistically, analyses revealed that respondents from Victoria more frequently reported owning livestock than residents of other states (Victoria = 11.6%, South Australia = 6.1% and Tasmania = 7.8%)⁶⁸. In particular, the Victorian towns of Gisborne (18.8%), Yarrambat (17.5%) and Orbost (17.0%) showed high levels of livestock ownership, as did Ashton (22.1%) in South Australia.

Table 8.5.4. Proportion of respondents in each lot size category who indicated owning livestock or pets.

Block Size	Livestock	Pets
Residential (<2 acres)	2.2%	60.1%
Small Rural (2- 20 acres)	37.2%	64.1%
Medium Rural (20-99 acres)	50.0%	63.3%
Large Rural (100 or more acres)	72.7%	45.5%

Individual and Community Bushfire Preparedness (Dependent Variable)

Respondents were given the options of answering either 'true of my property', 'not true of my property' or 'N/A' to 27 questions assessing the completion of bushfire preparedness activities around their property. Total scores on the dependent variable, Preparedness, were derived by dividing the number of 'true of my property' responses by the total number of questions answered either 'true of my property' or 'not true of my property'. Questions in which participants answered 'N/A' were not included in the calculation of an individual's total Preparedness score. Only those respondents who answered 'true of my property' or 'not true of my property' to more than 15 of the 27 questions were calculated a final preparedness score. This criterion excluded a number of respondents who answered 'not applicable' to all, or nearly all, of the questions. This criterion had the effect of excluding 79 participants from a preparedness score. Furthermore, only those who answered more than 20 of the 27 preparedness items were given a final preparedness score. This rule removed those who have accidentally skipped a page of the survey (preparedness items ran across two pages). This condition had the effect of excluding a further 9 respondents. In total, 88 respondents were removed from analysis on this variable.

In all, a total preparedness scale score (multiplied so as to be out of 100) was able to be calculated for 1196 respondents (93.15%). The distribution of preparedness scores appears on visual inspection to be roughly normally distributed but does in fact fail statistical tests of normality (see Figure 8.5.1)⁶⁹. In particular, there appeared to be a usually high number of respondents with a perfect preparedness score of 100 (N=14). Given the nature of the scale, the fact that it is conceivable that individuals could have accomplished all the actions listed, and the inability to verify responses, we have opted to include these values in further analyses while noting that some may be erroneous.

⁶⁶ –Square comparison of the ownership of livestock (yes/no) across five lot sizes ($\chi^2(4)=349.11$, $p=0.0001$).

⁶⁷ Chi –Square comparison of the ownership of pets (yes/no) across five lot sizes ($\chi^2(4)=3.37$, $p=0.50$).

⁶⁸ Chis-Square comparison of livestock ownership (yes/no) across three states ($\chi^2(2)=8.43$, $p=0.015$).

⁶⁹ Kolmogorov-Smirnov test of normality (1196) = 0.046, $p<0.0001$, Shapiro-Wilk test of normality (1196) = 0.995, $p=0.001$.

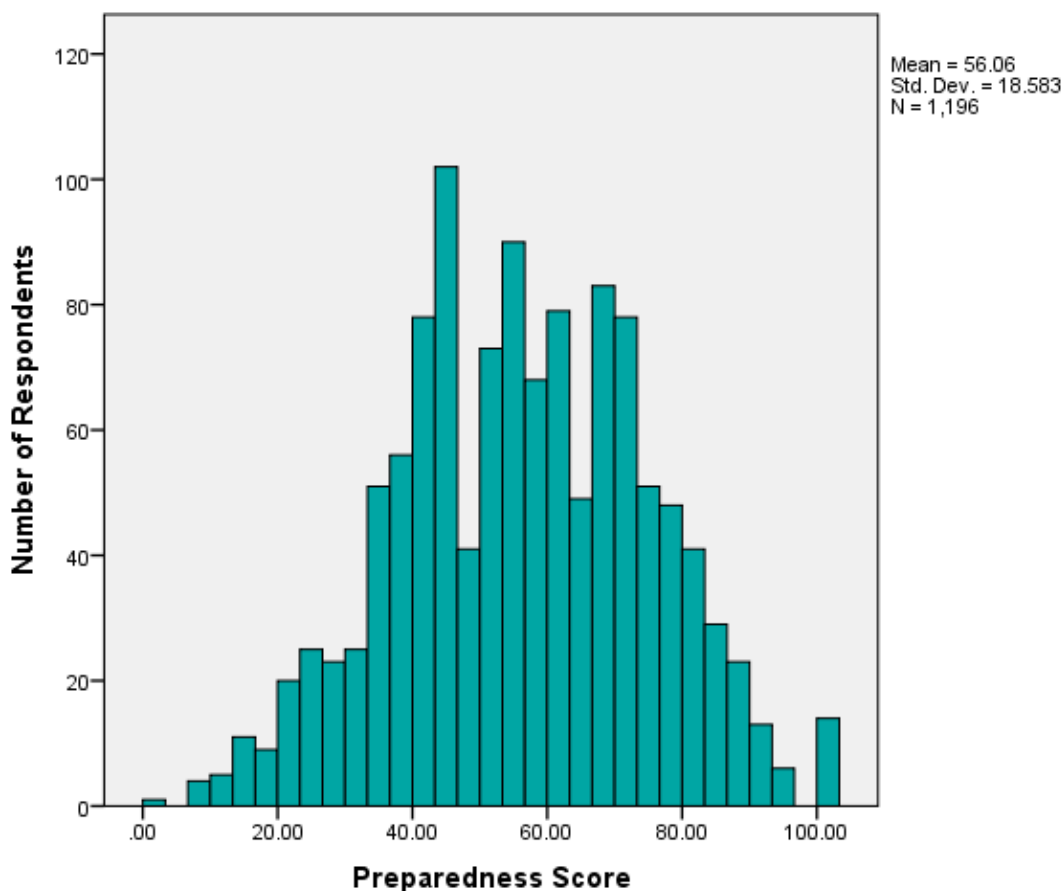


Figure 8.5.1: Histogram of total preparedness scores for all respondents across all areas for a 27 item preparedness scale. Note: while on visual inspection the data appears approximately normally distributed, it fails a Shapiro-Wilk test of normality.

Across all communities, the mean preparedness scale score is 56.06 out of a total of 100, with a standard deviation of 18.58. Analyses indicated that there are significant differences in the preparedness actions completed across the 18 different communities sampled⁷⁰. The poorest levels of preparedness were observed for the communities of Glenalta in South Australia (51.45) and Risdon Vale in Tasmania (49.73) while the highest preparedness levels were observed in Bright, Victoria (62.50) and Ashton, South Australia (63.81, see Figure 8.5.2, below). Post-hoc comparisons reveal that the only significant differences between the preparedness levels of the communities sampled occur between the two high-preparedness, and the two low-preparedness communities mentioned above⁷¹. Comparisons of preparedness between respondents in the three states sampled revealed no significant differences between states⁷² though residents of Tasmania reported slightly lower levels of preparedness (see Figure 8.5.3).

⁷⁰ One-way ANOVA of preparedness across 18 communities ($F(17,1178)=2.82, p<0.0001$).

⁷¹ Bonferroni post-hoc comparisons

⁷² One-way ANOVA of preparedness across three states ($F(2,1193)=0.70, p=0.50$).

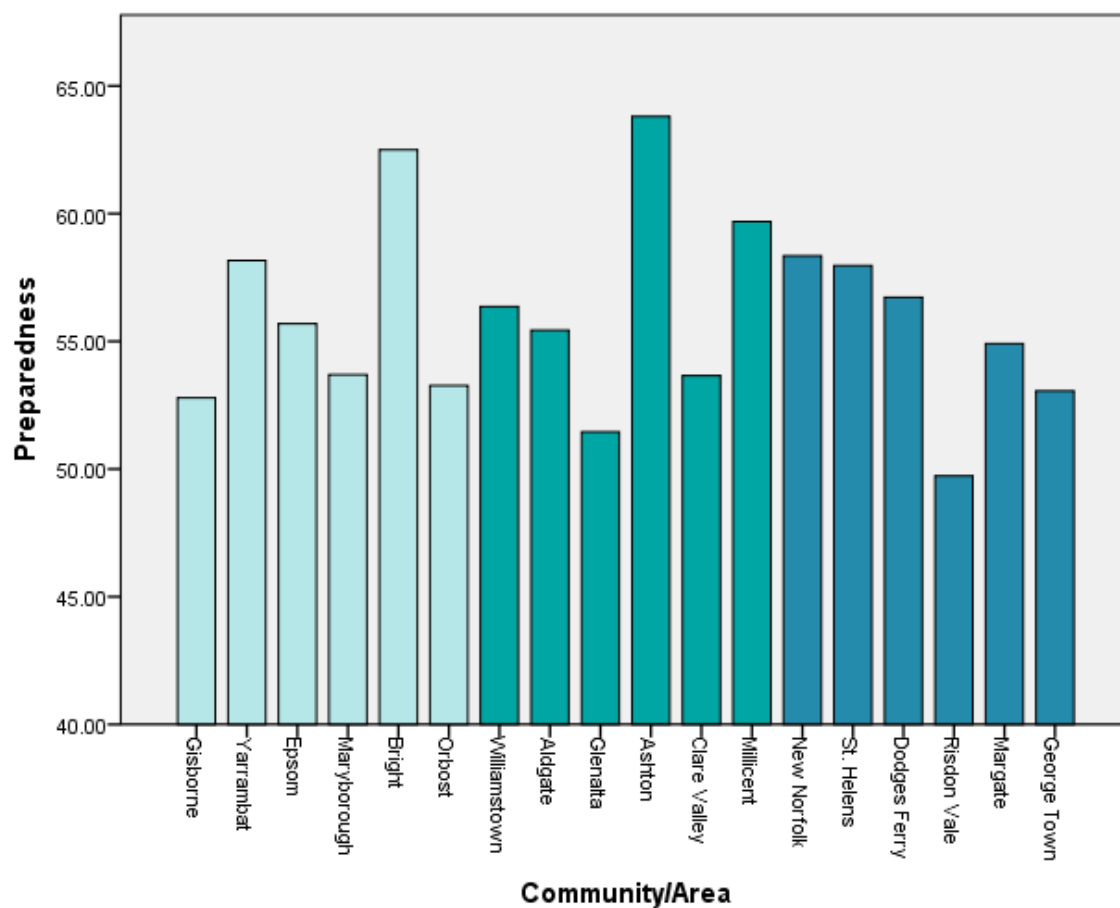


Figure 8.5.2. Mean preparedness scores derived from a 27 item preparedness measure for 18 communities sampled across Victoria, South Australia and Tasmania.

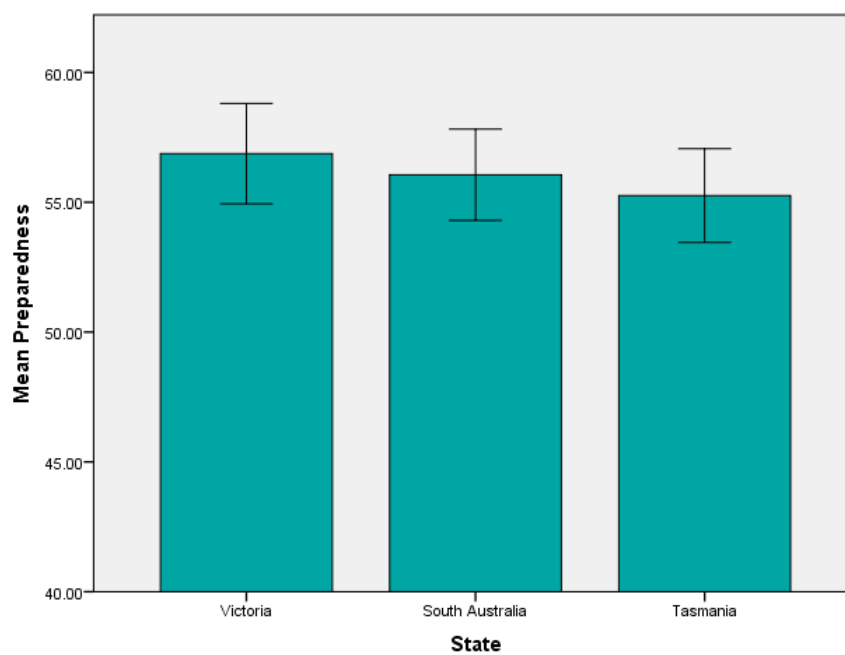


Figure 8.5.3: Mean preparedness for bushfire scores across three states. Note that error bars denote the 95% Confidence Interval around the mean. No significant differences were observed across the three states ($F(2,1193)=0.70$, $p=0.50$).

Preparedness by Response Type

As has been previously shown in the Western Australian community questionnaire, preparedness scores appear to vary depending on the respondents' indicated response to the threat of bushfire⁷³. In particular, it appears as though respondents indicating that they are going to stay and defend their property are more prepared than those intending to 'protect their property but leave if the fire directly threatens it', those intending to 'Wait for the police, fire or other emergency services to tell them what to do on the day' and those intending to 'leave as soon as they know there is a fire threatening their town or suburb' (see Figure 8.5.4).

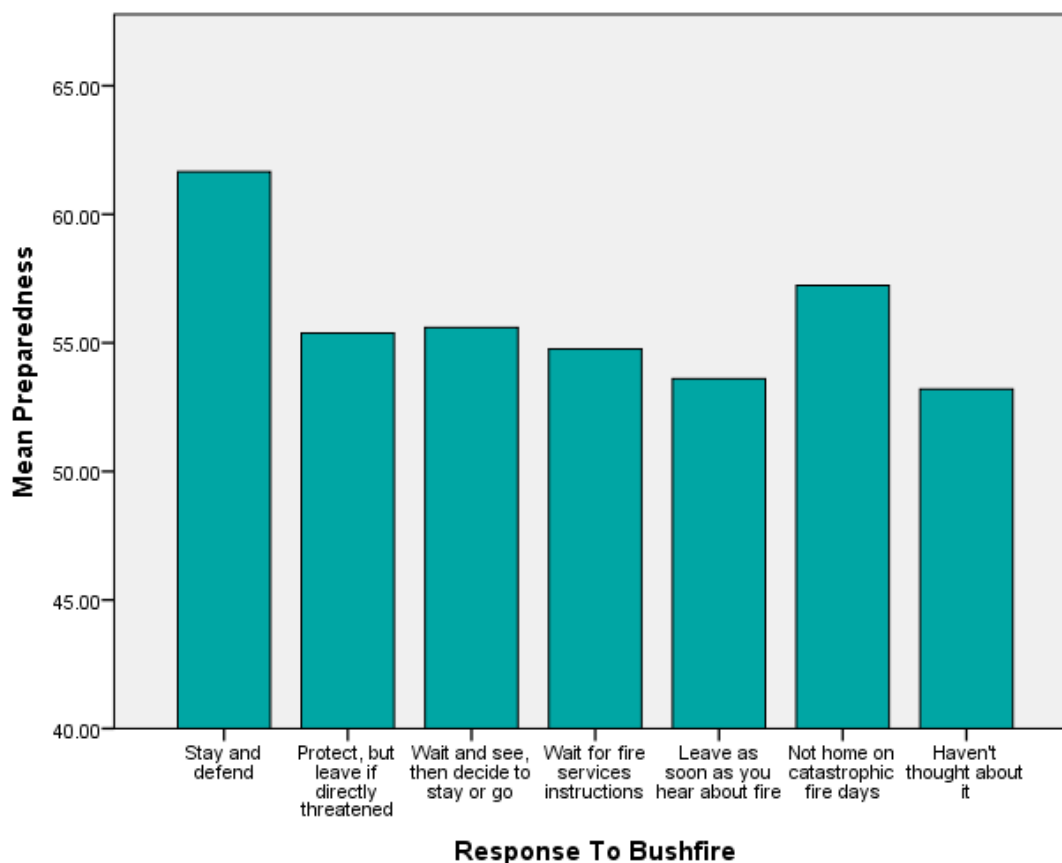


Figure 8.5.4. Mean preparedness scores for all respondents split up by the intended response to the threat of bushfire to their town/suburb.

Respondents Who Frequently Answered 'Not Applicable'

A separate analysis was conducted on those respondents who failed to answer sufficient questions to be given a preparedness score. There appeared little evidence that those who had skipped a page responded in a manner different to those answering all questions. Those respondents who answered 'not applicable' to more than half of the questions they answered were however of interest.

In terms of age, these respondents appeared slightly older (Mean = 65.54) and had resided on their property for an average of 19.54 years (compared to 17.79 for the wider group).

The majority of these respondents came from Tasmania (23/35) with only 6 from each of S.A. and Victoria. Consistent with these respondents being older, was the finding that they were overwhelmingly living as a couple with no dependents or as sole occupiers of their house (collectively 30/35 respondents) and frequently were retired (18/32). Twenty of the 35 respondents indicated

⁷³ One way ANOVA of preparedness across 7 responses to the imminent threat of bushfire (e.g. varieties of the stay/leave decision; $F(6,1174)=3.85$, $p=0.001$).

having left school at or before completion of year 10 with more than half (17/35) indicating that they were in the lowest income bracket. Every single respondent indicated living on a residential sized block, with 23/32 indicating that their nearest pocket of bushland was more than 100m away from their property. An independent samples t-test revealed that these respondents rated significantly lower levels of bushland in their local government areas than other respondents⁷⁴. In summary, it appears that the decision to answer 'not applicable' to the majority of preparedness question may be as a result of not seeing bushfire as a realistic threat.

Community Level Variables

Quantity of Bushland in the Local Government Area

Across two questions, respondents were asked both about the proximity of bushland to their house, as well as the amount of bushland present in their local government area. Approximately half of the respondents (N=532) indicated that the nearest pocket of bushland was more than 100m away from their house, with the remaining respondents indicating that bushland was either adjacent to their house (N=245), within 30m of their house (N=99), or between 30 and 100m of their house (N=279). Analyses demonstrated that respondents who indicated that bushland was closer to their house had also undertaken more preparedness activities on their property⁷⁵. While the decrease in preparedness with diminishing proximity to bushland appeared to occur in an almost linear fashion (see Figure 8.5.5.), post-hoc comparisons indicated the only significant difference lay between the preparedness levels of those adjacent to bushland and those with bushland more than 100 meters from their house. Correlations between bushfire preparedness and the proximity of bushland are broadly consistent with the above findings, indicating a small but significant relationship in the expected direction such that the closer bushland is to the respondents' dwelling, the more prepared they are likely to be ($r = -0.088$, $p=0.003$).

Additionally, and as might have been expected, significant differences were observed between communities in the perceived quantity of bushland present within their local government areas⁷⁶ (see Figure 8.5.6). Thickly wooded areas such as the timber town of Orbost (81.82%) and the alpine town of Bright (73.24%) were rated as such by respondents providing a degree of face validity to the results. Overall, all but one community was rated on average as being wooded above the mid-point of the scale (New Norfolk, Tasmania, 48.34%), validating the selection of these areas as being at bushfire risk.

⁷⁴ Independent samples t-test of reported amounts of bushland in the local government area and respondents who were given, and not given a preparedness score ($t(1197)=2.21$, $p=0.027$).

⁷⁵ One way analysis of variance of preparedness across 4 levels of proximity of bushland to the respondents' dwelling ($F(3,1151)=3.18$, $p=0.023$).

⁷⁶ One way analysis of variance of the reported quantity of bushland present in the respondents' local government area (/100) across 18 communities sampled ($F(17,1183)=11.61$, $p<0.0001$).

