Received: 23 August 2023 | Revised: 16 October 2023 | Accepted: 31 October 2023

DOI: 10.1002/vetr.3614

Vet Record

ORIGINAL RESEARCH

'All we found were bones': Veterinary workers' distress and trauma after Australia's Black Summer bushfires

Nicola K. Paul | **Suzanne M. Cosh** | **Amy D. Lykins**

School of Psychology, Faculty of Medicine and Health, University of New England, Armidale, New South Wales, Australia

Correspondence
Amy D. Lykins, Psychology Building, University of New England, Armidale, New South Wales 2351, Australia.
Email: alykins@une.edu.au

Present address

Nicola K. Paul, UNE Business School, Faculty of Science, Agriculture, Business and Law, University of New England, Armidale, New South Wales, Australia.

Abstract

Background: Australia's 2019/2020 Black Summer bushfires affected billions of animals, many of which were rescued and cared for by veterinary and animal care workers (VACWs). Little is known about VACWs' disaster-related experiences and how these experiences may affect them.

Methods: We used a convergent mixed-methods design to explore how a variety of VACWs experienced the Black Summer bushfires. Data were gathered between April and July 2020. Participants (N = 93) were recruited via Facebook posts and emails that contained a link to an online survey. The survey included open-ended questions about VACWs' bushfire-related experiences and quantitative measures of posttraumatic stress disorder symptoms, psychological distress, burnout and grief.

Results: Participants reported a variety of bushfire-related experiences and described several ways the disaster affected their work, personal lives and communities. Overall, participants scored highly on measures of psychological ill-health.

Limitations: Our cross-sectional design and use of non-probability sampling limited the generalisability of the results and may have introduced a response bias.

Conclusion: Our results contribute new information on the experiences of VACWs during and after bushfires and the psychological hazards they may face due to the extreme and prolonged stressors produced by such disasters. Implications for policy and veterinary practice are discussed.

KEYWORDS
burnout, bushfires, human–animal interaction, occupational health, psychological distress, veterinary professionals

INTRODUCTION

The period from July 2019 to March 2020 saw a series of bushfires (i.e., wildfires) affecting more than 11 million hectares in Australia's south and east.[1] This 'Black Summer' killed an estimated 3 billion native vertebrates[2] and 56,000–69,000 production animals.[3] Companion animals were largely spared, although many were evacuated[4] and some required veterinary intervention for behavioural problems related to traumatic experiences.[5] These events meant that veterinary and animal care workers (VACWs) were central to the disaster response and recovery.

VACWs are employees or volunteers in roles including (but not limited to) veterinarians, veterinary nurses, animal attendants, wildlife carers, foster carers and administrators. These workers protected community interests during and after the Black Summer bushfires through treatment decisions that preserved production animal welfare and farmers' financial wellbeing,[6] and by evacuating threatened species to safeguard ecosystems.[7] There has been little investigation into the potential repercussions for VACWs who conducted this work during the Black Summer, although there is evidence that veterinarians have experienced psychological adversity associated with

previous disasters globally.[8] VACWs affected by the Black Summer bushfires may be similarly susceptible to poor mental health.

The broad and ongoing repercussions of the Black Summer bushfires[1] mean it is likely that VACWs in affected regions who have not conducted work specifically in response to the disaster may nevertheless be vulnerable to psychological adversity. The disaster damaged the environment through habitat destruction and air/water pollution,[9,10] while property destruction, displaced residents and disrupted infrastructure have devastated communities.[11–13] Similar environmental and community impacts have been identified as psychological risks for disaster responders[14] and other bushfire-affected populations.[15,16] Consequently, these conditions may present hazards to the psychological health of VACWs operating in fire-affected regions.

It is likely that VACWs in these regions could not access adequate assistance for their mental wellbeing. Generally, there is little understanding of what strategies may enhance VACWs' mental health,[17] and veterinarian disaster responders have previously reported limited psychosocial support.[8] Reports that poor mental health is a significant reason for industry-wide workforce shortages[18] suggest it is likely that the psychological strain on disaster-affected VACWs, combined with inadequate assistance to help them recover, will result in shortages of VACWs who are available to respond to future disasters.

Such shortages may contribute to mass animal suffering, intensified trauma for animal owners and proliferation of disease, as seen in the USA after Hurricane Katrina.[19] Furthermore, climate change is increasing the frequency and severity of disasters caused by natural hazards.[20,21] It is therefore urgent that VACWs are properly supported so they can help mitigate the consequences of these disasters. Understanding VACWs' experiences of the Black Summer bushfires and their subsequent psychological health will contribute information on how these valuable workers might be better supported.

The current study

The importance of VACWs—specifically veterinarians—in disaster preparedness, response and recovery has been acknowledged since at least the 1980s,[22–24] and veterinarians have provided aid to people and animals affected by many types of disasters.[25–29] However, most investigations into how VACWs experience disasters have focused on veterinarians responding to disease outbreaks.[8] Less empirical evidence exists on the experiences of VACWs exposed to other types of disasters, including natural hazards. Additionally, the literature largely ignores VACWs who collaborate with veterinarians during disasters. Therefore, we aimed to explore how a variety of VACWs experienced the Black Summer bushfires and to investigate their psychological health following these experiences.

MATERIALS AND METHODS

Participants

Data were collected as part of a larger project that investigated the vocational experiences and mental health of VACWs.[30] We recruited a convenience sample of VACWs between April and July 2020. VACWs therefore participated in our study approximately 1–12 months after they experienced the Black Summer bushfires, depending on their location. This use of non-probability sampling was appropriate because we did not intend to generalise to the population or establish causal links.[31] Rather, we aimed to deepen the empirical understanding of conditions VACWs encountered during and after the Black Summer bushfires and explore potential hazards to their psychological wellbeing following these experiences. Participants were required to be 18 years or older and working or volunteering for a veterinary or animal care organisation.

Procedure

The Human Research Ethics Committee of the University of New England approved this study prior to participant recruitment (HE 20-062). The first author (N.P.) posted invitations containing a link to the study on her personal Facebook page and in VACW Facebook groups; 61 (65.6%) participants accessed the study via this channel. N.P. also used her university account to email invitations to Australian veterinary and animal care organisations with publicly accessible email addresses; 32 (34.4%) participants accessed the study in this way. After providing informed consent, participants answered demographic questions and indicated whether they had (1) cared for bushfire-affected animals and/or (2) been otherwise affected by the bushfires. Next, self-reported measures of psychological symptoms (below) were presented randomly.

Study design

We used a convergent mixed-methods design, whereby qualitative and quantitative data were collected concurrently and given equal priority for interpretation.[32] We chose to use an online survey over methods such as interviews or focus groups to encourage honest participation from VACWs by guaranteeing anonymity.[33] This was important for participants in a small and interconnected industry who were sharing sensitive information.[33]

Measures

posttraumatic stress disorder (PTSD) symptoms

We assessed trauma exposure and PTSD symptoms based on the criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5)[34] using the PTSD checklist for DSM-5 (PCL-5).[35] First, participants were asked if they had experienced a traumatic event. If they answered 'yes', they were asked to describe the worst event and then indicate how much they had been bothered in the past month by 20 PTSD symptoms, using a five-point scale. Scores had a possible range of 0–80; a score 31 or greater was used to infer probable PTSD.[35]

Psychological distress

We used the Depression Anxiety Stress Scales (DASS-21),[36] consisting of three seven-item subscales, to quantify psychological distress. Participants used a four-point scale to indicate how much statements indicative of depression (e.g., low mood, pessimism), anxiety (e.g., panic, worries) and stress (e.g., tension, hyperarousal) applied to them over the past week. Totals for each subscale had a possible range of 0–21, and symptom severity was categorised based on established cut-offs (depression: normal = 0–4, mild = 5–6, moderate = 7–10, severe = 11–13, extremely severe ≥14; anxiety: normal = 0–3, mild = 4–5, moderate = 6–7, severe = 8–9, extremely severe ≥10; stress: normal = 0–7, mild = 8–9, moderate = 10–12, severe = 13–16, extremely severe ≥17).[36]