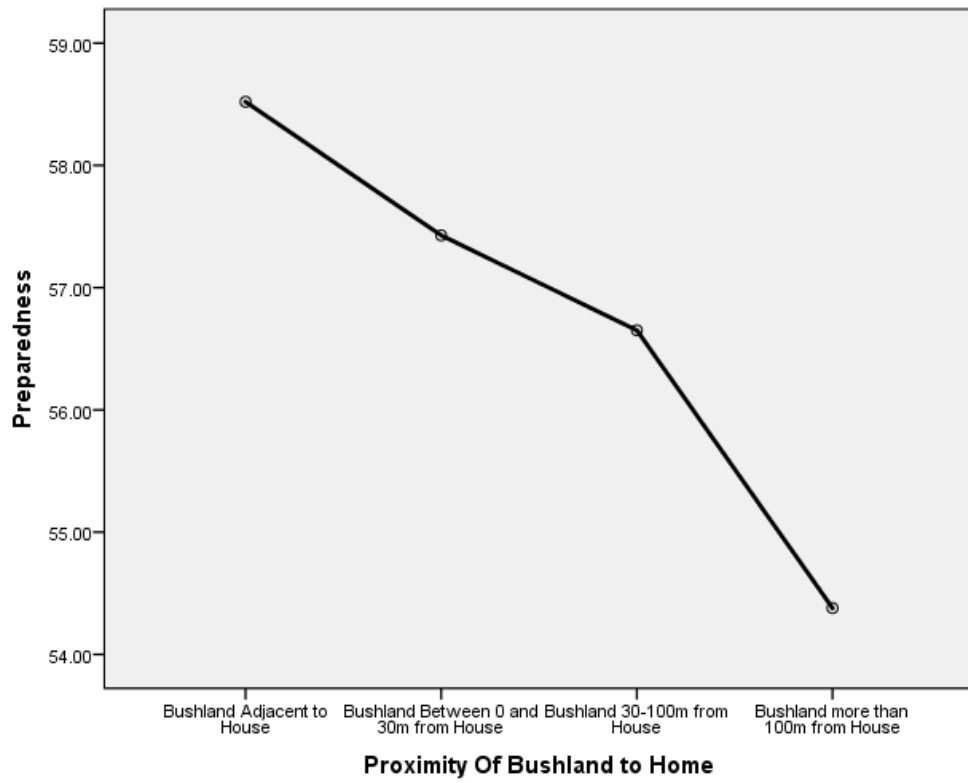


Figure 8.5.5: Mean Bushfire preparedness scores for respondents whose homes are at varying distances from the nearest bushland

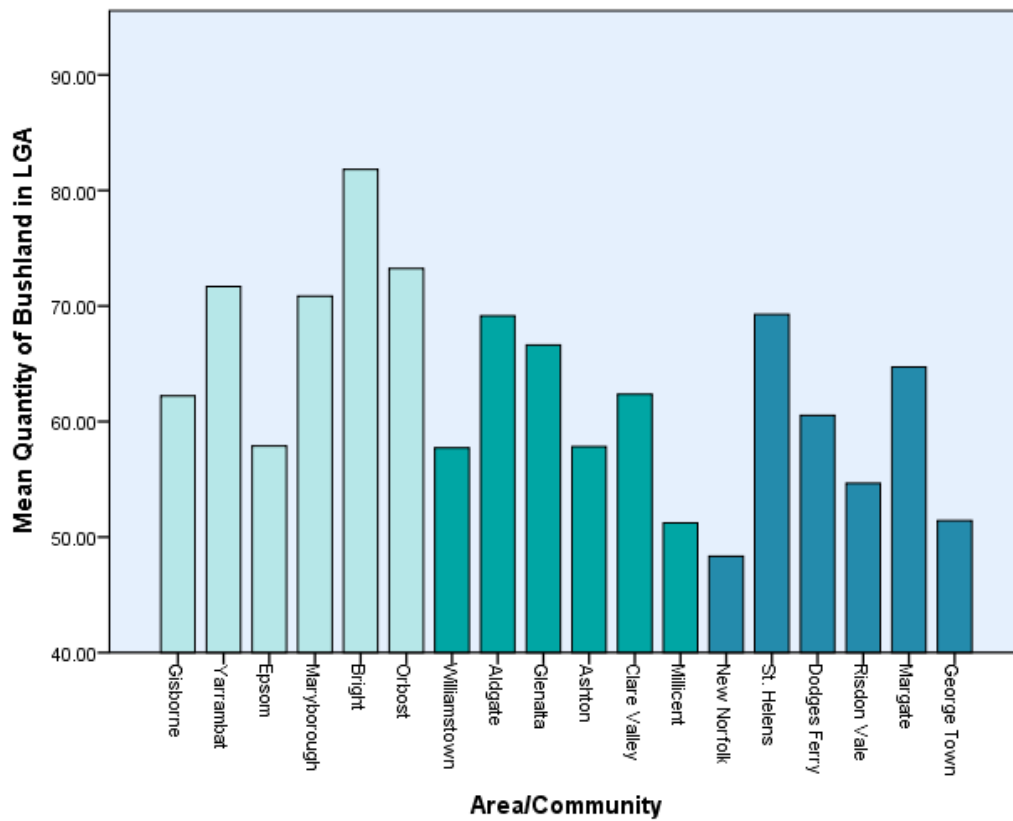


Figure 8.5.6: Average rated quantity of bushland across 18 local government areas surveyed.

Social Capital

The 24 items comprising the Onyx and Bullen (2000) Social Capital scale showed high levels of internal reliability justifying the use of the items as a total Social Capital score⁷⁷. Only those respondents who answered 20 items or more items received a total Social Capital scale score. The scale score was calculated by taking the average response (on a one to 4 scale) across all answered items. This average score has then been multiplied by 25 in order to achieve a score out of 100. In all, scale totals were calculated for 1229 respondents, while 55 (4.3%) were excluded on the above criterion. As with the above-mentioned preparedness measure, while appearing normally distributed ('bell shaped distribution') the scale total scores did not pass statistical tests of normality⁷⁸.

As shown in Figures 8.5.7 and Table 8.5.5 below, mean social capital scores differed significantly, both by state⁷⁹, and by community⁸⁰. Between states, post-hoc comparisons revealed that Tasmania (68.52) had significantly lower reported levels of social capital when compared to either Victoria (72.50) or South Australia (71.15). Correlations reveal that social capital scale scores correlate significantly and positively with place attachment scale scores across all respondents ($r=0.33$, $p<0.0001$) suggesting that those respondents who perceive more social capital are also more attached to their town/suburb.

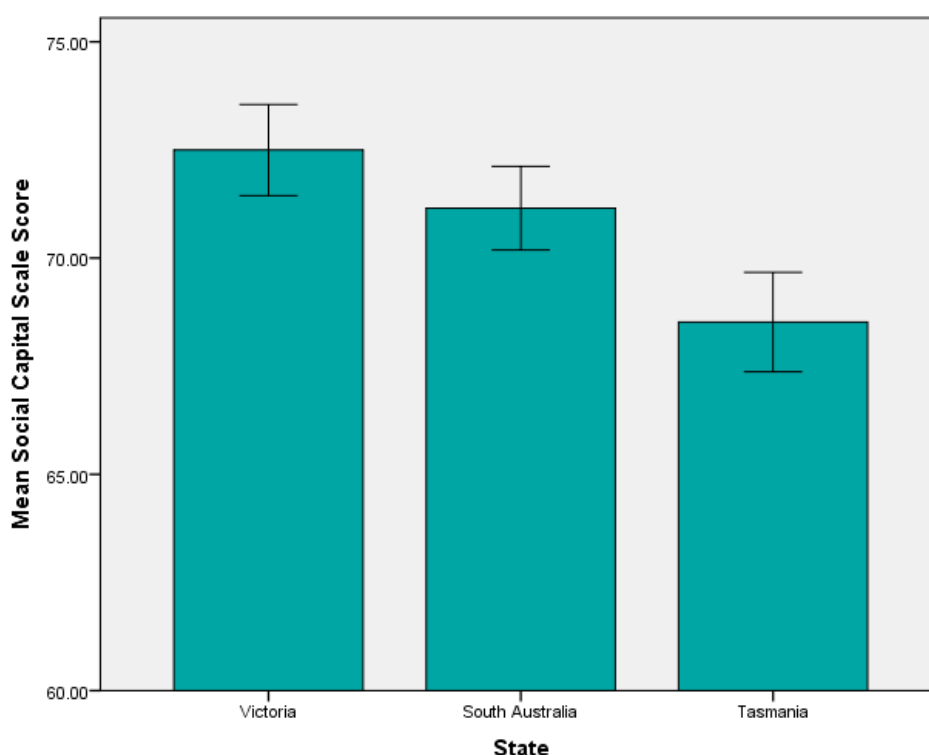


Figure 8.5.7 Mean social capital scale scores across three states. Error bars represent the 95% confidence intervals around the mean.

⁷⁷ The 24 Social Capital items had a Cronbach's alpha of 0.84, showing good internal consistency.

⁷⁸ Kolmogorov-Smirnov (1229)=0.035, $p=0.002$, Shapiro-Wilk (1229)=0.994, $p<0.0001$ tests of normality.

⁷⁹ One way ANOVA of social capital scale total across 18 communities ($F(2,1226)=13.52$, $p<0.0001$)

⁸⁰ One way ANOVA of social capital scale total across 3 states ($F(17,1211)=4.40$, $p<0.0001$).

Place Attachment

Place attachment was assessed with 11 items. These 11 items were identical to those used in the Western Australian questionnaire except that respondents were asked to answer the question about their 'district/suburb' rather than their 'home'. Analyses indicated that the 11 items functioned as a coherent scale and as such scale totals were computed⁸¹. As in the previous questionnaire, a total Place Attachment score was only derived for those respondents who answered at least 9 out of the 11 Place Attachment questions. For each respondent, a total score was derived by taking the average of the scores across all questions answered. Note that scores have been transformed so as to be out of a total of 100 for purposes of clarity.

As with the previous study, further analyses (see Appendix F) suggested that the eleven items used to assess place attachment were in fact measuring two distinct, but related concepts, namely Place Identity (about whether the respondents' home was crucial to their sense of identity) and Place Dependence (whether the home was important to the things they do and how they live).

For all three scales (Place Attachment Total, Place Identity and Place Dependence), analyses indicated that there were small but significant differences in Place Attachment across the 18 communities sampled⁸². Further analyses indicated that the only significant differences were between the community of Bright who evidenced the highest levels of Place Attachment (78.46) and Epsom (67.42) and Millicent (67.70) with the lowest levels of Place Attachment. Significant positive correlations were observed between scores on Preparedness and Place Attachment Total ($r=0.19$, $p<0.0001$), Place Identity ($r=0.14$, $p<0.0001$) and Place Dependence ($r=0.22$, $p<0.0001$) suggesting that as Place Attachment rises, so does the number of preparedness activities undertaken.

Aggregated Perceptions of Risk

Initial investigations into responses to the six items assessing perceptions of risk indicated that two separate but related concepts were being assessed (see Appendix F). Three questions were found to be tapping perceptions of bushfire risk to the town or suburb, while the remaining three questions were found to assess perceptions of risk to the respondent personally⁸³.

Based on this, three scale variables were computed including the perceived risk of fire to the respondents' town, the perceived risk of fire to their property, and a combined six item general risk score. All scores were multiplied so as to be out of a total of 100. Respondents needed to have answered each item on the scale in order to receive a scale score. The means for these three scales, broken up by community, are presented in Table 8.5.6 below. Statistics indicated that there were significant differences between the 18 communities for all three scales⁸⁴. Furthermore, respondents overall rated the risk of fire to their community as higher than the risk of fire to their property/house⁸⁵.

⁸¹ The 11 items comprising the Place Attachment scale demonstrated high inter-item correlations and had high internal consistency (Cronbach's alpha = 0.949).

⁸² One-way Analyses of Variance for Place Attachment Total, Place Identity and Place Dependence respectively, across 18 communities ($F(17,1199)=2.94$, $p<0.0001$; $F(17,1169)=2.63$, $p<0.0001$; $F(17,1186)=3.09$, $p<0.0001$).

⁸³ The six questions assessing perceptions of risk demonstrated good internal consistency (Cronbach's alpha of 0.82), as did the two three item subscales (Risk to Town, alpha = 0.80; Risk Personal, alpha = 0.76).

⁸⁴ One-way ANOVA revealed significant differences between communities for 'Risk to Town' ($F(17,1242)=14.79$, $p<0.0001$), 'Risk to Property' ($F(17,1238)=11.66$, $p<0.0001$) and 'Total Risk' ($F(17,1242)=15.49$, $p<0.0001$).

⁸⁵ Repeated measures t-test between the 'risk of bushfire to community' and the 'risk of bushfire to their own personal property' ($t(1243)=30.31$, $p<0.0001$).

Table 8.5.6. Mean risk scores (to town, to property and total risk) across 18 surveyed communities.

Area	State	Town/Area	Risk to Town	Risk to Property	Risk Total
1	Vic.	Gisborne	77.53	60.64	69.09
2	Vic.	Yarrambat	80.62	72.91	76.73
3	Vic.	Epsom	63.70	57.80	60.97
4	Vic.	Maryborough	73.42	58.55	66.05
5	Vic.	Bright	79.27	63.87	71.61
6	Vic.	Orbost	73.66	57.34	65.70
7	S.A.	Williamstown	70.36	62.53	66.32
8	S.A.	Aldgate	81.61	70.36	76.15
9	S.A.	Glenalta	74.80	65.68	70.11
10	S.A.	Ashton	76.61	60.78	68.70
11	S.A.	Clare Valley	76.61	59.11	68.07
12	S.A.	Millicent	70.78	54.50	62.61
13	Tas.	New Norfolk	68.28	54.06	61.39
14	Tas.	St. Helens	74.55	60.77	67.64
15	Tas.	Dodges Ferry	73.33	65.20	69.16
16	Tas.	Risdon Vale	62.20	55.38	58.79
17	Tas.	Margate	75.61	65.50	70.58
18	Tas.	George Town	59.67	48.20	53.94
Total	--	---	73.79	61.65	67.74

Correlations suggest that respondents' perceptions of risk are strongly related to their perceptions of the amount of bushland in their local community and the proximity of bushland to their homes (the correlations in Table 8.5.7. below indicate that as the proximity of bushland to the respondents' house increases, so do their perceptions of bushfire risk). Furthermore, evidence of convergent validity is provided by the fact that personal risk assessments are more highly correlated with the proximity of bushland to the respondents' house rather than the amount of bushland in the Local Government Area. Similarly, ratings of the quantity of bushland present in the Local Government Area are more strongly correlated with respondents' perceptions of the risk of bushfire to the town than the risk of bushfire to themselves and their property.

Table 8.5.7. Correlations between three risk scales and answers on two questions related to the proximity of bushland to the respondents' house and their perceptions as to the amount of bushland in their Local Government Area.

	Risk to Town	Risk Personal	Risk Total
Proximity of Bushland to House	-0.161* (N=1212)	-0.361* (N=1207)	-0.299* (N=1197)
Quantity of Bushland in LGA	0.410* (N=1183)	0.284* (N=1178)	0.399* (N=1169)

* p<0.0001

As has been suggested previously, the community means for all three 'perception of risk' variables correlate significantly with the response rate from each of the 18 communities. Response rate correlates $r=0.64$ ($p=0.004$) with perceived risk to town, $r=0.61$ ($p=0.007$) with perceived risk to own home/person and $r=0.66$ ($p=0.003$) with the combined risk score. It can be surmised from this data

that residents who do not perceive themselves to be at risk of bushfire have not been motivated to return the questionnaire.

Local Government (Perceptions and Actions)

Inspections

A number of respondents indicated that they had not previously been inspected but had subsequently answered questions related to the nature of these inspections, their frequency, and their benefits. In most cases, respondents who indicated that their properties had not been inspected correctly answered subsequent questions about these inspections as 'Unsure' or 'I am not aware of an inspection'. Sixteen respondents who answered the subsequent question about the manner in which the inspection was conducted (e.g. drive-by, fly-over or in person) despite not indicating that their property had been inspected were removed from further analyses including these variables. Those respondents who answered subsequent questions regarding the benefits of their inspection despite having indicated that they had not been inspected had their answers recoded as 'N/A' for this section.

A total of 1214 respondents indicated either a year or month, or that they had not been inspected to the question of "when was the last time your property has been inspected for compliance with bushfire regulations". Analyses did not indicate any differences between communities in terms of the proportions of residents indicating having had their properties inspected for compliance with bushfire regulations⁸⁶. Similarly, no significant differences in the number of inspections were seen between states, though these differences approached significance⁸⁷. Overall however, the rates of inspections were notably lower than in the previous Western Australian questionnaire, with only 125 respondents (10.5%) indicating having been inspected.

While it is possible that Western Australia has higher rates of inspection, perhaps a more likely explanation involves differences in the response format for the questions. While both questions were worded almost identically (see Table 8.5.8), the National Questionnaire inherently assumes an inspection, asking respondents immediately for a month or year, as well as offering a 'has not been inspected' option. These differences may, however, not fully account for the differences in responses as intuitively it would seem that higher, not lower levels of inspections might be expected under this wording. Perhaps instead it was the range of subsequent questions relating to the nature of this inspection which led to a lower response rate. As a result of written comments on the W.A questionnaire, further questions relating to bushfire inspections were included in this version, to more accurately determine the types of inspections undertaken. It is possible that the increased information requested in the present questionnaire prevented those with incomplete knowledge of (or those likely to make guesses about) their properties' inspection from answering in the positive. Additionally, compared to the previous Western Australian questionnaire, the current questionnaire features a higher proportion of residential respondents, the majority of whose homes were not inspected for compliance⁸⁸ (Table 8.5.9).

⁸⁶ A one-way ANOVA did not indicate there to be significant differences between communities in the proportions of residents indicating that they had been inspected ($F(17,1196)=1.30$, $p=0.18$).

⁸⁷ A One-way ANOVA of the proportion of residents indicating having had their properties inspected across the three states sampled ($F(3,1211)=2.48$, $p=0.08$).

⁸⁸ Chi Square analysis of the rates of inspection across residential and non-residential blocks ($\chi^2(1)=38.21$, $p<0.0001$). Note that for the purpose of this analysis all non-residential block sizes have been collapsed into a single 'non-residential' category.

Table 8.5.8: Wording of items related to the inspection of properties for compliance with bushfire regulations across two questionnaire administrations.

State	Item Wording
Western Australia	“Has your property ever been inspected for compliance with fire regulations?”
Victoria, Tasmania, South Australia	“When was the last time that your property has been inspected for compliance with bushfire regulations?”

Table 8.5.9: Rates of inspection for residential (<2 acre) and non-residential (>2 acre) sized lots. Percentages indicate rates of inspection for residential and non-residential categories (i.e. percentages relate to table rows).

Variable	Inspected	Not Inspected	Total
Residential	81 (8.1%)	915 (91.9%)	996 (100%)
Not Residential	44 (23.2%)	146 (76.8%)	190 (100%)
Total	125 (10.5%)	1061 (89.5%)	1186 (100%)

While in the Western Australian questionnaire a number of respondents had manually written to indicate that their inspection had been conducted by “aerial flyover”, only one respondent to the present questionnaire indicated this type of inspection. As a result, this category has been removed from the following analysis owing to insufficient data. As can be seen in Table 8.5.10. below, there are no significant differences between the manner in which inspections are conducted between the states⁸⁹. On average, approximately two thirds of inspected respondents indicate having had inspectors physically enter their property to conduct the inspection, while one third of inspections are conducted by ‘drive-by’.

Table 8.5.10: Types of bushfire regulation compliance inspection across the three states studied. Percentages indicate the types of inspection within each state (i.e. percentages relate to table columns).

Variable	Victoria	South Australia	Tasmania	Total
Drive-by Inspection	13 (36.1%)	17 (41.5%)	9 (34.6%)	39 (37.9%)
Physical Inspection	23 (63.9%)	24 (58.5%)	17 (65.4%)	64 (62.1%)
Total	36 (100%)	41(100%)	26(100%)	103 (100%)

Respondents who indicated having been inspected were significantly more prepared than those who had not been inspected⁹⁰. Those indicating having been inspected scored on average 63.39 points on the preparedness scale compared to 55.27 for those not inspected. While further analysis revealed that the preparedness advantage from having been inspected isn’t statistically related to the recency of the inspection⁹¹, it does appear that the advantage is slightly diminished for inspections more than 4 years ago (see Figure 8.5.8).

⁸⁹ Chi-square analysis of the manner in which inspections were conducted (drive-by inspection vs physical inspection) across all three states ($\chi^2(2)=0.39$, $p=0.82$).

⁹⁰ Independent samples t-test of preparedness levels between those respondents indicating having been inspected for bushfire regulation compliance and those who have not been inspected ($t(1138)=4.61$, $p<0.0001$).

⁹¹ One-way ANOVA of preparedness across four time periods in which the last inspection took place ($F(3,114)=1.21$, $p=0.31$; see Figure 8.5.8),

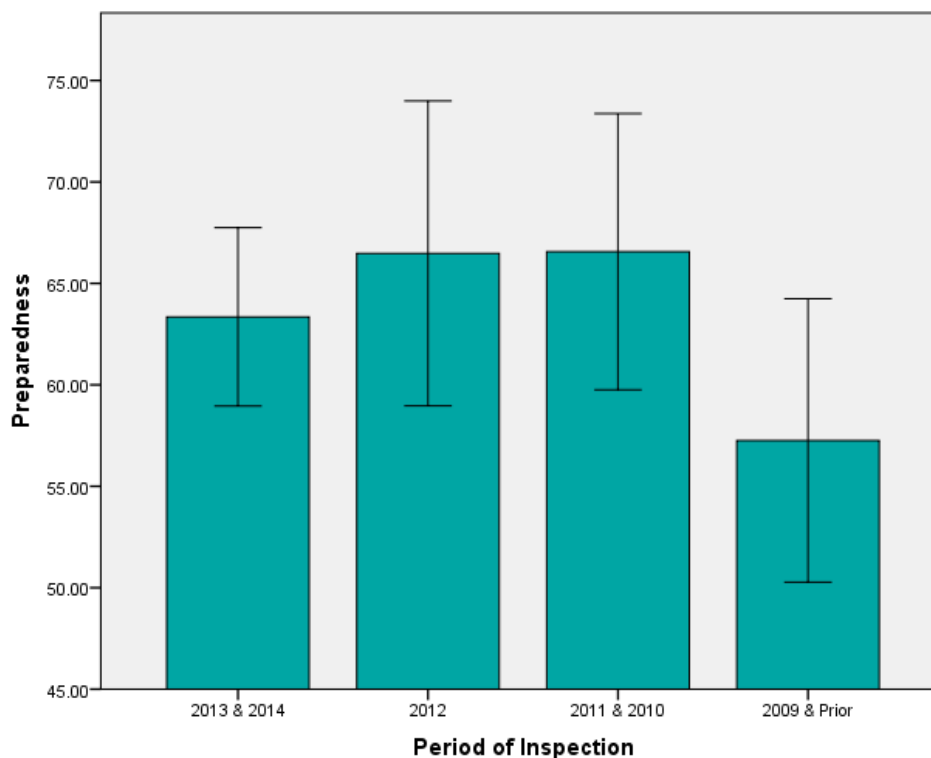


Figure 8.5.8. Mean preparedness for respondents who indicated that their properties were inspected for compliance with bushfire regulations across four different time periods. Note that some time periods have been collapsed in order to achieve sufficient sample sizes for analysis. No group differences reach statistical significance. Error bars denote the 95% Confidence Interval around the means.

The number of respondents indicating that they had received infringement notices, had been fined, or had been forced to pay for the work of contractors as a result of a failure to comply with bushfire regulations were very low. Only 2.34% (N=28) of respondents indicated that they had been issued with an infringement notice, and 0.76% (N=9) of respondents indicated that they had been forced to pay for the work of contractors sent to remedy failures of compliance. No respondents indicated that they had been fined for a failure to comply with bushfire hazard reduction regulations. The rarity of these cases prohibits further quantitative analyses, though comparisons across the three states suggest a statistically higher rate of infringements in Tasmania compared to the other states⁹². It is conceivable that the rates of infringement and fines reported above are low because of respondents' disinclination to admit to having received fines or infringements due to the associated negative perceptions. In support of this conclusion are the somewhat higher rates of agreement to the question of whether they were aware of their friends or neighbours having been fined for failure to comply with bushfire hazard reduction regulations (5.41% agreement, N=66). However, analyses showed that knowing that friends or neighbours had been fined for failure to comply did not appear to lead to these people taking further preparedness activities on their properties⁹³.

Perceptions of Government and Government Agencies

The current set of eight items assessing agency competence was based on results from the previous Western Australian questionnaire in which it was determined that respondents were not easily able

⁹² A one-way ANOVA of infringement notices across the states reveals a significantly higher rate of infringement in Tasmania in comparison to Victoria or South Australia ($F(2,1193)=3.09$, $p=0.046$).

⁹³ Independent sampled t-test of preparedness depending on whether the respondent knew, or did not know, a friend that had been fined for failure to comply with bushfire hazard reduction regulations ($t(1146)=0.80$, $p=0.94$).

to distinguish between different agencies responsible for bushfire, or between the capabilities a single agency displays across a range of different actions. The eight items employed in the present questionnaire relate to 'agencies' generally rather than having a separate set of questions for each responsible agency; this represents a significant reduction on the number of items compared to the previously questionnaire.

As was found in the Western Australian sample, respondents were unable to distinguish between the questions relating to the competencies of government agencies and all questions were found to be answered in a highly similar fashion (high inter-item correlations; for further detail, see Appendix F). As a result, a total 'confidence in government' scale score was calculated for respondents who answered all eight items related to the competence of agencies responsible for bushfire. In total, 1171 respondents were given a total score on this scale, while 113 were excluded.

Descriptive statistics for the 'Confidence in Agencies' scale suggested that respondents were reasonably confident in the capabilities of agencies responsible for bushfire ($M = 70.88$, $SD = 18.04$). The scale did not appear to be normally distributed, being positively skewed towards high confidence. While it appears that most respondents are moderately positive with regards to the competence of agencies responsible for bushfire, a smaller proportion of respondents range across varying levels of negativity. Analyses revealed that agency confidence varied significantly across the three states⁹⁴, with significantly less confidence in agency competence in Tasmania compared to South Australia and Victoria⁹⁵. Significant differences were also observed at the community level, mirroring those at the state level⁹⁶. Three out of the four communities with the lowest confidence in the competence of agencies responsible for bushfire were located in Tasmania (St. Helens (60.08), Dodges Ferry (63.82) and Margate (64.64)), with the other low scoring community being Orbost (62.87) in Victoria. While the recent fires at Fawcett/Dunalley may have affected responses in Dodges Ferry, it is unclear what has resulted in low confidence scores across Tasmanian communities. The two highest scoring communities were Epsom (79.77) in Victoria and Williamstown (80.41) in South Australia.

Interestingly, confidence in the capabilities of agencies responsible for bushfire was not associated with individual preparedness ($r=0.049$, $p=0.10$), but did correlate negatively with block size ($r=-0.12$, $p<0.0001$), negatively with the quantity of bushland in the local government area ($r=-0.12$, $p<0.0001$), negative with perceptions of risk ($r=-0.13$, $p<0.0001$) and negatively with previous bushfire experience ($r=-0.13$, $p<0.0001$). In other words, those who lived on residential blocks, who perceived there to be only sparse bushland in their local area and who felt that the threat of bushfire was minimal had greater confidence in the capabilities of agencies responsible for fire. This statement could be turned around to broadly indicate that those people who lived in forested area and with experience of bushfire perceived agencies to be less capable.

Bushfire Education Materials

Respondents were initially asked whether they received bushfire preparedness materials from fire or land management agencies or local governments and were then asked a further five questions about these notices if they answered positively to the first. In total, 54% of respondents indicated receiving such materials. Despite the following questions applying only to those answering the first question in the affirmative, a number of respondents answered questions related to the quality of bushfire preparedness materials that they previously indicated not receiving. These respondents have been excluded from further analyses.

⁹⁴ A One-way ANOVA suggested that confidence in agencies differed significantly across the three states ($F(2,1168)=11.05$, $p<0.0001$)

⁹⁵ As revealed by Bonferroni Post-hoc comparisons.

⁹⁶ One way ANOVA of agency confidence across 18 communities sampled ($F(17,1153)=5.96$, $p<0.0001$).

High correlations were observed between items assessing the quality of bushfire preparedness materials and further analyses indicated that the five items were capable of being utilized as a coherent scale⁹⁷. As a result, for 652 respondents total scores were computed, these being the sum of these five items. This score was then converted to a score out of 100. On average, respondents rated notices positively, with a mean of 77.86 and a standard deviation of 11.29. Comparisons indicated that there were no differences in the perceived quality of notices across either the three states or 18 communities sampled⁹⁸.

While the quality of the information presented did not differ across states, differences were observed in the proportions of respondents who indicated receiving notices. Significantly more residents of South Australia reported receiving bushfire preparedness materials than residents of either Victoria or Tasmania⁹⁹. At a community level, differences were also observed¹⁰⁰. Post-hoc tests revealed that in two communities (Aldgate and Glenalta in South Australia) significantly more residents reported receiving materials than in a number of other communities (68.18% and 76.29% respectively)¹⁰¹. The communities with the lowest number of respondents indicating being in receipt of bushfire preparedness materials was Maryborough (35.29%), Orbost (34.09%), and George Town (31.91%).

Both the dichotomous (yes/no) variable asking whether respondents received bushfire preparedness materials and the scale total for the quality of these materials correlated positively with agency confidence and the number of preparedness actions undertaken (see Table 8.5.11 below)¹⁰². In other words, while simply receiving bushfire preparedness materials was associated with higher ratings of agency competence and personal preparedness, those who perceived the materials to be of high quality also had more confidence in the competence of agencies responsible for fire and were personally more prepared for bushfire.

Table 8.5.11: Correlations between questions assessing bushfire preparedness materials and both agency confidence and preparedness. Brackets mention the number of respondents included in the analysis.

Variable	Agency Confidence	Preparedness
Received Annual Notices	0.14** (1154)	0.06* (1173)
Notices Quality Scale Total	0.44** (604)	0.23** (619)

* p<0.05 ** p<0.0001

Additionally, respondents were asked whether they had attended an information evening or community safety meeting in their local area sometime within the last 2 years. Across all respondents (N=1248), 26.28% of respondents indicated having attended such an event. The proportion indicating attendance differed significantly across the three states with Tasmania (14.22%) reporting far lower

⁹⁷ The combined set of five bushfire education material items displayed high internal consistency (Cronbach's alpha = 0.85) and all questions loaded on a single factor accounting for 65.29% of the variance

⁹⁸ One – way ANOVA of the perceived quality of bushfire information material across three states (F(2,649)=0.14, p=0.87) or 18 communities (F(17,634)=1.50, p=0.09).

⁹⁹ One-way ANOVA of the proportion of respondents indicated that they received bushfire information material across three states (F(2,1247)=7.04, p<0.001).

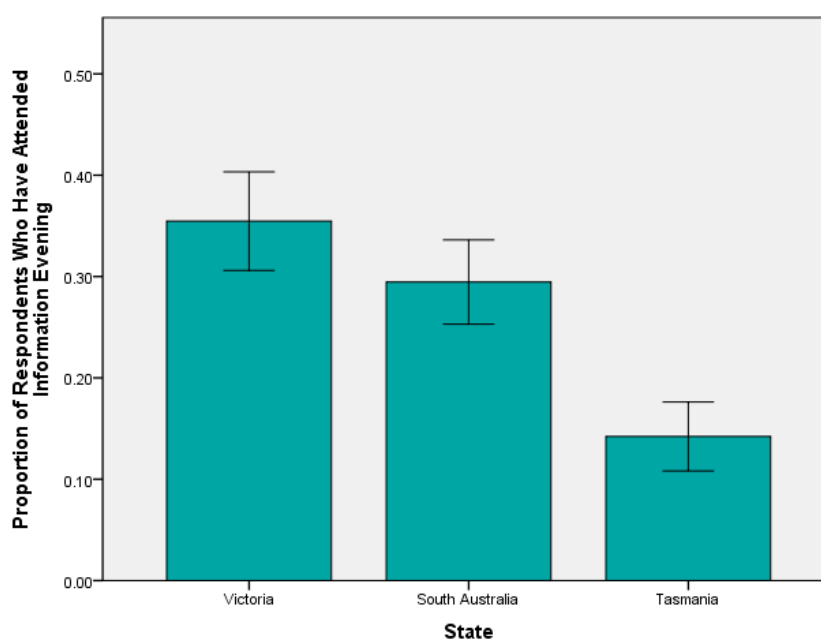
¹⁰⁰ One-way ANOVA of the proportion of respondents indicated that they received bushfire information material across 18 communities (F(17,1232)=4.25, p<0.0001).

¹⁰¹ As revealed by Bonferroni post-hoc comparisons

¹⁰² Furthermore, an independent samples t-test similarly revealed a preparedness difference between residents receiving (M=57.08, SD=17.91), and not receiving (M=54.93, SD=19.17) bushfire preparedness notices (t(1171)=-1.98, p=0.048).

rates of attendance than Victoria (35.47%) or South Australia¹⁰³ (29.46%, See Figure 8.5.9). As expected, this effect is mirrored when attendance is broken down across the 18 communities, with all Tasmanian communities scoring below the population mean for attendance (Figure 8.5.10). Outside of Tasmania, only the communities of Maryborough (7.84%) and Millicent (14.29%) had similarly low attendance rates. Comparisons revealed that those who had attended an information evening or community safety meeting within the last two years (N=313) had undertaken significantly more preparedness activities on their properties than those who had not attended such an event (N=859)¹⁰⁴. On average those who had attended such a meeting scored 64.84 points on the preparedness measure compared to 52.80 points for those who had not attended. From this data it cannot be ascertained whether attendance at such an event leads to increased preparedness or whether people who take preparing for bushfire seriously are more inclined to attend such events.

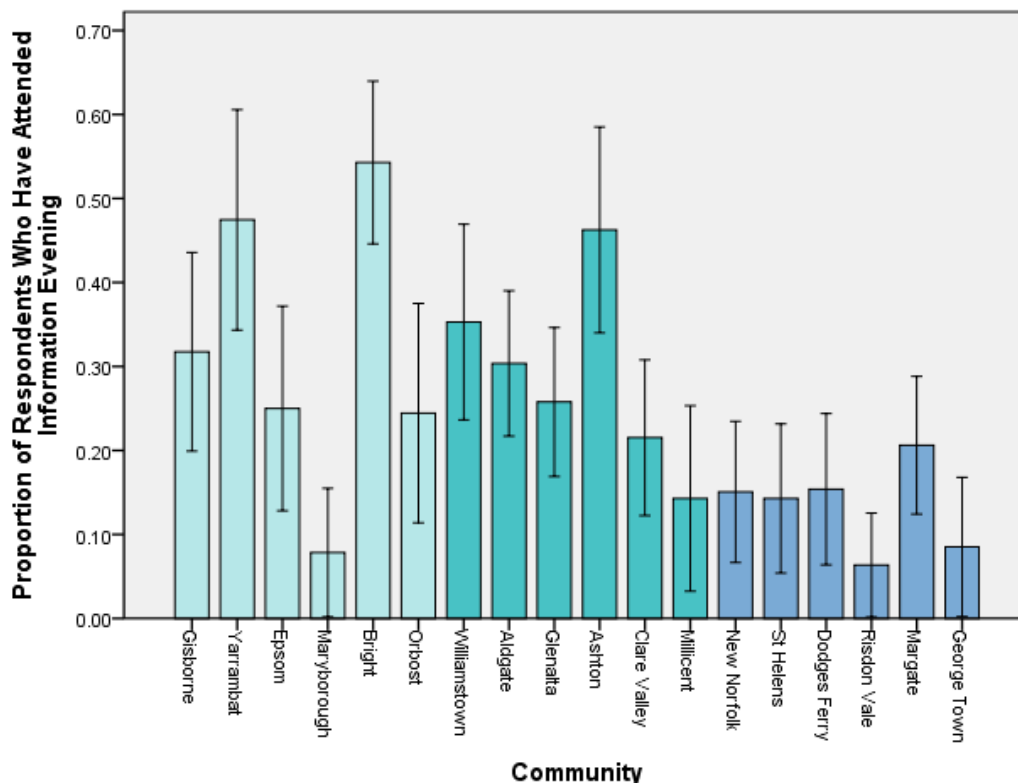
Figure 8.5.9: Proportion of respondents across three states that reported having attended an information evening or community safety meeting in their local area within the last 2 years. Error bars denote the 95% confidence intervals around the mean.



¹⁰³ One-way ANOVA of the proportion of respondents indicating having attended a bushfire information event across three states ($F(2,1245)=25.67, p<0.0001$).

¹⁰⁴ Independent samples t-test between the preparedness levels of those who have and those who have not attended a bushfire information event ($t(1170)=10.28, p<0.0001$).

Figure 8.5.10: Proportion of respondents across 18 communities in three states that reported having attended an information evening or community safety meeting in their local area within the last 2 years. Error bars denote the 95% confidence intervals around the mean.



Theory of Planned Behaviour

In total, respondents were asked 23 questions, in a randomised order, relating to four key concepts included in the Theory of Planned Behaviour; Self-Identity (4 questions), Perceived Behavioural Control (3 questions), Subjective Social Norms (3 questions), and Attitude to the issue of bushfire (13 questions). These four sections are explained in further detail in the sections below.

Self-Identity

Four questions were *asked* relating to respondents' self-identity as it relates to bushfire preparedness. Respondents were asked about whether they see themselves as the kind of person who is prepared for bushfire and for whom preparedness is an important part of who they are. One negatively worded question was re-coded so that for all questions high scores are associated with a strong bushfire preparedness self-identity. All items correlated strongly, positively, and significantly with one-another; with correlations ranging from $r=0.32$ to $r=0.70$ (i.e. a respondent who scored highly on one item was likely to score highly on all items). These and other analyses demonstrated the capacity for these four questions to be used as a single scale¹⁰⁵. Scale totals were computed for all respondents answering all four questions (N=1209 out of 1284). Respondents averaged a score of 13.48 out of a total possible score of 20 indicating that on average respondents felt that preparing for bushfire was moderately a part of who they were. Statistical comparisons indicated that there were significant differences between the communities, though primarily between the communities of Glenalta and

¹⁰⁵ Items demonstrated moderate to high internal consistency ($\alpha = 0.80$) and load strongly on a single factor accounting for 63.33% of the variance.

Ashton in South Australia, who demonstrated very low (12.59), and very high (14.75) levels of Self-Identity respectively¹⁰⁶. No significant differences were seen across states¹⁰⁷.

Subjective Social Norms

Three questions were asked relating to the concept of Subjective Social Norms including questions related to the actions undertaken by friends and neighbours, their influence over respondents' personal decisions to prepare, and the way respondents' preparations would be perceived by the community. Correlations between these three items were only low to moderate ($r=0.161$ to 0.288) but significant. A single scale score was computed for those respondents who answered all three questions (1223 out of 1284). The average scale scores was 8.72 out of a possible score of 15 suggesting that most respondents felt that their friends and neighbours had a slight to moderate influence on their actions and would somewhat approve of them undertaking preparedness activities. Analyses revealed that there were no significant differences in subjective norms between communities¹⁰⁸.