Burnout

The Copenhagen Burnout Inventory (CBI)[37] was used to measure exhaustion in general (i.e., personal burnout; seven items) and attributed to work (i.e., work burnout; six items). Participants answered questions (e.g., 'How often do you feel tired?') using a five-point scale. The possible range of scores for each subscale was 0–100; a score 50 or greater indicated probable burnout.[37]

Grief

We quantified grief using the Grief Diagnostic Instrument (GDI)[38] to measure the symptoms arising from combined losses. Participants selected the ways they had experienced losses as a VACW (e.g., 'compassionate euthanasia') from a list of 11 options. They then rated how often they had experienced 16 grief symptoms in the previous 2 weeks using a four-point scale. The potential range of scores was 0–48, and participants' grief severity was categorised according to established cut-offs (none = 0, mild = 1–17, moderate = 18–22, severe ≥23).[38]

VACWs and the Black Summer bushfires

Participants answered 'yes' or 'no' to the question, 'Have you cared for or are you currently caring for animals injured in the 2019–2020 bushfire crisis?' They also answered 'yes' or 'no' to the question, 'Were you personally impacted by the 2019–2020 bushfire crisis outside your role as an animal care worker?' Participants who answered 'yes' then selected the ways they were impacted from a list of eight (detailed in the Results section). They were also invited to respond to the prompt: 'Please provide detail on other ways you were personally affected by the 2019–2020 bushfire crisis'.

Data analysis

We used SPSS (version 28) to conduct quantitative analyses. Five cases had missing data on two variables, so no cases were deleted for having excessive missing data.[39] Little's Missing Completely at Random Test suggested that data were missing at random ($\chi^2(18) = 15.68$, $p = 0.62$). Therefore, missing values were replaced using estimates produced by the Expectation Maximisation algorithm in the Missing Value Analysis module.

We obtained qualitative data from participants' descriptions of ways they were personally affected by the bushfires and from responses to the PCL-5's open question in cases where participants described the Black Summer as their worst traumatic event. We chose a conventional/inductive approach to a descriptive content analysis considering the limited available data on VACWs' disaster-related experiences.[40] N.P. read responses repeatedly to achieve immersion and then used NVivo 12 to code the data. Coded items were clustered into subcategories and then combined into categories. All data in each category were collated and checked for internal consistency and conceptual distinctiveness of each category by the second and third authors (S.C. and A.L.).

We chose a single coder to avoid the limitations introduced by employing multiple coders; the risk of generating superficial interpretations[41] was of particular concern given the objectives of this study. N.P.'s experience as a veterinary nurse facilitated understanding of participants' context, and S.C.'s and A.L.'s experience as research psychologists strengthened the rigour of this study's qualitative component by reducing the influence of biases arising from N.P.'s background.[42] We also supported the rigour of this study by employing a mixed-methods design to facilitate data triangulation and by presenting verbatim descriptions that best represent our interpretations.[42] Potentially identifying information (e.g., names of organisations, locations, etc.) has been removed to preserve anonymity.

TABLE 1 Descriptive statistics for psychological symptoms reported by veterinary and animal care workers ($N = 93$)

Variable	Mean (SD)	Observed range	Cronbach's α	≥Cut-off, *n* (%)
PTSD symptoms	19.72 (19.13)	0–70	0.95	24 (25.80)
Depression	5.99 (5.92)	0–21	0.95	N/A
Anxiety	4.29 (4.25)	0–19	0.84	N/A
Stress	8.06 (5.30)	0–21	0.90	N/A
Personal burnout	55.82 (18.37)	16.67–91.67	0.85	58 (62.37)
Work burnout	45.85 (20.29)	3.57–100	0.88	35 (37.63)
Grief	14.99 (9.69)	0–47	0.94	N/A

Note: Cut-offs indicating probable disorder—posttraumatic stress disorder (PTSD) ≥31; personal and work burnout ≥50.
Abbreviation: SD, standard deviation.