Attitude to the issue of Bushfire

Attitudes towards preparedness for bushfire mitigation were assessed by 13 questions across four sections. The 6 item short version of the New Environmental Paradigm assessed respondents' general environmental views while 2 further questions assessed their views of controlled burning and 2 questions assessed their levels of concern for the effects that preparedness has on the aesthetic appearance of their home. Finally, three questions assessed respondents' beliefs about the efficacy of taking preparedness actions.

New Environmental Paradigm (NEP, 6 – item)

The 6 item short version of the New Environmental Paradigm was used to assess respondents' underlying ecological worldviews. Research shows that respondents who achieve a pro-ecological score (high score) on the NEP support actions that enhance the environment. Scores on three items were reverse coded such that high scores on each question related to positive ecological views.

Overall, analyses indicated that the six items assessing environmental worldview collectively functioned as a scale, and as a result scale totals were computed (for more information see Appendix F). Scale totals were computed by summing responses across the six items (after reverse coding) for those respondents who had answered all six questions ($N=1175$). The average score across all respondents was 22.16 out of a total of 30, demonstrating moderately pro-environmental views on average. Significant differences exist between the states in mean scores on the NEP scale, with Tasmanian (Mean = 21.67) respondents having significantly, albeit only slightly, less positive pro-environmental views than respondents in Victoria (Mean = 22.37) and South Australia (Mean = 22.42)¹⁰⁹.

¹⁰⁶ . A one-way ANOVA revealed significant differences in Self- Identity across the 17 communities ($F(17,1191)=2.69$, $p<0.0001$),

¹⁰⁷ A One-way ANOVA of self-identity scores (scale total) across 18 communities sampled ($F(17,1206)=0.70$, $p=0.50$).

¹⁰⁸ One-way ANOVA of total Subjective Social Norm scale across 18 communities ($F(17,1205)=1.14$, $p=0.31$).

¹⁰⁹ One-way ANOVA of total New Environmental Paradigm scale score across three states ($F(2,1172)=4.85$, $p=0.008$).

Attitudes towards Controlled Burning

Attitudes towards controlled burning were assessed using two items, the first assessing controlled burning's effect on native animals and plants, and the second assessing its importance for fire prevention. The two items were only moderately, but significantly correlated ($r=0.27$, $p<0.0001$) suggesting that respondents who answered favorably to one were more likely to answer favorably to the other. Of the two items only the item related to the importance of controlled burning for bushfire prevention was significantly related to preparedness ($r=0.16$, $p<0.0001$) suggesting that those respondents who believed controlled burning was important for fire prevention had higher levels of preparedness. No significant differences were observed in the mean ratings on either of these two questions across the three states measured¹¹⁰.

Attitudes towards Property Aesthetics related to Fuel Management

The influence of aesthetic concerns on preparedness was also assessed using two items. The first item assessed respondents' beliefs that preparedness activities would ruin the aesthetic appearance of their house or property, while the second assessed whether aesthetic concerns would affect the preparedness activities they undertook. The two items had a moderate to high and significant correlation with one-another ($r=0.421$, $p<0.0001$), although only the item assessing the belief in whether preparedness activities would ruin the appearance of their house or property was significantly and negatively correlated with preparedness ($r=-0.10$, $p=0.001$). Perhaps unsurprisingly, the correlation suggests that those respondents who believed that undertaking preparedness activities would ruin the appearance of their properties were less likely to take preparedness actions. Once more, attitudes towards property aesthetics and bushfire did not differ across the three states¹¹¹.

Attitudes towards the Efficacy of Preparing

Theoretically, questions assessing efficacy of preparedness actions differ from those assessing Perceived Behavioural Control as the former assesses respondents' perceptions of whether taking actions will prevent losses in the face of a bushfire, while the latter assesses respondents' ability to undertake these actions. For example, a Perceived Behavioural Control question will assess whether a person has the capabilities to clear their property of fuel loads, while an efficacy question will assess whether the respondent believes that having a property clear of fuels will lead to a better chance of survival should a bushfire hit. In other words, questions about efficacy relate to an attitude, while questions about capabilities to undertake actions relate to the concept of Perceived Behavioural Control. Nevertheless, on many levels the wording of these questions sounds similar and it is possible that respondents might view them as similar.

Factor analysis (details of which are described in Appendix F) broadly indicated that the two sets of questions assessing Efficacy of Preparing and Perceived Behavioural Control were in fact viewed differently by respondents. As a result of these analyses it was decided that all three efficacy items would be retained, and total scores were calculated by summing scores on all three variables for those participants that had answered all three. Statistical comparisons did not indicate any differences between the respondents of different states in their beliefs about the efficacy of preparedness¹¹².

¹¹⁰ One way ANOVA of attitudes towards controlled burning compared across three states ($F(2,1202)=0.50$, $p=0.95$).

¹¹¹ One-way ANOVA of attitudes towards aesthetics across the three states was not significant ($F(2,1211)=1.48$, $p=0.23$).

¹¹² One way ANOVA of efficacy of preparedness scale score across three states ($F(2,1209)=1.70$, $p=0.18$).

Perceived Behavioural Control

For a full description of the derivation of Perceived Behavioural Control questions, see the section immediately above on 'attitudes towards the efficacy of preparedness actions' as well as Appendix F. Based on factor analysis, two of the three items assessing Perceived Behavioural Control were retained. The third item was excluded as respondents interpreted it more in line with efficacy of preparing rather than Perceived Behavioural Control. The resulting two items were summated for each respondent to give a total score out of 10 for Perceived Behavioural Control with high scores indicating respondents perceived many barriers to preparedness (i.e. low perceived behavioural control). Analyses indicated that there were significant differences between the three states with regards to Perceived Behavioural Control, with residents of South Australia having significantly weaker control beliefs (Mean = 9.58) than residents of either Victoria (Mean = 9.19) or Tasmania (Mean = 9.09)¹¹³. These results suggest that residents of South Australia believe themselves less able to undertake bushfire preparedness activities than residents of other states.

Individual Level Variables

Property Size

Analyses suggested that respondents on residential blocks had significantly different responses to the threat of bushfire when compared to respondents from larger properties¹¹⁴. In particular, it appears that residents on larger rural blocks are more likely to want to stay and actively defend their properties, and less likely to wait for fire and emergency services to tell them what to do when compared to those on residential blocks. Furthermore, respondents on residential blocks had, on average, undertaken far fewer preparedness activities than respondents on non-residential blocks. Respondents from non-residential blocks appeared almost equally well prepared regardless of whether they lived on small, medium or large sized rural properties¹¹⁵.

Respondents from non-residential blocks also showed more positive attitudes towards preparing their properties for bushfire (i.e. were more likely to believe that undertaking preparedness activities would lead to the survival of their house) and felt themselves more capable of undertaking bushfire preparedness activities (Perceived Behavioural Control)¹¹⁶.

Employment & Home Ownership

Comparisons indicated significant differences in preparedness between different levels of employment (Figure 8.5.11 below)¹¹⁷. Further inspection revealed that this difference lay primarily between retirees and all other forms of employment (i.e. part-time, full-time and business owner/manager), though retirees were significantly more prepared than other respondents not currently in the workforce (i.e. Unemployed, Not in the workforce). Retirees demonstrated significantly higher preparedness levels than those at other levels of employment, and it did not

¹¹³ One way ANOVA of Perceived Behavioural Control scale score across three states ($F(2,1206)=7.71$, $p<0.0001$).

¹¹⁴ Chi-Square comparisons of five levels of property size (residential, small, medium and large rural properties and land only) against 7 different responses to the imminent threat of bushfire (i.e. variations of the stay vs leave decision; $\chi^2(6)=33.77$, $p<0.0001$).

¹¹⁵ One-way ANOVA of preparedness across five different block sizes ($F(4,1240)=11.01$, $p<0.0001$). Bonferroni post-hoc comparisons revealed the only significant difference to lie between the preparedness levels of respondents on residential blocks and all other lot sizes.

¹¹⁶ Independent samples t-test between residential/non-residential respondents and the efficacy of preparedness scale score ($t(1180)=2.08$, $p<0.05$) or the perceived behavioural control scale score (2 items; $t(1178)=2.73$, $p<0.01$).

¹¹⁷ One-way ANOVA of preparedness across six levels of employment ($F(5,1154)=11.12$, $p<0.0001$, see Figure 8.5.11) with Bonferroni post-hoc comparisons.

appear to matter whether only one member of a family was retired (Mean Retired = 60.45, Mean Other= 52.90) or whether both were retired (Mean Retired = 61.00, Mean Other = 53.59)¹¹⁸.

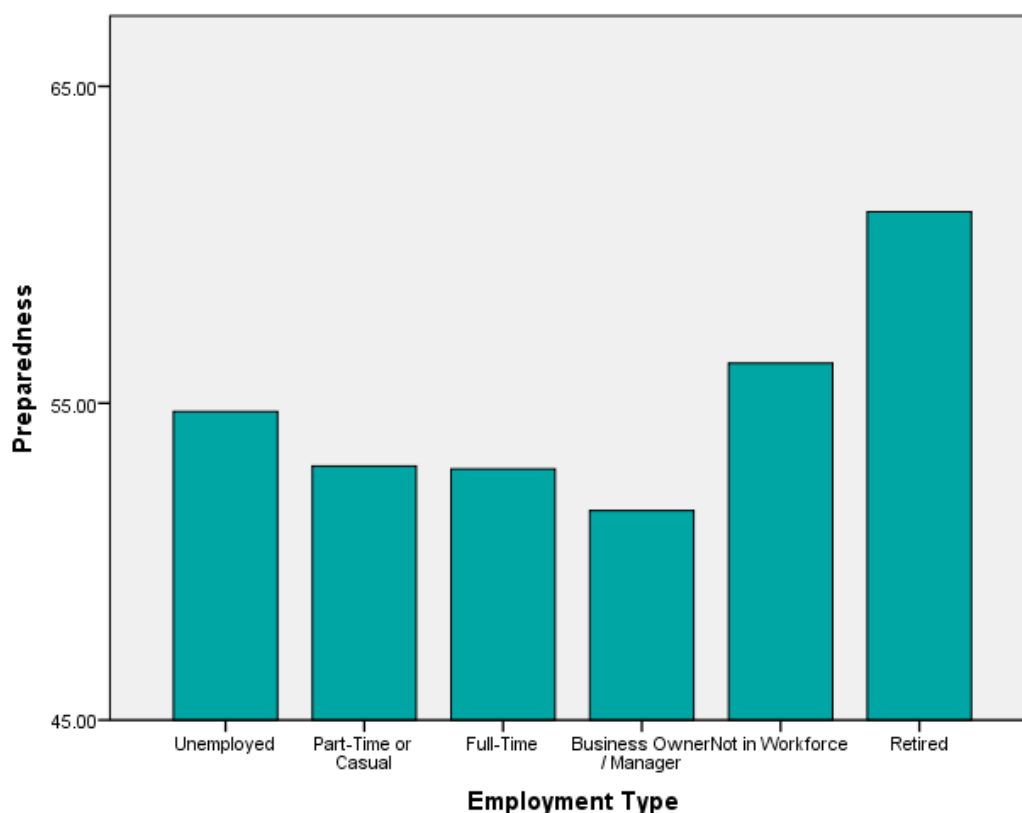


Figure 8.5.11: Mean bushfire preparedness scores across six different employment categories.

Respondents were given the choice of selecting one of four different living arrangements as applicable to their family including owning their own house, renting in a share-house arrangement, renting as a family household, or company supplied. Sufficient responses to permit analysis were received for only two categories; owning their home (N=1103) and renting as a family household (N=50). There appeared no significant differences between these levels, though contrary to previous findings, those renting scored marginally higher on preparedness¹¹⁹.

One hundred and two respondents indicated owning livestock, though these respondents did not appear to be significantly more prepared than those without livestock¹²⁰. Similarly, no significant differences were observed between those that did, and those that did not report owning pets¹²¹. While owners of livestock do not appear to be more prepared than those who do not, there is yet the possibility that they might contemplate a different response to the threat of bushfire as a result of

¹¹⁸ Independent samples t-test between of preparedness between respondents indicating one member of the household was retired ($t(1164)=7.02, p<0.0001$) or both adult members of the household were retired ($t(1164)=6.58, p<0.0001$).

¹¹⁹ Independent samples t-test of preparedness between those who owned their own home, and those who rented as a family household ($t(1151)=0.40, p=0.69$).

¹²⁰ Independent samples t-test of preparedness between those respondents indicating ownership of livestock, and those not owning livestock ($t(1169)=0.69, p=0.49$).

¹²¹ Independent samples t-test of preparedness between those respondents who owned pets and those that did not ($t(1169)=1.11, p=0.27$).

concerns for the welfare of their animals. However, after limiting the analysis to those not on residential blocks (N=195), comparisons did not detect any differences between the response to fire of those with and without livestock¹²².

Length of Residence

Correlations demonstrated only a small, significant, negative correlation between the length of time living in a particular community and the number of preparedness activities undertaken ($r=-0.099$, $p<0.001$) suggesting that as respondents reside for longer periods of time in a community, they undertake fewer preparedness activities. This association is however very weak, and no significant relationship was found between the length of residence at their particular address, and bushfire preparedness actions ($r=0.13$, $p=0.65$).

Previous Bushfire Experience

In total, across all communities, 40.76% of respondents indicated having been previously affected by bushfire. Furthermore, those who indicated having been previously affected by bushfire had undertaken more preparedness activities on their properties (Means of 58.34 and 54.52 for those who had been, and had not been previously affected by bushfire respectively)¹²³. Large and significant differences were observed between communities in the proportion of respondents who indicated having been previously affected by bushfire (see Table 8.5.5)¹²⁴. The lowest levels of previous experience were reported for the communities of Epsom, Victoria (7.4%) and George Town, Tasmania (16.7%), while by far the highest level of previous experience was reported by residents of Dodges Ferry (77.3%), many of who were affected by the devastating nearby fire at Fawcett in early January, 2013.

In addition to simply having been affected by bushfire, respondents were asked to report the years in which they had been affected. Analysis of the most recent year in which they had been affected presents a somewhat complex picture (Figure 8.5.12). While significant differences exist between the categories, further investigations indicate that those respondents affected by fire between 10 and 20 years ago are significantly more prepared than those who have never been affected, and those affected between 5 and 10 years ago¹²⁵. On the whole, this analysis appears inconclusive and is difficult to interpret, possibly as a result of not having information related to the severity of the experience in question. A 'close call' in the recent past may have less impact on preparedness than having lost one's entire house back in the 1960's; as this would be an experience one is not likely to forget in a hurry!

As might be expected, correlations reveal an association between having been previously affected, and the subsequent perceptions of the risk of bushfire ($r=0.20$, $p<0.0001$ for the relationship between previous bushfire experience and perceived risk of fire to the town/suburb of residence). This indicates that respondents who have previously been affected by bushfire consider themselves to be at higher risk of being affected by bushfire than those with no previous bushfire experience.

¹²² Chi-square comparison of livestock ownership (yes/no) and response to the imminent threat of bushfire (i.e. variations on the stay or leave decision; $\chi^2(6)=5.32$, $p=0.50$).

¹²³ Independent samples t-test of preparedness depending on whether respondents had, or had not, been previously affected by bushfire ($t(1172)=3.48$, $p=0.001$).

¹²⁴ One-way ANOVA of the proportion of residents indicating being previously affected by bushfire across 18 communities ($F(17,1238)=6.79$, $p<0.0001$).

¹²⁵ One way ANOVA of preparedness across five temporal categories relating to the most recent year in which the respondent was affected by bushfire ($F(5,1127)=3.65$, $p<0.01$) with post hoc Bonferroni comparisons.

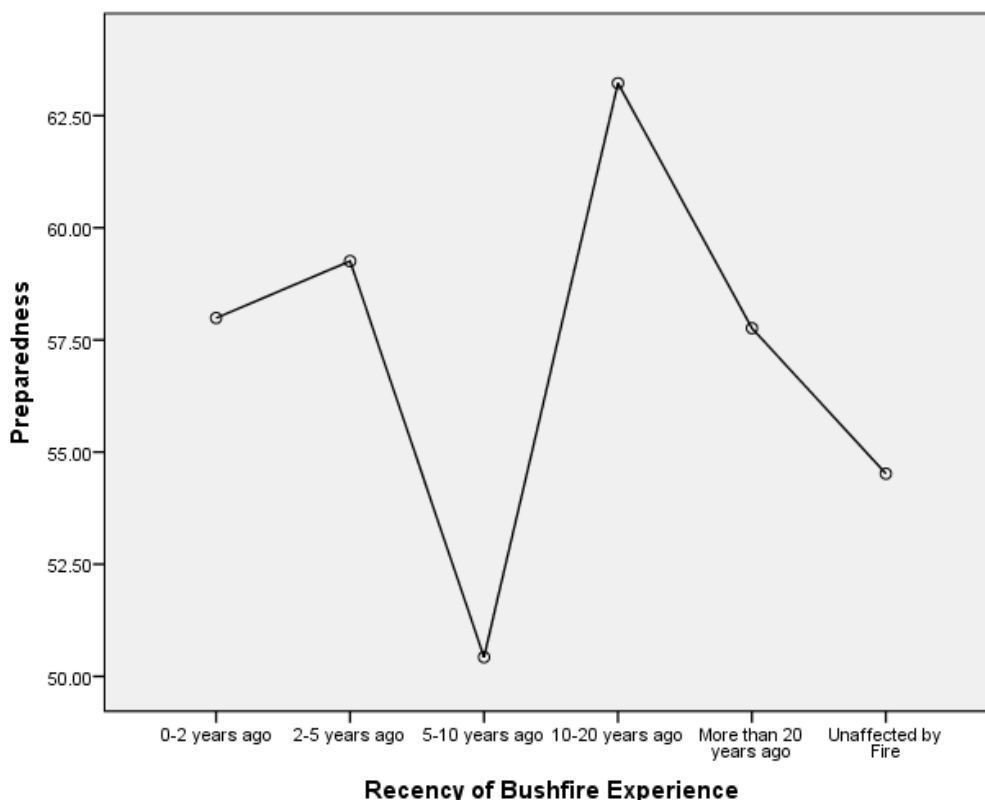


Figure 8.5.12: Mean preparedness across all respondents, separated by the year in which they had been affected by bushfire. Note: those respondents indicating that they have been affected but where the year of impact was not recorded are not included in this analysis.

Involvement with Bushfire Safety Organisations

Across all communities, 17.54% (N=215) of respondents indicated being involved in at least one community-level preparedness activity (e.g. Community Safety Group, Volunteer Bushfire Brigade or Neighbourhood Phone Tree). As was found in the Western Australian community study, those who indicated being involved in community preparedness activities were significantly more prepared for bushfire than those not involved¹²⁶, having prepared on average 13 percentage points better (Mean 66.35 for those involved and 53.71 for those not involved). Additionally, there exist significant differences between communities in terms of the proportion of respondents who were involved with community preparedness activities¹²⁷, ranging from 0% in Risdon Vale (Tasmania) to 37.3% in Ashton (South Australia, see Table 8.5.5). Incidentally, Ashton was also the most prepared community in our sample. The different states sampled also differed in the proportion of individuals involved in community preparedness activities. Tasmania (12.29%) had the lowest involvement, followed by Victoria (17.92%) and then South Australia (21.96%)¹²⁸.

Involvement can be further broken down into a number of specific activities such as those listed in Table 8.5.12A. As can be seen in Table 8.5.12B, with the exception of being on an emergency management committee, those individuals involvement in each of these activities were significantly more prepared than those not involved. Interestingly, the identical pattern of results was seen for

¹²⁶ Independent samples t-test of preparedness separated by whether the respondent indicated having been involved with a community preparedness activity or not ($t(1177)=9.33$, $p<0.0001$).

¹²⁷ One-way ANOVA of the proportion of respondents involved with a community preparedness activity across 18 communities ($F(17,1242)=3.11$, $p<0.0001$).

¹²⁸ One-way ANOVA of the proportion of respondents involved with a community preparedness activity across three states ($F(2,1257)=7.14$, $p=0.001$).

those respondents who indicated having been involved with these activities in the past; in this case all four categories were associated with higher preparedness.

Table 8.5.12A: Percentages of respondents who indicated being involved with a variety of community level bushfire preparedness activities.

Activity	Currently	In the Past
Community Safety Group (e.g. Community Fireguard)	3.17%	2.93%
Volunteer Bushfire Brigade	5.63%	5.79%
Emergency Management Committee	1.43%	2.06%
Neighbourhood Phone Tree	5.15%	4.04%

Table 8.5.12B: Mean preparedness scale scores for respondents currently involved, or who have been involved in the past, in a number of community preparedness activities. Note: t-tests indicate the presence of significant differences across all activities except being a member of an emergency management committee.

Activity	Preparedness		T-Test
	Currently Involved	Not Currently Involved	
Community Safety Group (e.g. Community Fireguard)	66.05	55.69	t(1178)=3.39, p=0.001
Volunteer Bushfire Brigade	64.22	55.53	t(1178)=3.73, p<0.0001
Emergency Management Committee	60.43	55.97	t(1178)=0.95, p=0.34
Neighbourhood Phone Tree	65.61	55.48	t(1178)=4.26, p<0.0001

A more detailed investigation into the types of people indicating involvement with any community preparedness activity revealed that they were significantly more likely to be living on larger (non-residential) sized blocks¹²⁹ and were significantly less likely to be retired¹³⁰. The latter, while perhaps contrary to previous results suggesting retirees were more prepared, may be explained by noting that some community preparedness activities such as membership of a volunteer bushfire brigade requires considerable strength and physical endurance, likely to be more often had by younger individuals.

Additionally, residents were asked a number of questions about membership of agencies with a responsibility for fire mitigation and suppression. In our sample, 4.22% of respondents indicated that they were personally employed as a retained fire-fighter or an employee of an agency with the responsibility for bushfire. In all likelihood, this value is larger than the true rate in the wider population representing the increased propensity of this group to respond on issues related to their vocation. A much larger 57.38% of respondents indicated having friends who are members of the local volunteer bushfire brigade. For both groups, either personally being a fire-fighter¹³¹, or having friends who are volunteer fire fighters¹³² was linked to having undertaken significantly greater numbers of bushfire preparedness actions.

¹²⁹ Chi square comparisons between involvement with a community preparedness activity (yes/no) and block size (5 levels; $\chi^2(1)=24.76$, $p<0.0001$).

¹³⁰ Chi square comparisons between involvement with a community preparedness activity (yes/no) and retirement status (retired/not retired; $\chi^2(1)=12.18$, $p<0.0001$).

¹³¹ Independent sample t-test of preparedness between career/retained fire-fighters and non-fire-fighters (t(1170)=2.75, $p=0.006$).

¹³² Independent samples t-test of preparedness between those respondents indicating that they had friends who were fire fighters and those who did not (t(1176)=6.27, $p<0.0001$).

Regression Analyses

Correlation Matrices

Tables 8.5.14 and 8.5.15 (below) display Pearson's 'r' correlation coefficients between all major variables considered for inclusion in the Hierarchical Linear Models computed below, as well as between these variables and the dependent variable (preparedness). Higher correlation coefficients (closer to 1 or -1) represent stronger associations between the two variables in question. With the exception of the level of aesthetic concerns related to preparedness and New Environmental Paradigm scores, all variables demonstrated significant correlations with the dependent variable 'bushfire preparedness'.

HLM Analyses

Level 0: The Null Model

As was done with the previous study, the presence of individual and community level differences was investigated using Hierarchical Linear Modelling. Prior to the construction of the full multi-level model, a number of necessary preconditions were satisfied. The null model, or model without any predictor variables, was first computed so as to ascertain whether a significant amount of variance existed at the community level to necessitate the use of hierarchical linear modelling techniques (Table 8.5.13 below). The χ^2 test on the null model ($\chi^2(17) = 48.04, p < 0.001$) indicated that individual preparedness varied significantly as a function of the community in which respondents lived, indicating the need for hierarchical linear techniques to model community level variance. The intra-class correlation (Hofman, 1997) once again indicated a small but significant proportion of the variance in individual preparedness lies between communities (2.59%). The remaining portion of the variance (97.41%) is potentially accountable by individual level factors and will be explored further below.

Table 8.5.13: Random Effects Only (Null) Model of community level differences in bushfire preparedness ($n=1196$) in HLM.

Model	Variable	Coefficient	SE	t-ratio	Significance
Random Effects Only	Constant	55.99	0.87	64.69	P<0.001
	<i>Community Variance</i>	8.95			
	<i>Residual Variance</i>	336.43			
ICC		0.0259			
		(2.59%)			

Table 8.5.14: Correlation matrix showing Pearson's 'r' for key individual level variables and individual bushfire preparedness scale scores.

Variable	Preparedness	Affected Prior	Retired	Residential Block	Inv. Com. Prep	TPB Efficacy of Prep	TPB Aesthetics	TPB Controlled Burns	TPB NEP	TPB Perc. Beh. Control	TPB Subjective Norms	TPB Self Identity
Preparedness	1	0.10***	0.20***	-0.09**	0.26***	0.12***	0.03	0.10***	-0.05	-0.20***	0.25***	0.65***
Affected Prior		1	0.00	-0.05	0.18***	0.10***	0.02	0.03	0.11***	0.00	0.01	0.14***
Retired			1	0.06*	-0.08**	-0.12***	-0.12***	-0.06	-0.06	-0.08**	0.04	0.12***
Residential Block				1	-0.14***	-0.06	-0.07*	-0.03	0.02	-0.07*	-0.06*	-0.16***
Involved in Community Preparedness					1	0.13***	0.01	0.07*	0.00	-0.03	0.09**	0.23***
TPB Efficacy of Preparedness						1	0.22***	0.15***	0.05	-0.17***	0.10***	0.28***
TPB Aesthetics							1	0.23***	0.03	-0.15***	-0.10***	0.06*
TPB Controlled Burns								1	-0.19***	-0.03	0.13	0.13***
TPB NEP									1	0.03	-0.05	-0.05
TPB Perceived Behavioural Control										1	0.00	-0.20***
TPB Subjective Norms											1	0.35***
TPB Self Identity												1

* p<0.05, ** p<0.01, *** p<0.001

Table 8.5.15: Correlation matrix showing Pearson's 'r' for key community level variables and individual bushfire preparedness scale scores. Note that for variables subsequently included as community-level predictors, correlations presented here have been conducted on individual responses rather than aggregated community-level values.

Variable	Preparedness	Social Capital	Place Attachment	Risk to Town	Involved In Comm. Prep. Act.	Prop. Inspected
Preparedness	1	0.18***	0.19***	0.16***	0.26***	0.14***
Social Capital		1	0.32***	0.18***	0.24***	0.06
Place Attachment			1	0.19***	0.18***	0.03
Risk to Town				1	0.23***	0.09**
Involved In Community Prep. Activities					1	0.18***
Property Inspected						1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Level 1A: Individual Level Variables - Demographics

Customarily, in the second stage of analysis, individual-level covariates are added to the analysis to control for any community related differences in these variables. In this analysis these variables have been added in two steps. In the first step, the same individual level variables were added as were studied in the previous Western Australian study. In the second step a series of six variables were added corresponding to the measures utilized to study the components of the Theory of Planned Behaviour. By including these variables in two steps it is possible to determine the unique proportion of individual level variance accounted for by components of the Theory of Planned Behaviour, over and above existing known individual-level variables. In the first step four individual level variables were entered, including whether the respondent had been previously affected by fire (yes/no), a dichotomized employment variable asking whether the respondent was retired (yes/no), a dichotomized block size variable asking whether the respondent lived on a residential sized block (yes/no) and a question asking whether the respondent was involved in community level preparedness activities (yes/no). The results of this analysis are presented in Table 8.5.16.

Table 8.5.16: Individual level covariates Model (n=1137) Step 1, including only variables related to prior bushfire exposure, retirement status, block size, and community bushfire preparedness involvement.

Model	Variable	Coefficient	SE	t-ratio
Individual – level covariates	Constant	52.08	1.55	33.58***
	Affected Prior Y/N	2.03	1.08	1.88
	Retired Y/N	8.35	1.05	7.96***
	Residential Block Y/N	-3.07	1.42	-2.16*
	Involved in Community Prep Y/N	12.14	1.38	8.79***
	<i>Community Variance</i>	4.40**		
	<i>Residual Variance</i>	297.63		
	<i>Incremental Prop of Community Explained</i>	50.84%		
	<i>Incremental Prop of Residual Explained</i>	11.53%		
	<i>Total Prop of Community Explained</i>	50.84%		
	<i>Total Prop of Residual Explained</i>	11.53%		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Three of the four individual-level covariates added to the model above were statistically significant predictors of individual bushfire preparedness. Respondents who indicated being retired had scored an additional eight points on preparedness more than those who were not retired. Similarly, those respondents involved in community preparedness activities had scored over 12 additional points on preparedness compared to those not involved in community preparedness activities, though once again it is impossible to say whether involvement led to preparedness or an interest in preparedness led to involvement. As was previously found, living on a residential block resulted in respondents having undertaken significantly fewer preparedness activities than those who lived on small, medium or large rural properties. However, unlike in the Western Australian study, those respondents who indicated having been previously affected by bushfire were not significantly more prepared than those not previously affected, though the difference was close to significance ($p=0.06$). The addition of these four variables to the model accounted for 11.53% of the total individual-level variance and 12.55% of the total variance, indicating that substantial individual and community-level variance remained unexplained. The introduction of the above four individual-level variables also had the effect of reducing the total remaining community-level variance by 49.16%, though the remaining community-level variance remained significant ($\chi^2(17) = 32.56, p < 0.01$).

Level 1B: Individual Level Variables & Theory of Planned Behaviour

In the second step, individual-level predictor variables related to the Theory of Planned Behaviour were included in the model in addition to Step 1 variables. In total, six additional TPB predictor variables were included in the model (see Table 8.5.17). All variables were group mean centered prior to inclusion.

Self-identity was not included in the model as its accuracy is questionable when assessed in a self-response format in the same questionnaire as the dependent variable. In the current questionnaire, Theory of Planned Behaviour self-identity items were presented after the bushfire preparedness items and their wording made their intent unambiguous. It seems likely that the extremely high correlations between preparedness and TPB Self-identity ($r=0.65$, $p<0.0001$) can be explained as the result of respondents explicitly (albeit perhaps unconsciously) matching their self-identity responses to the level of their indicated preparedness. It is doubtful whether the measurement of this item separately from bushfire preparedness would demonstrate a similar magnitude of relationship with preparedness.

Table 8.5.17: Individual level covariates Model, Step 2, including all individual-level covariates and Theory of Planned Behaviour variables.

Model	Variable	Coefficient	SE	t-ratio
Individual – level covariates	Constant	52.38	1.55	33.80***
	Affected Prior Y/N	2.28	1.08	2.11*
	Retired Y/N	8.09	1.07	7.58***
	Residential Block Y/N	-2.98	1.41	-2.11*
	Involved in Community Prep Y/N	10.63	1.38	7.73***
	TPB Attitude: Efficacy of Preparing	0.45	0.28	1.62
	TPB Attitude: Aesthetics	0.58	0.33	1.74
	TPB Attitude: Controlled Burns	0.72	0.35	2.05*
	TPB Attitude: NEP	-0.15	0.14	-1.02
	TPB Perceived Behavioural Control	-1.94	0.34	-5.76***
	TPB Subjective Social Norms	2.19	0.29	7.61***
	TPB Self Identity (Not Entered)			
<i>Community Variance</i>		4.36**		
<i>Residual Variance</i>		268.65		
<i>Incremental Prop of Community Explained</i>		0.45%		
<i>Incremental Prop of Residual Explained</i>		8.61%		
<i>Total Prop of Community Explained</i>		51.28%		
<i>Total Prop of Residual Explained</i>		20.15%		
* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$				

Three of the six Theory of Planned Behaviour variables included in this step of the model were found to be significant individual-level predictors of individual bushfire preparedness. Respondents attitudes towards controlled burns was a significant predictor of preparedness, with results indicating that those respondents who viewed controlled burning favourably also had higher scores on preparedness. The two strongest TPB predictors were Perceived Behavioural Control and Subjective Social Norms, with both being significant predictors of individual bushfire preparedness. Results indicated that as respondents perceived themselves to have greater behavioural control (i.e. they felt more capable of undertaking bushfire preparedness actions), the number of individual preparedness actions completed increased. Similarly, with regards to Subjective Social Norms, results indicated that as

respondents felt norms to complete preparedness activities increased, so did the number of preparedness activities undertaken. No other TPB variables were significant predictors of individual bushfire preparedness. Neither attitudes towards the efficacy of preparing, concerns about aesthetics, or general levels of pro-environmental views influenced individual bushfire preparedness.

The inclusion of six Theory of Planned Behaviour items only minimally affected the four individual-level variables included previously. While having been previously affected by bushfire only demonstrated a strong trend with preparedness in step 1, this association appears stronger and significant in the present model with previous bushfire experience being related to greater levels of individual preparedness. In total, the addition of six TPB variables accounted for an additional 8.61% of the variance in individual preparedness above the previously included individual predictors. The complete set of ten individual variables included in level 1 accounted for 20.15% of the variance in individual preparedness, as well as accounting for 51.28% of the available community-level variance. After the inclusion of these ten variables the remaining community-level variance remained significant and we will attempt to explain this variance with addition of Level 2 community-level variables in the next section.

Level 2: Community Level Variables

At level 2, the final stage of analysis, community-level predictors were included in the model. Four community-level variables were entered including 'Place Attachment', 'Aggregated Level of Risk to Town', 'Social Capital' and 'Proportion of Community Involved in Community Preparedness Activity'. Unlike the previous Western Australian study, 'Place Attachment' has been included as significant differences were observed between communities in the present study. Similarly, the 'Proportion of Properties Inspected by Local Government' has not been included as previously conducted One-way ANOVA did not reveal significant differences between communities on this level. If significant differences are not observed between communities using ANOVA, the variable cannot predict community-level variance in preparedness and should not be included in the Hierarchical Linear Model. Further to this, intra-class correlation coefficients for the included and excluded community level predictors are presented in Table 8.5.18 below and may be interpreted as the proportion of observed variance in ratings due to systematic between-community differences compared to the total variance in ratings (LeBreton & Senter, 2008). All community-level variables were interval in nature and were Grand Mean Centered prior to inclusion in the model. The results from this analysis (the full model) are shown in Table 8.5.19 below.

Table 8.5.18 Intra-class correlation coefficients for all aggregated community level predictors.

Variable	ICC(1)
Social Capital	0.044
Place Attachment	0.023
Aggregated Risk to Town	0.173
Prop. In Community Prep. Activity	0.029
Prop. Of Properties Inspected	0.004

Table 8.5.19: Individual-level covariates and community level predictors (Full) model (n=1216).

Model	Variable	Coefficient	SE	t-ratio
Individual – level covariates	Constant	52.08	1.52	34.24***
	Affected Prior Y/N	2.35	1.08	2.18*
	Retired Y/N	8.20	1.07	7.68***
	Residential Block Y/N	-2.75	1.411	-1.95
	Involved in Community Prep Y/N	10.22	1.39	7.37***
	TPB Attitude: Efficacy of Preparing	0.45	0.28	1.62
	TPB Attitude: Aesthetics	0.58	0.33	1.76
	TPB Attitude: Controlled Burns	0.71	0.35	2.03*
	TPB Attitude: NEP	-0.18	0.14	-1.22
	TPB Perceived Behavioural Control	-1.99	0.34	-5.88***
	TPB Subjective Social Norms	2.18	0.29	7.56***
TPB Self Identity (Not Entered)				
Community – level predictors	Social Capital	0.18	0.34	0.55
	Place Attachment	-0.23	0.31	-0.74
	Aggregated Risk to Town	0.00	0.15	0.02
	Prop. In Community Prev. Activity	0.25	0.11	2.24*
<i>Community Variance</i>			2.76	
<i>Residual Variance</i>			268.66	
<i>Incremental Prop of Community Explained</i>			17.88%	
<i>Incremental Prop of Residual Explained</i>			-0.0003%	
<i>Total Prop of Community Explained</i>			69.16%	
<i>Total Prop of Residual Explained</i>			20.14%	
* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$				

Only one community-level variable was found to be a significant predictor of community-level variance in individual preparedness. Unlike the previous Western Australian study, the Proportion of Respondents Involved in a Community Preparedness Activity' was a significant predictor of community-level variance while the 'Aggregated Perceived Risk of Bushfire to the Town' was not shown to be a significant predictor. With regards to the involvement in community preparedness activities, results suggest that as a greater proportion of a community is involved, that community's preparedness also increases. Additionally, and as has been previously found, neither 'Social Capital' nor 'Place Attachment' were significant predictors of Community-level variance.

The inclusion of Community-Level predictors caused some minor changes in the significance of individual-level predictors. Following the inclusion of community-level predictors, living on a residential block was no longer a significant predictor of individual level variance, though this variable still demonstrated a strong trend ($t=-1.95$, $p=0.052$). Overall, the full model accounted for 21.41% of the variance in preparedness, including 20.14% of the available variance at the individual level and 69.16% of the variance at the community level. The remaining community level variance was not found to be significant.

Table 8.5.1: Demographic and individual level variable means for each of the 18 communities studies.

Area	State	Town/Area	Age	Prop Income Low	Prop Educ. Low	Years on Property	Years in Town	% Retired	% Residential	% Bushland in LGA	Preparedness ¹³³
1	Vic.	Gisborne	53.37	19.7%	31.2%	13.43	18.49	31.8%	70.3%	62.2%	52.79
2	Vic.	Yarrambat	55.93	26.0%	27.6%	18.46	21.28	31.6%	60.3%	71.6%	58.16
3	Vic.	Epsom	56.09	38.0%	43.4%	12.14	18.73	34.6%	88.5%	57.8%	55.68
4	Vic.	Maryborough	60.04	62.8%	53.8%	20.20	32.98	40.7%	94.6%	70.8%	53.69
5	Vic.	Bright	64.09	60.8%	45.1%	17.42	23.02	57.7%	89.5%	81.8%	62.50
6	Vic.	Orbost	59.19	59.5%	56.2%	18.17	33.65	40.4%	82.6%	73.2%	53.26
7	S.A.	Williamstown	59.41	52.3%	47.8%	16.78	20.65	38.0%	84.5%	57.7%	56.36
8	S.A.	Aldgate	58.03	24.8%	13.7%	17.55	20.51	37.5%	91.1%	69.1%	55.44
9	S.A.	Glenalta	62.93	31.8%	15.9%	24.25	26.81	59.8%	98.6%	66.6%	51.45
10	S.A.	Ashton	57.97	38.3%	24.2%	20.23	23.89	38.8%	61.8%	57.8%	63.81
11	S.A.	Clare Valley	62.46	54.2%	55.0%	18.96	29.10	42.0%	93.7%	62.3%	53.65
12	S.A.	Millicent	58.57	69.2%	44.2%	18.14	36.17	36.6%	97.7%	51.2%	59.69
13	Tas.	New Norfolk	61.75	61.1%	56.2%	20.87	34.32	53.5%	87.3%	48.3%	58.35
14	Tas.	St. Helens	61.34	57.2%	31.2%	13.59	15.71	50.8%	72.1%	69.2%	57.97
15	Tas.	Dodges Ferry	57.75	45.8%	48.5%	14.10	16.66	41.9%	85.5%	60.5%	56.72
16	Tas.	Risdon Vale	60.56	37.1%	42.3%	19.62	25.19	46.9%	95.3%	54.6%	49.73
17	Tas.	Margate	55.85	44.2%	43.3%	14.41	17.09	37.5%	65.0%	64.7%	54.91
18	Tas.	George Town	62.34	71.1%	60.9%	20.98	32.65	54.4%	93.3%	51.4%	53.06
Total	---	---	59.48	41.7%	38.3%	17.79	24.11	43.7%	84.1%	64.03	56.06
N											1196
ANOVA											F(17,1178)=2.82, p<0.0001

Note: Figures for the percentage of retirees represent those respondents where *at least* one person is retired (i.e. self or partner).

¹³³ Preparedness statistics have been provided as a comparison. The three communities highest, and lowest, on preparedness have been shaded green and red respectively.

Table 8.5.5 Mean scale scores for a variety of community level variables across the 18 communities sampled. Note that green and red shading indicates the top and bottom three communities on each variable respectively.

Area	State	Town/Area	Place Attachment	Social Capital	Risk Total Score	Prop. Personally Affected	Prop. Involved in Community Prep	Prop. Properties Inspected	Preparedness
1	Vic.	Gisborne	71.66	72.50	69.09	32.8%	16.9%	11.1%	52.79
2	Vic.	Yarrambat	75.85	72.55	76.73	50.0%	18.6%	17.5%	58.16
3	Vic.	Epsom	67.42	69.51	60.97	7.4%	16.7%	5.9%	55.68
4	Vic.	Maryborough	70.01	70.27	66.05	41.8%	10.9%	13.5%	53.69
5	Vic.	Bright	78.46	75.46	71.61	51.4%	22.6%	15.5%	62.50
6	Vic.	Orbost	74.09	72.06	65.70	41.3%	17.4%	8.5%	53.26
7	S.A.	Williamstown	72.70	72.68	66.32	21.7%	20.3%	7.4%	56.36
8	S.A.	Aldgate	73.30	69.39	76.15	45.8%	28.7%	8.6%	55.44
9	S.A.	Glenalta	70.77	68.49	70.11	32.2%	12.5%	11.1%	51.45
10	S.A.	Ashton	74.76	72.70	68.70	55.9%	37.3%	16.7%	63.81
11	S.A.	Clare Valley	74.82	74.25	68.07	40.3%	17.1%	11.3%	53.65
12	S.A.	Millicent	67.70	71.00	62.61	34.1%	13.6%	9.5%	59.69
13	Tas.	New Norfolk	71.86	65.15	61.39	40.3%	16.4%	4.4%	58.35
14	Tas.	St. Helens	71.28	71.39	67.64	31.8%	9.4%	14.3%	57.97
15	Tas.	Dodges Ferry	72.73	70.26	69.16	77.3%	13.6%	8.1%	56.72
16	Tas.	Risdon Vale	67.23	66.87	58.79	43.8%	0%	8.3%	49.73
17	Tas.	Margate	71.27	68.66	70.58	46.9%	17.4%	9.2%	54.91
18	Tas.	George Town	76.95	69.46	53.94	16.7%	14.3%	0%	53.06
Total	---	---	72.63	70.72	67.74	40.8%	17.5%	10.3%	56.06
N			1216	1211	1243	1256	1260	1214	1196
ANOVA			F(17,1199)=2.94 , p<0.0001	F(17,1211)=4.40 , p<0.0001	F(17,1225)=15.49 , p<0.0001	F(17,1238)=6.79 , p<0.0001	F(17,1242)=3.11 , p<0.0001	F(17,1196)=1.30 , p=0.183	F(17,1178)=2.82 , p<0.0001

8.6 Discussion

In this chapter, individual, community and state-level predictors of bushfire preparedness have been explored across 18 communities and three states in Australia's fire affected south-east. Results were found to be broadly consistent with those of the previous Western Australian study presented in Chapter 7. Despite explicit attempts to maximize community differences through the selection of socially, economically and geographically distinct communities, the variability in individual preparedness linked to community-level constructs was once again small (2.59%), while no evidence of state-level variability was found. Hierarchical Linear Modelling analyses once again indicated that the vast majority (upwards of 97%) of the variability between respondents in terms of bushfire preparedness existed at the individual level. With reference to individual-level variables, the results of the present study mirror the Western Australian study exactly: respondents were found to be more highly prepared if they had previously been affected by bushfire, if they were retired, if they lived on a rural block, and if they were involved in any community bushfire preparedness activities. A potential rationale supporting the manner in which these variables influence preparedness has been extensively discussed in Chapter 7 and the present results support these earlier conclusions.

Individual- level Variables

Vegetation/Bushland

While data related to the severity of previous fire experience were not collected, previous exposure to bushfire was directly related to higher, and perhaps more realistic, perceptions of bushfire risk, which in turn was related to higher preparedness. Perhaps unsurprisingly, respondents on rural properties reported having more bushland in their local government area, and reported bushland being closer to their homes. Given that the amount and the proximity of bushland was shown to be related to increased perceptions of bushfire risk, it seems once again possible that increased, or more realistic perceptions of risk are a driving force towards greater bushfire preparedness amongst these individuals. Unfortunately, the correlational nature of the data requires a degree of caution with regards to these conclusions as direct causality cannot be inferred.

Theory of Planned Behaviour

In addition to the variables reported on above, and present in the previous W.A. questionnaire, the current study further incorporated additional variables, allowing for the application of the Theory of Planned Behaviour (TPB). The TPB assumes that a substantial component of behavioural intentions (or in this case actual behaviours) can be accounted for by individuals' attitudes towards the behaviour at hand, their perceived ability to undertake the behaviour, and relevant social norms encouraging that behavior; in this case bushfire preparedness actions. The inclusion of a range of variables assessing these three components accounted for an additional 8.61% of the variability in individual preparedness scores over and above the four individual-level variables discussed in the paragraphs above.

With regards to attitudes towards bushfire preparedness, only respondents' attitudes towards controlled burning were related to preparedness such that more positive attitudes were related to increased preparedness. Attitudes towards the efficacy of preparedness (i.e. whether preparing would increase chances of survival) were not found to be related to preparedness scores. Similarly, neither general environmental views nor concerns relating to the aesthetic damage of bushfire preparedness were related to total individual bushfire preparedness scores.

Overall, salient social norms regarding preparedness, and residents' beliefs in their ability to undertake preparedness actions were more significant predictors of individual bushfire preparedness. Individuals who felt a greater pressure from their friends, family and neighbours to undertake preparedness actions were significantly more likely to do so. Similarly, individuals who believed themselves more capable of undertaking actions, and who perceived fewer barriers to preparing, had undertaken more preparedness behaviours.

State and Community-Level Variables

Somewhat contrary to findings, communities in the previous W.A. study were expected to differ considerably in terms of preparedness; partly as a result of W.A. legislation placing the primary responsibility of bushfire mitigation in the hands of Local Governments. Under this rationale, communities in the current study (the responsibility for which lies with a single overarching state level agency) may have been expected to vary somewhat less. While indeed the results have supported this possibility, possible preparedness differences between states were not observed. This is not to say that there were no differences between states however. Respondents from the 6 Tasmanian communities reported significantly lower levels of Social Capital, had less confidence in the capability of their respective bushfire agency, and indicated attending fewer bushfire information evenings. Despite this, none of these differences were found to translate into differing levels of bushfire preparedness as might have been expected. It is possible that substantial high-level cross communication between state agencies (i.e. via AFAC and the Bushfire CRC) may have led to the adoption of similar practices across agencies, minimizing state-level differences. Additionally, and with the exception of naming practices, legislation covering the three states included in the present study is notably similar.

A similar story was observed at the community-level. A range of variables were found to differ across communities including aggregated ratings of Place Attachment, Social Capital, the risk of bushfire to the town/suburb and confidence in agencies responsible for fire as well as the proportion of residents who had previously been affected by bushfire or were involved in community preparedness activities. However, hierarchical analyses revealed that only one variable, the proportion of respondents in a community who were involved in a community preparedness activity, was related to the bushfire preparedness. Communities in which a high proportion of respondents were involved in a community preparedness activity such as a neighbourhood phone tree or volunteer fire brigade were found to be significantly higher on preparedness. Once again, the correlational design of the study makes it impossible to determine whether involvement has led to preparedness or whether those communities that take preparedness seriously have higher rates of community preparedness involvement.

Property Inspections

While not a significant community-level predictor, rates of property inspections appeared substantially lower than in the Western Australian study but the cause of this difference is not easy to determine. The answer may well lie in the way that the questions were phrased. The previous W.A. study asked respondents only whether their property had been inspected, while the present study asked not only when the last inspection took place, but also asked a range of follow up questions related to the manner in which the inspection was carried out. Many Western Australian residents may have answered 'yes', more in relation to a 'belief' that their property was inspected, while the more detailed questions in the present study make answering in the affirmative possible only for those sure of having been inspected. Nevertheless, those indicating having been inspected were once again found to be substantially more prepared and this effect seemed relatively unrelated to the recency of the inspection suggesting that it may be the possibility of an inspection as much as

the information gained during the inspection that is an important motivator of preparedness. This effect is however possibly mitigated by the fact that knowing friends or neighbours fined for failure to comply did not lead to further preparedness.

Agency Confidence & Bushfire Notices

Confidence in government agencies responsible for bushfire, while generally high, differed significantly between states, with Tasmania demonstrating significantly less confidence in their relevant fire and emergency agency than either South Australia or Victoria. It is important to recognize that this was not a measure of the actual capabilities of these agencies, and ratings may well have been affected by significant recent fires, particularly those throughout Tasmania in the 2012/2013 fire season. Ratings of confidence in the competency of agencies was related to block size, amount of surrounding bushland, perceptions of risk, and previous fire experience such that residents with previous fire experience, on larger properties, surrounded by substantial bushland and perceiving significant risk rated themselves as less confident in the competency of their relevant fire agency. A likely interpretation is not that the resident felt their local agency to be incapable, but rather that they had gained more realistic perceptions around the dangers of bushfire, and had lowered their expectations of the services that bushfire agencies could offer in times of bushfire.

Additionally, residents were more likely to show confidence in their relevant fire agency if they reported receiving bushfire education materials, and higher confidence was related to the perceived increase in the quality of these notices. Interestingly however, confidence was not found to be related to preparedness suggesting that few residents were blindly putting their faith, and their survival, in the hands of bushfire agencies. Receiving bushfire notices on the other hand was linked, albeit only marginally, to greater bushfire preparedness. More strongly linked was whether respondents had been to an information evening though it is impossible to know whether they went to the evening as a result of bushfire preparedness already being an integral part of their self-identity, or whether they were more prepared as a result of information gained at the meeting.

Measurement Considerations

Statistical Power

Statistical power considerations have once again limited the number of community-level variables that have been included in the present analyses. While the inclusion of additional communities has improved statistical power, our ability to detect community-level differences was still somewhat compromised and if anything, community-level influences on preparedness may be larger than what was found in the present work. Future studies looking to employ Hierarchical linear modelling to investigate bushfire preparedness should look to include a high number of communities (upwards of 30), while the inclusion of fewer respondents from each community (as low as 30) would have minimal statistical impact.

A more difficult issue involves the level at which different variables are included. We have touched on this discussion in Chapter 7 already; making the point that there are numerous variables for which inclusion at the individual level or community level would be equally appropriate. While some variables such as Social Capital are collectively created and may perhaps best be seen as a community construct, others such as the perception of bushfire risk can be either individually held perceptions, or collectively influenced by the community. In the present chapter we have included a range of variables collectively measuring aspects of the Theory of Planned Behaviour. Statistical power has meant that these variables were only included in analyses at the individual level, though some of them may usefully exist as community-level constructs also. For example, it could be argued

that subjective behavioural norms, while perceived by an individual, would more appropriately be a community-level variable as the norm is likely to be community-wide and community constructed. Attitudes towards preparedness may also be collectively constructed (for example, Tasmania as a state scores lower on the New Environmental Paradigm scale). Finally, in the present study variables have only been added at one level (either individual or community) though some may exert an influence at both. To tackle these issues, future researchers should look to make 'a priori' decisions regarding the level at which variables will be included. Furthermore, while each of the predictors included in the present model passed standard tests of within community reliability, consideration should be given to the measurement of community-level variables at the community level, rather than as a result of the aggregation of individual responses.

Measurement of Preparedness

Bushfire preparedness is a very difficult concept to measure as it is dependent on a variety of issues including the nature of the residents' property, their intended response to the imminent threat of bushfire and prevailing scientific notions or 'gold standard' of what constitutes preparedness. In the present scale, adapted from Dunlop et al. (2014), 'total' preparedness scores have been computed across all items on the preparedness scale. Scores were computed as the proportion of items a respondent indicated having accomplished divided by the number of actions applicable. Decisions regarding the applicability of actions were however left to the respondent and this may have led to a variety of response outcomes. For example, the item; *"You have cleared fuels (e.g., leaves, twigs and long grass) for a distance of at least 20m around the house"* may have been answered as either 'yes', 'no' or 'not applicable' by residential respondents. One may have chosen 'yes' as the area immediately around their home was clear of fuel, while another may have chosen 'no' as they had not actually cleared it as it was clear already, while yet another may have chosen 'N/A' as they believed the question not applicable to those on small residential lots. All three options may have been selected despite the exact same property characteristics.

Perhaps more importantly, the 'total score' calculation was based on all items across all subsections (vegetation management, planning, evacuation and structural house preparations), and no consideration was given to the strategic decisions of residents. It seems reasonable to argue that residents with no intention of actively defending their homes should not be subtracted points for failing to have a working pump, hoses, ladders or protective clothing, as they are not likely to need these for evacuation. While these respondents had the possibility of answering 'n/a' to these items, inspection of preparedness scores with 'response to threat of fire' actions reveals that most did not do this. While across both studies, those intending to stay and defend achieved the highest preparedness scores, it cannot be ruled out that their advantage over other groups relates to the greater proportion of the scale applicable to their strategy, rather than to their extra diligence in undertaking relevant preparedness actions. In future, consideration may be given to the possibility of including only those items related to a particular response such that those seeking to 'actively defend' their homes would be scored on the entire list of preparedness items, while those seeking to leave early may only be scored on 'planning' and 'evacuation' sub-sections.

Conclusion

Despite selecting a variety of community types at risk of bushfire, on aggregate, all communities scored similarly with regards to preparedness for fire and no state-level differences were observed. However, community-level scores masked the considerable variability in preparedness of individuals within these communities (97% of the variability occurred between individuals rather than between communities). The factors best able to distinguish between well and poorly prepared individuals matched the previous W.A. study exactly: living on a rural lot, being retired, having previously been affected by bushfire, and being involved in a community preparedness activity were likely to coincide with being well prepared for bushfire. The pattern of results for other individual level

variables similarly mirrored the Western Australian study. Additionally, the present study established that those respondents who felt capable of undertaking preparedness activities, and those who felt their friends and neighbours were going to judge them poorly for not undertaking them were likely to be more prepared. In contrast to the previous study, the small remaining between-community variability in preparedness was found to be accounted for by differences in the proportion of a community involved in a community preparedness activity.

9. General Conclusion

Despite the fact that bushfires are a frequent occurrence in many parts of Australia and are the focus for regular, targeted education campaigns about what households should do to reduce risk, many exposed households still fail to undertake the necessary preparation (Cottrell, 2009; Killalea & Llewellyn, 2010; Paton, Tedim, et al., 2010; J. Sutton & Tierney, 2006). Neither are fire-prone communities necessarily well prepared (Agani et al., 2010; Beatson & McLennan, 2011; Cottrell, 2009; Cottrell & King, 2007).

This project was conceived in the context of these identified shortcomings and the projected increases in the severity of bushfires in Australia, which are likely to escalate the associated economic and psychological costs (Bushnell & Cottrell, 2007). The project was specifically designed to identify the contribution of various social and psychological factors to the level of preparedness of households in fire prone areas, paying particular attention to the contribution of community level characteristics which previous research has suggested might be implicated (Jakes et al., 2007). However, in reviewing the relevant research, it was clear that most of the focus has been on the role of individual characteristics and less often on community level influences. Furthermore, attempts to specify the nature of community-individual relationships in influencing the type and extent of preparedness are rare. We attempted to fill this gap.

Our initial exploration of community level differences in preparedness and the factors which appeared to account for these differences (Chapters 4 & 5) produced results which were consistent with similar studies in the research literature on disaster preparedness (Bihari & Ryan, 2012; Jakes et al., 2007; Paton et al., 2006). Our post-fire surveys and qualitative data pointed to the importance of residents' perceptions of the risk of bushfire in driving preparedness; the linear relationship between the perceived level of risk and the number of preparedness activities in the survey data was striking. In addition, the degree to which members of the community were involved in local bushfire related groups emerged as a significant factor, although it is not clear whether being well prepared causes respondents to join like-minded people in the local bushfire groups or whether such membership prompts residents to undertake further preparedness activities. Such participation is a typical marker of the community level variable, Social Capital, which involves strong social ties and a sense of collective efficacy (Jakes et al., 2007; Sampson, 2004).

Hierarchical analyses of data from the two subsequent large-scale quantitative studies indicated that unravelling the distinctive contributions made by individual and community level variables is important: in the WA study, individual level variables accounted for 95% of the variance; in the larger multi-state survey which included more communities, the figure was above 97%. Contrary to our expectations, the contribution of community level variables, although statistically significant, was small; although it may be that the relatively small differences in preparedness between the communities in our study contributed to the lower than expected influence of community level factors. However, it is perhaps important to consider that in epidemiological studies on the effects of community and neighbourhood variables on outcomes in other domains (health and crime rates), similar analytic techniques also produced modest estimates of the influence attributable to community level variables (Mohnen et al., 2011; Oberwittler, 2004). In contrast, studies which have not undertaken analyses which separate individual and community level influences produce estimates of more substantial contributions from the community which should now, perhaps, be reassessed.

Although the results from both our surveys showed clear differences in preparedness and in the predictor variables between fire-prone communities, the HLM analysis indicated that in WA only the aggregated perceptions of the bushfire risk in the respondents' town was a significant community level predictor. The fact that risk operated at a community level is consistent with research (Scherer

& Cho, 2003) which points to the existence of “risk perception networks”, social linkages which might help explain why different communities often respond in different ways to the same types of risk (Brenkert-Smith et al., 2006). In the multi-state survey only the proportion of respondents involved in a community preparedness activity was significant. In other words, the degree of involvement by local residents in preparedness activities like community meetings, information sessions and the volunteer bushfire brigades generates higher overall levels of preparation in any community, as well as predicting individual preparedness. The experience of participation in community organisations, like bushfire ready groups, does appear to motivate people to better prepare their own properties as well as taking part in community actions (Shiralipour et al., 2006). Our findings are also consistent with research which shows that local knowledge of bushfires and a history of bushfire experience within communities influence both risk perception and trust that preventive measures make a difference (Blanchard & Ryan, 2003; Bushnell & Cottrell, 2007b). Contrary to some previous research (e.g. Bihari & Ryan, 2012; Jakes et al., 2007) we found that neither the levels of social capital, nor the levels of surveillance for compliance with bushfire regulations predicted preparedness, although there were large differences between communities in the reported vigilance of responsible agencies in conducting property inspections. The results, however, do show that where community members are aware of social norms which highlight the importance of preparedness, they are more likely to prepare; this suggests that social influences, not captured in measures of Social Capital may be in play.

Most of the differences between respondents in their preparedness were related to individual characteristics and the results of both studies were identical: respondents were better prepared if they had previously been affected by bushfire, if they were retired, if they lived on a rural block, and if they were involved in any community bushfire preparedness activities. In the WA study, perceptions of risk also appear to account, at least in part, for the difference in preparedness seen between respondents with and without prior experience of bushfire. When individual-level variables derived from the Theory of Planned Behaviour were added in the second study, results showed that the better prepared were those who had favourable attitudes to controlled burning and those who reported stronger social norms to undertake bushfire preparation. Consistent with other studies (Paton et al., 2006), those who felt more capable of undertaking bushfire preparedness actions were also more likely to undertake such actions.

Limitations and future directions

As is the case with surveys generally, the relatively low response rates and the high number of retirees reduced the representativeness of our sample. The observed link between community bushfire risk perception and the community response rate was also interesting to observe. However, we did manage to cover a wide range of fire-prone communities in southern Australia, something that has not previously been undertaken.

In addition, as discussed earlier, many of the variables we measured are simultaneously properties of individuals and of communities when considered in aggregate. While our results indicate substantial differences between communities on a number of these aggregated variables – for example, the proportions of the community previously affected by fire, retired from the workforce, living on residential sized blocks, and involved in community bushfire preparedness activities – our relatively small sample of communities (and the reduced power of the analysis) made it difficult to reach firm conclusions about the level of influence of all of these variables. Future research which samples more households from more communities might assist in more precisely assessing these influences.

Measures of bushfire preparedness are also notoriously difficult to devise. In our studies, we computed a score which was based on the respondents’ assessments of whether or not various

actions were applicable in their situations. As indicated in Chapter ()this may have led to respondents in identical circumstances making different judgments about whether the action described was actually relevant to them, given their location and bushfire planning . Future works should evaluate the applicability of such scales to residential and non-residential respondents as well as considering utilizing different item subsets for different fire strategies (i.e defending vs. leaving early).

Implications of the research

As the results obtained in the present body of work are largely derived from correlational research designs, a degree of caution is needed when determining what practical applications could usefully be pursued by bushfire and emergency services agencies.

Our results suggest that bushfire mitigation policies designed to increase preparedness levels in bushfire-prone communities should incorporate strategies which facilitate participation in community bushfire organisations and community preparedness activities. While it is possible that only householders who already place a high importance on bushfire preparedness may join, it is equally possible that such community programs teach valuable preparedness skills to householders. Furthermore, the community context of such initiatives may also exert a powerful social norming effect; placing residents in situations where they come in contact with others who are taking preparedness seriously may make them more likely to take action themselves.

The WA results also suggest that measures which emphasise the level of bushfire risk to communities are likely to be effective in driving better preparation. Our research has indicated that realistic perceptions of bushfire risk are not held uniformly across a community. In particular, residents on small suburban lots appear to understate their risk of bushfire. It appears likely that the lack of bushland within the visual range of their homes, coupled with an inaccurate understanding of the mechanics of large bushfires leads to a false feeling of security and a concomitant negligence in undertaking bushfire preparedness activities. Campaigns specifically designed to provide residential/suburban householders on the urban fringe with realistic risk information may mitigate this effect.

It is also clear that reinforcing social expectations (norms) that everyone should undertake preparedness actions influences people to prepare their own households. While further research is needed, it may be more the perception that friends and neighbours are preparing for bushfire than their actual preparedness which drives the influence of social norms. As a result, emphasising the actions undertaken (actually or aspirationally) by neighbours, friends and key community figures may be an effective and affordable means of driving preparedness. Furthermore, emphasizing that it is within everyone's capacity to undertake actions which reduce bushfire risks are likely to improve preparedness. If those respondents who feel more capable of preparing undertake more preparedness actions, then by extension, those who feel incapable are underprepared. While some preparedness actions are either difficult, time consuming, or expensive, many are not. Media messages that emphasise the numerous beneficial preparedness behaviours that are simple, affordable and effective may substantially improve community preparedness.

Apart from the practical implications discussed above, the present project has added substantially to our understanding of the community influence on individual preparedness. Unfortunately however, the community influence was not as large as it was hypothesized to be, and individual, rather than community factors were shown to account for the vast majority of the variability in preparedness, suggesting that the continued focus on individual drivers of bushfire preparedness is warranted.

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11. Publications, Presentations and Reports

10.1 Publications

1. Paton, D. & Buergelt, P.T. (2012) Community engagement and wildfire preparedness: The influence of community diversity. In D. Paton & F. Tedim (Eds.) *Wildfire and community: Facilitating preparedness and resilience* (pp. 241-259). United States, Charles C Thomas.

A further series of publications is planned for completion towards the latter half of 2014.

10.2 Conference Presentations

1. Buergelt, P.T., Morrison, D., Lawrence, C., Dunlop, P. & Clark, P. (July, 2011). Integrating research and practice: A holistic, multi-site and process-orientated action research designed to build community disaster capacity. Paper presented at the 5th Australasian Natural Hazards Management Conference, Gold Coast, Queensland, Australia.
2. Morrison, D., Skinner, T., Lawrence, C., Macleod, C., Buergelt, P.T., Dunlop, P. & Clark, P. (July, 2011). Information processing in the face of threat: A multilevel research perspective. Paper presented at the 5th Australasian Natural Hazards Management Conference, Gold Coast, Queensland, Australia.
3. Buergelt, P.T., Morrison, D., Skinner, T., Lawrence, C., Macleod, C., Dunlop, P.D., Notebaert, L., McNeill, I., & Clarke, P. (July, 2011). Decision making & human behavior under stress: A multilevel research project. Paper presented at the RMIT Disaster Research Seminar Series, RMIT, Melbourne, Australia.
4. Morrison, D., Lawrence, C. & Buergelt, P. (July, 2011). Community level influence on individual behaviours: Bushfire readiness & decision making. Paper presented at the Australian Fire and Emergency Services Authority Council Conference 2011, Sydney, Australia.
5. Buergelt, P.T., Dunlop, P., Lawrence, C., & Morrison, D. (August, 2012). The role of local government in influencing bushfire preparedness in selected Western Australian communities. Paper presented at the Australian Fire and Emergency Services Authority Council Conference 2012, Perth, Australia.
6. Buergelt, P.T., Dunlop, P., Lawrence, C., & Morrison, D. (August, 2012). Core community-level influences fostering proactive preparedness. Paper presented at the Australian Fire and Emergency Services Authority Council Conference 2012, Perth, Australia.
7. Lawrence, C., Oehmen, R., & Morrison, D. (August, 2013). Community level influences on individual bushfire preparedness. Paper presented at the Australian Fire and Emergency Services Authority Council Conference 2013, Melbourne, Australia.

10.3 Research Advisory Forum Presentations

1. Buergelt, P.T., Lawrence, C., & Morrison, D. (May, 2011). Community level influences on individual behaviours with respect to bushfire readiness and decision making in the face of

immediate threat. Paper presented at the Research Advisory Forum #4, Kedron, Queensland.

2. Buergelt, P.T., Lawrence, C., & Morrison, D. (May, 2012). Community level influences on individual behaviours with respect to bushfire readiness and decision making in the face of immediate threat. Paper presented at the Research Advisory Forum #6, Hobart, Tasmania.
3. Oehmen, R., Lawrence, C. & Morrison, D. (May, 2013). Community level influences on individual behaviours with respect to bushfire readiness and decision making in the face of immediate threat. Paper presented at the Research Advisory Forum #8, Perth, Western Australia.

10.4 Reports

1. Heath, J., Nulsen, C., Dunlop, P., Clarke, P., Buergelt, P. & Morrison, D. (2011) The February 2011 fires in Roleystone, Kelmscott and Red Hill. Report to Fire and Emergency Services Authority of Western Australia, Bushfire Cooperative Research Centre, Melbourne, Australia.

APPENDIX A. Project Timeline

Year 1 (April 2010 – April 2011)

- **April 2010:** Establishment
- **July/August 2010:** Signing of research contracts
- **December 2010:** Initial project ethics approvals gained from UWA HREC (Revised October 2011).
- **February 2011:** Ph.D. Candidate Jessica Boylan commenced project involvement.
- **March 2011:** Commencement of Dr Petra Buergelt as Post-doctoral researcher.

Year 2 (April 2011 – April 2012)

- **May 2011:** Participation and presentation at BCRC Research Advisory Forum, Kedron, Queensland
- **July 2011:** Presentation at the 5th Australasian Natural Hazards Management Conference, Gold Coast, Queensland, Australia.
- **July 2011:** Presentation at Australian Fire and Emergency Services Authority Council annual conference.
- **July 2011:** Enhanced UWA/RMIT disaster research team collaboration via research visit and presentation to RMIT.
- **August 2011:** Ph.D Candidate Andrew Chapman commenced project involvement.
- **August 2011:** Facilitated research sharing workshop with Fire and Emergency Services Authority of Western Australia (FESA)
- **August – September 2011:** Organised and held, ‘Disaster Research Seminar Series’ at the University of Western Australia (See APPENDIX B for more detail).
 - **5th August:** Adjunct Professor Jim McLennan
 - **26th August:** Professor Kevin Ronan
 - **2nd September:** Professor Douglas Paton
 - **30th September:** Assoc. Professor David Johnston
- **August-September 2011:** Selection of Communities for Qualitative Research
- **August-September 2011:** Development of Qualitative Interview Questions
- **August-September 2011:** Engagement with Local Governments re. Qualitative Research
- **October – December 2011:** Conducted numerous in-depth qualitative research interviews with staff in the Shire of Mundaring and community representatives.

Year 3 (April 2012 – April 2013)

- **May 2012:** Participation and presentation at BCRC Research Advisory Forum, Hobart, Tasmania
- **May-August 2012:** Research of theoretical concepts underpinning W.A. Study
- **August 2012:** Presentation at Australian Fire and Emergency Services Authority Council annual conference.
- **September 2012:** Appointment and Commencement of Dr Raoul Oehmen as Post-doctoral researcher.
- **September-October 2012:** Development of W.A. Study
- **November 2012:** Pre-testing of W.A. Communities Questions on small rural sample
- **November – December 2012:** Sourcing of communities and addresses for W.A. Communities Questionnaire mail out.
- **December 2012:** W.A. Communities Questionnaire printing and mail out completed

- **January 2013:** Multiple research team members participated in the Hobart, Tasmania, post fire research interviews.
- **February – March 2013:** Employment of Margaret Bowden as Research Assistant to assist with coding of returned W.A. Communities Questionnaires.

Year 4 (April 2013 – April 2014)

- **April – May 2013:** Hierarchical Linear modelling analysis of W.A. Communities Questionnaire data.
- **May 2013:** Participation and presentation at BCRC Research Advisory Forum, Perth, Western Australia.
- **June – August 2013:** Interpretation of results from W.A. study
- **August 2013:** Presentation at Australian Fire and Emergency Services Authority Council annual conference.
- **September – October 2013:** Development of National Communities Questionnaire based on finds of W.A. questionnaire.
- **October – November 2013:** Communication with RFS, TFS, CFS, CFA regarding content and distribution locations of National Communities Questionnaire.
- **December 2013:** Printing and distribution of National Communities Questionnaire.
- **January – February 2014:** Coding and data entry of returned National Communities Questionnaire.
- **March 2014:** Data cleaning and descriptive analysis of National Communities Questionnaire data.
- **April 2014:** Data analysis and Hierarchical Linear Modeling analysis of Communities Questionnaire data.
- **May-June 2014:** Preparation of Project Final Report

APPENDIX B: Disaster Research Seminar Series (Flyer)

The School of Psychology at the University of Western Australia in partnership with the Bushfire Cooperative Research Centre and the Fire & Emergency Services Authority of Western Australia present:

Disaster Research Seminar Series



Natural disasters are on the rise, creating widespread unprecedented emotional and financial devastation. In this seminar series key Australian and New Zealand researchers share their comprehensive knowledge to provide valuable insights into a wide variety of aspects of disaster preparedness and response. The presentations will be of interest to researchers in many disciplines (incl., psychology, business, geography, sociology, planning), policy makers, and practitioners.

5 August 2011

Adjunct Professor Jim McLennan
(La Trobe University, Victoria)

'Where the rubber meets the road':

The centrality of what people decide to do during the period between awareness of threat and impact of the hazard

2 September 2011

Professor Douglas Paton
(University of Tasmania, Tasmania)

Adapting to living with bushfire and earthquake hazards: Integrating household, community and societal influences

26 August 2011

Professor Kevin Ronan
(CQ University, Queensland)

The role of youth, families and schools in community disaster preparedness and prevention

30 September 2011

A/Professor David Johnston
(Director of the Joint Disaster Research Centre, Massey University/GNS Science, New Zealand)

Exploring elements of an effective disaster recovery process: Lessons from recent New Zealand events

Chairs:

W/Professor David Morrison, W/Professor Carmen Lawrence

Time:

3 – 4.30 pm followed by informal discussions

Venue:

Myers Lecture Theatre, Myers St. Building
University of Western Australia
35 Stirling Highway, Crawley WA 6009

Each presenter also will conduct a **Master Class** 9 am – 12 noon on the morning of their presentation. The Master Classes will be announced separately.

Queries:

Please contact petra.buergelt@uwa.edu.au
or patrick.clarke@uwa.edu.au.

Host:

Bushfire Cooperative Research Centre
School of Psychology
35 Stirling Highway
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<http://www.psychology.uwa.edu.au/research/bushfire>

APPENDIX C: W.A. Communities Questionnaire, Questions

Risk Perception Items¹³⁴

Respondents were instructed to indicate how likely or how severe the effects of bushfire will be on them personally, and on their town or suburb. All questions were presented along with a 7 point Likert response scale, anchored at 1; 'definitely won't happen' or 'not severe at all' and 7; 'definitely will happen' and 'extremely severe'.

- How likely is it that a fire will threaten your town or suburb in the next fire season?
- How significant do you think the threat of bushfire is to life and property in your town?
- If a bushfire were to occur in your town or suburb, how severe would the impact of it be on your town or suburb?
- If a fire were to occur in your town or suburb, how likely would it be for the fire to reach your property?
- How severe do you think the negative consequences of a bushfire in your town or suburb would be to you personally?
- To what extent do you think your house is more or less vulnerable to bushfires than most other houses in your area?

Bushfire Preparedness Actions

Respondents were instructed to indicate which of the following actions they completed around their house and property at the time they started filling out the survey. Respondents were given the option of selecting either 'yes', 'no' or 'N/A'¹³⁵

- Cleared fuels (e.g., leaves, twigs and long grass) for a distance of at least 20m around the house
- You have formed a household bushfire emergency plan
- There is a minimum two meter gap between your house and tree branches or shrubs
- Your external house timbers all have a sound coat of paint
- You possess and have prepared equipment to put out spot fires and sparks, such as metal buckets, rakes, shovels, and mops
- You have mapped out an evacuation route
- Flammable and combustible materials such as firewood, boxes, gas cylinders, and wooden garden furniture are stored away from the house

¹³⁴ This block of items was labelled as 'Community Expectations' in the questionnaire respondents received.

¹³⁵ In hindsight this was not the correct response format for these questions. As per previous work utilising these questions, the correct response options should have read; 'true of my property', 'not true of my property' and 'N/A'. As a result of this wording, two questions were found to be ambiguous and were subsequently removed (e.g. 'There is no timber, rubbish, and old junk lying around your property').

- There is gutter protection installed on your house
- You have thought carefully about what each person in your household would need to do in the event of a bushfire
- You have ensured that leaf litter and twigs under trees are raked throughout the fire season
- All gaps and vents are covered in order to reduce the risk of embers entering the house or cavities (e.g. floor spaces, in the roof space, under eaves, external vents, skylights, evaporative air conditioners, chimneys, and wall claddings)
- You have ensured that your fire-fighting equipment is operational within the past month
- You know exactly what documents and personal effects you would take with you if you left the house
- You have installed a roof-mounted sprinkler system
- You possess a power source that operates independent of the mains (e.g., a generator) that can be used to power the pump
- You have listed important things to do and remember in case of a fire (written or typed on computer, phone, etc.).
- You possess full length protective clothing (wool, cotton) including gloves, eye protection, work boots, and a broad brimmed hat)
- Within the past 6 months you have conducted controlled burning on your property to reduce the fuel load
- All the trees on or near your property are away from overhead utility lines, or lines are buried and not susceptible to fire
- You possess ample supplies of drinking water to prevent dehydration during the fire
- Your relevant documents and personal effects (e.g. passport, birth certificate, deeds etc.) are currently stored in an appropriate place for evacuation, off-site, or in a fire safe compartment
- A fire-resistant roof is currently installed on your house (e.g. metal, tile, composition)
- You possess an evacuation box containing blankets, water, and first aid kit and medications
- Tree branches up to 2m off the ground are pruned
- There is no timber, rubbish, and old junk lying around your property
- You have a list of the items that you would *want* to take with you if you were to evacuate (e.g. photos, laptops, cameras)
- Your relatives know about the intended fire plan of your household

Bushfire Prevention Enforcement

Respondents were asked to indicate their agreement (five point Likert scale) to four questions relating to the property inspections carried out by officers of the local shire. The questions were the following:

- The property inspection helped me to understand what I am required to do to reduce fire risk.
- The officers who carried out the fire inspection gave me helpful advice about fire prevention.
- The officers who carried out the fire inspection made demands that were too hard for me to meet.
- The officers returned later to see if I had carried out the hazard reduction actions they had recommended.

Bushfire Education Materials

Respondents were asked to indicate their agreement to a series of ten questions related to the quality of bushfire education materials sent out by their shire. The 5 point response scale varied from 'Strongly Agree' to 'Strongly Disagree' with a 'Neutral' midpoint. The question asked respondents:

"How much do you agree with the following statements about the firebreak and fuel hazard reduction notices sent out by your local shire?"

- The notices are clear and easy to understand.
- Some of the instructions in the notices are too difficult to carry out.
- Notices are issued at the right time of year in order to remind me to take preparatory action.
- We have all the resources we need to carry out the instructions.
- Some of the actions recommended would destroy the appearance of my house and garden.
- Some of the instructions in the notices conflict with information from other agencies (e.g. Department of Conservation and the Environment).
- I believe that it is important to comply with the requirements laid out in the notices.
- Some of the instructions in the notices are unreasonable.
- The information makes it clear which actions I am required to complete by law.
- I am not willing to comply with the requirements laid out in the notices (Please give reasons below).

Confidence in Government and Emergency Services Agencies

Each question was presented with a seven point Likert response scale from 'Very Confident' to 'Very Unconfident' with 'Neutral' as the mid-point of the scale.

Department of Environment and Conservation (DEC)

How confident are you that the Department of Environment and Conservation (DEC) works effectively with the Department of Fire and Emergency Services (DFES; formerly FESA)?

How confident are you that the Department of Environment and Conservation (DEC) works effectively with your local government?

How confident are you that the Department of Environment and Conservation (DEC) works effectively with the local community to reduce fire risk?

How confident are you in the Department of Environment and Conservation (DEC) to make the proper decisions about the use of prescribed burning?

How confident are you that the Department of Environment and Conservation (DEC) is adequately prepared to handle a major bushfire?

Department of Fire and Emergency Services (DFES; Formerly FESA)

How confident are you that the Department of Fire and Emergency Services (DFES) works effectively with the Department of Conservation and Environment (DEC)?

How confident are you that the Department of Fire and Emergency Services (DFES) works effectively with your local government?

How confident are you that the Department of Fire and Emergency Services (DFES) is adequately prepared to handle a major bushfire?

How confident are you that the Department of Fire and Emergency Services (DFES) works effectively with the community to reduce fire risk?

Local Volunteer Fire Brigade

How confident are you that your local volunteer fire brigade is adequately prepared to handle a major bushfire?

State Government

How confident are you that the State Government does a good job of protecting private property from bushfires?

How confident are you that the State Government does a good job of notifying the public about upcoming prescribed burns?

How confident are you that the State Government does a good job of managing public land?

How confident are you that the State Government does a good job of communicating with the public about forest issues?

Local Government

How confident are you that the Local Government makes the proper decisions about the use of prescribed burning?

How confident are you that the Local Government makes the proper decisions regarding the clearing of vegetation to reduce bushfire risk?

How confident are you that the Local Government is adequately prepared to handle a major bushfire?

How confident are you that the Local Government has staff that are both capable and competent (i.e. the right people for the job) in the event of a major bushfire?

How confident are you that the Local Government is knowledgeable about bushfire preparedness?

How confident are you that the Local Government has an active approach to fuel management?

How confident are you that the Local Government does a good job of protecting private property from bushfires?

How confident are you that the Local Government does a good job of notifying the public about upcoming prescribed burns?

How confident are you that the Local Government does a good job of managing public land?

How confident are you that the Local Government does a good job of communicating with the public about forest issues?

How confident are you that the Local Government is knowledgeable about local forests?

How confident are you that the Local Government collaborates with nearby communities?

How confident are you that the Local Government shares resources (e.g. fire suppression equipment or personnel) with other government agencies?

How confident are you that the Local Government has a willingness to enforce bylaws (e.g. requirement of land owners to maintain fire breaks) to reduce bushfire risk?

How confident are you that the Local Government works with private business to improve community safety?

How confident are you that the Local Government makes fire prevention a high priority?

APPENDIX D: National Communities Questionnaire, Questions

Bushfire Education Materials

Respondents were asked to indicate their agreement to a series of five items related to the quality of bushfire education materials sent out by their shire. The 5 point response scale varied from 'Strongly Agree' to 'Strongly Disagree' with a 'Neutral' midpoint. The question asked respondents:

"How much do you agree with the following statements about the firebreak and fuel hazard reduction notices sent out by agencies responsible for bushfires in ... (insert either Victoria, South Australia or Tasmania)".

- The notices are clear and easy to understand
- Notices are issued at the right time of the year in order to remind me to take preparatory action
- The notices make it clear what preparedness activities I can undertake to improve the safety of me and my property.
- The notices ask me to take actions which I am able to accomplish
- The information makes it clear which activities I am required to complete by law

Confidence in Government and Emergency Services Agencies

Each question was presented with a seven point Likert response scale from 'Very Confident' to 'Very Unconfident' with 'Neutral' as the mid-point of the scale.

How confident are you that agencies responsible for fire prevention in _____ make the proper decisions about the use of prescribed burning?

How confident are you that agencies responsible for fire prevention in _____ makes fire prevention a high priority?

How confident are you that agencies responsible for fire prevention in _____ is adequately prepared to handle a major bushfire?

How confident are you that agencies responsible for fire prevention in _____ work hard to educate the community about fire risk and preparedness?

How confident are you that agencies responsible for fire prevention in _____ are knowledgeable about bushfire preparedness?

How confident are you that agencies responsible for fire prevention in _____ have an active approach to fuel management?

How confident are you that agencies responsible for fire prevention in _____ do a good job of protecting private property from bushfires?

How confident are you that agencies responsible for fire prevention in _____ are willing to enforce the requirement of land-owners to maintain fire breaks and reduce fuel loads to reduce bushfire risk?

Bushfire Prevention Enforcement

Respondents were asked to indicate their agreement (five point Likert scale) to four items relating to the property inspections carried out by hazard reduction officers from the relevant state fire agency. The questions were the following:

- The property inspection helped me to understand what I am required to do to adhere to fire regulations.
- The officers who carried out the fire inspection gave me helpful advice about how to reduce fire risk.
- The officers who carried out the fire inspection required actions that I was easily able to carry out.
- The officers returned later to see if I had carried out the fuel reduction actions they had required.

Theory of Planned Behaviour

Respondents were asked to indicate their agreement (five point Likert scale) to 23 items relating to the 4 sections of the Theory of Planned Behaviour (Attitudes, Subjective Behavioural Norms, Perceived Behavioural Norms, and Self Identity). The items were the following:

Attitudes Towards Preparing

Efficacy of Preparing

- If a bushfire threatens my property, I am likely to lose my house, no matter how much I prepare.
- While many factors are out of my control, undertaking preparedness activities will increase my chances of survival.
- Completing bushfire preparedness activities will be of no advantage if my property is threatened by a bushfire.

Aesthetic Concerns

- Controlled burning and vegetation management has negative effects on native animals and plants.
- Many preparedness activities would destroy the appearance of my house and garden.
- Regular controlled burning is important for fire prevention.
- The appearance of my house and garden affects the preparedness activities that I am willing to undertake.

New Environmental Paradigm (Short Form)

- Modifying the environment for human use rarely causes serious problems.
- The earth is like a spaceship with only limited room and resources.
- There are limits to economic growth even for developed countries like ours.
- Humans were meant to rule over the rest of nature.
- The balance of nature is very delicate and easily upset.
- Plants and animals exist primarily to be used by humans.

Perceived Behavioural Control

- There are many resources such as time, money and knowledge that influence what preparedness activities I can undertake on my property.
- If I wanted to I could easily undertake preparedness activities on my property
- Often there is a gap between my current level of preparedness for bushfire and what I would like my preparedness to be.

Subjective Social Norms

- Friends, family and neighbours have substantial influence over my decisions to undertake bushfire preparedness activities on my property.
- Friends, family and neighbours would view me favourably for undertaking bushfire preparedness activities on my property.
- Most of my neighbours undertake substantial bushfire preparedness activities on their properties.

Self Identity

- I am the kind of person that carefully prepares my property for bushfire.
- Preparing my property for bushfire is an important part of who I am.
- I am not the kind of person that is overly concerned with preparing my property for bushfire.
- I think of myself as someone who is prepared for bushfire.

APPENDIX E: Supplementary Statistical Analyses from W.A. Community Survey

Place Attachment – Factor Structure

A Principal Components Analysis with oblique (oblimin) rotation revealed two distinct factors, accounting collectively for 78.36% of the variance (see Table E.1 below). One item ('My home is the best place for what I like to do') loaded moderately on both factors but was retained as a 'place dependence' item in line with previous research. Cronbach's alpha across all 11 items indicated a scale of high internal consistency (alpha = 0.95) and this was not far reduced for either of the subscales (alpha of 0.92 for place dependence and 0.95 for Place Identity).

Table E.1: Factor loadings for a Principal Components Analysis with oblimin rotation on 11 items assessing place attachment in Western Australian communities. Factor loadings below 0.3 have been suppressed.

Item	Place Identity	Place Dependence
I feel my home is a part of me	.89	
My home is very special to me.	.96	
I identify strongly with my home	.90	
I am very attached to my home	.92	
Living in my home says a lot about who I am	.71	
My home means a lot to me	.91	
My home is the best place for what I like to do	.41	.48
No other place can compare to my home		.81
I get more satisfaction out of living in my home than I would anywhere else.		.86
Doing what I do at home is more important to me than doing it in any other place		.93
I wouldn't substitute any other area for doing the types of things I do at home.		.95

Perceptions of Bushfire Risk – Factor Structure

Scores for the six questions addressing perceptions of bushfire risk were subjected to factor analysis using the Maximum Likelihood method. The resultant scree plot revealed two factors with Eigenvalues of 3.36 and 0.97 respectively, and collectively accounting for 72.2% of the variance. Despite the Eigenvalue of factor 2 being below one, visual inspection of the scree plot indicated a second factor. The two extracted factors were substantially correlated $r=0.60$ and an oblique (Oblimin) rotation was applied. Factor loadings for the resultant solution are presented in Table E.2. below. The first factor can be labelled 'Risk to Town/Suburb' as this includes three items assessing the likelihood, significance and severity of potential fires to the town or suburb in which residents live. By contrast, the second factor can be labelled 'Risk to Property' as it includes the three items assessing the likelihood, severity of consequences and vulnerability of the respondents' own property.

Table E.2: Rotated factor loadings under a two factor solution for all six questions assessing perceptions of bushfire risk. Low loadings (under 0.4) have been suppressed for clarity.

Question	Factor 1	Factor 2
Q1: How likely is it that a fire will threaten your town or suburb in the next fire season?	0.61	
Q2: How significant do you think the threat of bushfires is to life and property in your town or suburb?	1.06	
Q3: If a bushfire were to occur in your town or suburb, how severe would the impact of it be on your town or suburb?	0.50	
Q4: If a fire were to occur in your town or suburb, how likely would it be for the fire to reach your property?		0.66
Q5: How severe do you think the negative consequences of a bushfire in your town or suburb would be to you personally?		0.76
Q6: To what extent do you think your house is more or less vulnerable to bushfires than most other houses in your area?		0.46

Perceptions of the Capabilities of Agencies – Factor Structure

For each agency or government level, Maximum Likelihood factor analysis revealed a distinct single-factor solution (an example scree plot for questions related to local government can be seen in Figure E.1. below). Table E.3. shows Eigenvalues and the proportion of variance accounted for by a single factor for each level of government or government agency sampled. Note that factor analysis was not conducted for local volunteer fire brigade as this agency was only assessed using a single question.

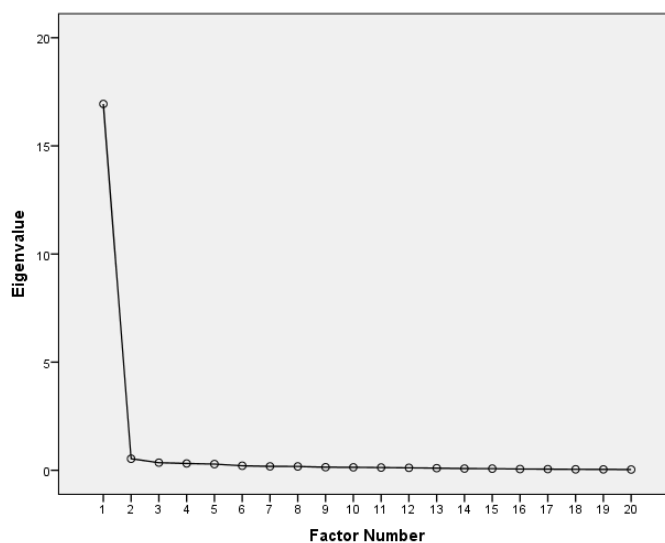


Figure E.1: Scree plot showing Eigenvalues across the twenty questions used to assess confidence in local government related to bushfire.

Table E.3: The percentage of variance accounted for by a single factor solution applied to a series of questions relating to the capabilities and capacities of a range of government levels and government agencies.

Agency	No. of Questions	% of Variance	Scale Average
Department of Fire and Emergency Services	4	79.14%	4.45
Department of Environment and Conservation	5	78.79%	4.18
Local Government	20	84.69%	4.18
State Government	4	77.00%	3.59

The high correlations between variables, and distinct single factor solution, suggests that respondents are indicating their general confidence in the particular government level or agency to each question.

APPENDIX F. Detailed Statistical Results from National Community Survey

Place Attachment – Factor Structure

A principal components analysis with oblique (direct oblimin) rotation suggests that the 11 Place Attachment questions load on to two factors, collectively accounting for 79.10% of the variance. As in previous work, these two factors can be labelled as ‘Place Identity’ and ‘Place Dependence’ (see Table F.1. below). One item, “My district/suburb us the best place for what I like to do’ loaded only moderately on the Place Dependence factor, but was retained as it is consistent with the relevant loadings in past research.

Table F.1: Factor loadings for a two factor principal components analysis with oblique rotation of 11 items related to Place Attachment

Item	Place Identity	Place Dependence
I feel my district/suburb is a part of me	0.865	
My district/suburb is very special to me	0.960	
I identify strongly with my district/suburb	0.939	
I am very attached to my district/suburb	0.926	
Living in my district/suburb says a lot about who I am	0.606	
My district/suburb means a lot to me	0.912	
My district/suburb is the best place for what I like to do		0.489
No other place can compare to my district/suburb		0.904
I get more satisfaction out of living in my district/suburb than I would anywhere else		0.846
Doing what I do in my district/suburb is more important to me than doing it in any other place		0.936
I wouldn't substitute any other area for doing the types of things I do in my district/suburb		0.945

Risk Perception – Factor Structure

Similar to the finding in the Western Australian questionnaire, a Principal Components Analysis with oblique (direct oblimin) rotation suggests that the six risk questions appear to fall on to two factors, able to be described as ‘Risk to Town’ and ‘Risk to Property’ (Table F.2).

Table F.2: Factor loadings for a two factor Principal Components Analysis of six questions assessing respondents' perceptions of the risk of bushfire to their house and community.

Question	Factor 1	Factor 2
How likely is it that a fire will threaten your district or suburb in the next fire season?	.878	
How significant do you think the threat of bushfires is to life and property in your district or suburb?	.880	
If a bushfire were to occur in your district or suburb, how severe would the impact of it be on your district or suburb?	.638	
If a fire were to occur in your district or suburb, how likely would it be for the fire to reach your property?		.711
How severe do you think the negative consequences of a bushfire in your district or suburb would be to you personally?		.728
To what extent do you think your house is more or less vulnerable to bushfires than most other houses in your district or suburb?		.888

Confidence in Government Agencies – Factor Structure

As was found in the Western Australian questionnaire, principal axis factor analysis suggested that questions concerning agency competence were best accounted for by a single factor, accounting for 68.03% of the variance (see Figure F.1, below). Additionally, the eight items demonstrated high internal consistency (Cronbach's alpha = 0.93), suggesting that computing total scale scores was appropriate. Consequently, scale scores were computed for all participants who answered all eight items relating to the competence of agencies responsible for bushfire. In total, 1171 respondents were given a total score on this scale, while 113 were excluded.

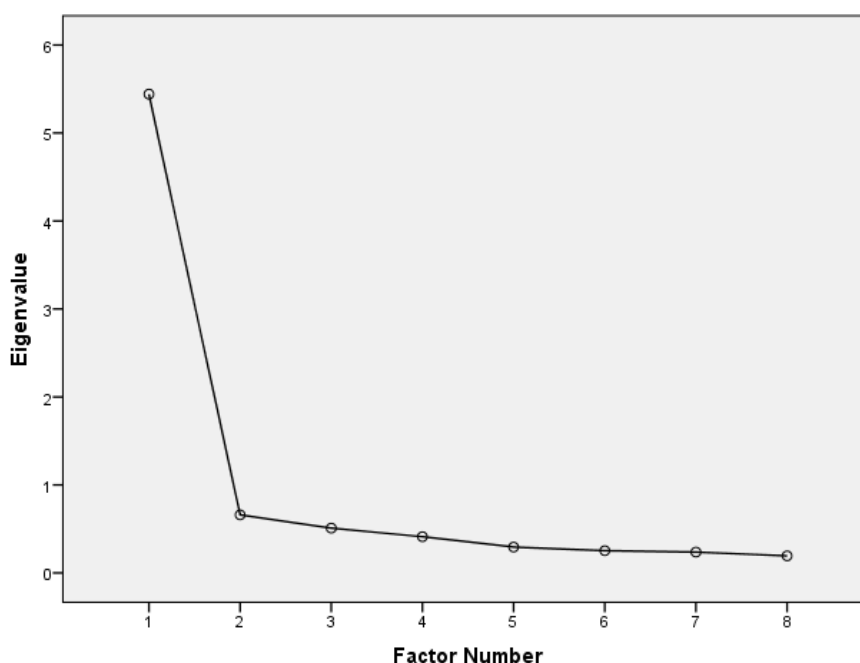


Figure F.1: Scree plot from principal axis factoring of eight items related to the perceived competence of agencies responsible for bushfires across all respondents.

New Environmental Paradigm (NEP) 6 Item Short Version – Factor Structure

The combined 6 item scale had only moderate but satisfactory internal consistency ($\alpha = 0.71$). Principal Components Analysis suggested that the 6 items loaded on to two distinct factors (accounting for 60.17% of the variance) with one item having moderate cross loadings and overall not loading strongly on either factor (see Table F.3 below). Previous research with the 6 item short version is limited, but factor analysis across various studies utilising the full 12 item scale show factor solutions with one, two or three factors. As the NEP is an established scale, and as the corrected item-total correlation for the ‘non-loading’ item in question is consistent with that of other items in the scale ($r=0.37$), it was decided to include the item in calculations of a total scale score.

Table F.3: Factor loadings for six items comprising the short version of the New Environmental Paradigm scale derived from a Principal Components Analysis with oblique (oblimin) rotation. Factor loadings below 0.2 have been suppressed. ‘R’ denotes items reverse coded.

Item	Factor 1	Factor 2
1 Modifying the environment for human use rarely causes serious problems. ‘R’		0.86
2 The earth is like a spaceship with only limited room and resources.		0.85
3 There are limits to economic growth even for developed countries like ours.	0.23	0.47
4 Humans were meant to rule over the rest of nature. ‘R’	0.68	
5 The balance of nature is very delicate and easily upset.	0.84	
6 Plants and animals exist primarily to be used by humans. ‘R’	0.84	

Efficacy of Preparing & Perceived Behavioural Control – Factor Structure

The three questions assessing the efficacy of preparedness behaviours and the three questions assessing perceived behavioural control were collectively subjected to a Principal Components Analysis with oblique (oblimin) rotation. Two items assessing the efficacy of preparedness, and one item assessing Perceived Behavioural Control were reverse coded to ensure consistency of directionality prior to analysis.

The resulting solution contained two clear factors, accounting for 53.04% of the variance). Unfortunately however, while the resulting solution broadly represented efficacy and behavioural control items as separate factors, it contained a number of cross-loadings and was difficult to interpret (see Table F.4 below). All three questions regarding the efficacy of preparedness actions loaded positively and moderately on factor one (correlations ranged between $r=0.56$ and $r=0.79$), though two of these three items also showed moderate cross loadings ($r=-0.32$ and $r=0.41$). As a result of these analyses, all three questions assessing the efficacy of preparedness were retained, while only two of the three items assessing perceived behavioural control were retained. The third item demonstrated a moderately strong association with the efficacy factor, with little association with perceived behavioural control.

Table F.4: Factor loadings following the application of Principal Components Analysis to six items assessing the efficacy of preparedness behaviours (3 items) and the respondents perceived behavioural control (3 items). 'R' denotes items reverse coded prior to analysis. Small loadings (under 0.3) have been suppressed.

Scale	Item	Factor 1	Factor 2
Efficacy	If a bushfire threatens my property, I am likely to lose my house, no matter how much I prepare. 'R'	.56	-.32
Efficacy	Completing bushfire preparedness activities will be of no advantage if my property is threatened by a bushfire. 'R'	.79	
Efficacy	While many factors are out of my control, undertaking preparedness activities will increase my chances of survival	.61	.41
Behavioural Control	There are many resources such as time, money and knowledge that influence what preparedness activities I can undertake on my property.		.76
Behavioural Control	Often there is a gap between my current level of preparedness for bushfire and what I would like my preparedness to be.		.78
Behavioural Control	If I wanted to I could easily undertake preparedness activities on my property. 'R'	-.59	

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