TABLE 2 Summary of psychological distress and grief severity for veterinary and animal care workers ($N = 93$)

Scale	Normal/none, *n* (%)	Mild, *n* (%)	Moderate, *n* (%)	Severe, *n* (%)	Extremely severe, *n* (%)
Depression[a]	53 (57)	6 (6.5)	13 (14)	8 (8.6)	13 (14)
Anxiety[b]	49 (52.7)	17 (18.3)	8 (8.6)	8 (8.6)	11 (11.8)
Stress[c]	46 (49.5)	10 (10.8)	20 (21.5)	8 (8.6)	9 (9.7)
Grief[d]	4 (4.3)	60 (64.5)	8 (8.6)	21 (22.6)	N/A

[a]Normal = 0–4; mild = 5–6; moderate = 7–10; severe = 11–13; extremely severe ≥14.
[b]Normal = 0–3; mild = 4–5; moderate = 6–7; severe = 8–9; extremely severe ≥10.
[c]Normal = 0–7; mild = 8–9; moderate = 10–12; severe = 13–16; extremely severe ≥17.
[d]None = 0; mild = 1–17; moderate = 18–22; severe ≥23.

RESULTS

This study analysed data from a sample of VACWs ($N = 93$) who reported that they had cared for animals injured by the Black Summer bushfires and/or were impacted by the disaster in other ways. Most participants identified as female ($n = 85$; 91.4%), seven (7.5%) as male and one (1.1%) as other gender. Participants had been a VACW for 0.4–38.4 years (mean = 11.2, SD = 9.9). Their roles included wildlife carers ($n = 30$), veterinary nurses ($n = 24$), managers ($n = 11$), zookeepers ($n = 5$), animal attendants ($n = 3$), foster carers ($n = 5$), administrative workers ($n = 2$), veterinarians ($n = 2$) and other/unspecified ($n = 11$).

Table 1 presents descriptive statistics, Cronbach's alphas and proportions of the sample that met or exceeded the PCL-5 and CBI cut-offs, while Table 2 summarises DASS-21 and GDI symptom severity. Seventy-five (80.6%) participants self-identified as having experienced a traumatic event, and about one-third of these participants met or exceeded the PCL-5 score that indicated they had potentially diagnosable PTSD. Additionally, 23 (24.7%) VACWs in our sample identified the Black Summer bushfires as their worst traumatic event, and three of these participants exceeded the PCL-5 cut-off. Furthermore, the majority of our participants were likely experiencing burnout, and about one-third of our sample exhibited moderate to extremely severe symptoms of depression, anxiety and/or stress. Notably, almost 98% of VACWs who participated in our study reported mild to severe grief.

VACWs' experiences of the Black Summer bushfires

Fifty-one (54.8%) participants indicated that they had cared for injured animals but had not been personally affected by the Black Summer bushfires, 19 (20.4%) had only experienced personal effects of the bushfires and 23 (24.7%) had cared for injured animals and experienced personal effects of the bushfires. The personal effects of the bushfires included evacuation ($n = 23$), ember attack ($n = 19$), defending property ($n = 14$), exposure to the fire front ($n = 13$), property destruction ($n = 6$), loss of livestock or pets ($n = 2$), loss of a loved one ($n = 1$) and other ($n = 15$).

Content analysis ($n = 33$) showed that the bushfires affected participants through unusual veterinary and animal care work, impacts on their properties and communities and psychological responses to these combined challenges, as summarised in Figure 1.

Veterinary work and the Black Summer bushfires

Participants described five distinct ways that the Black Summer bushfires affected their animal care duties, as detailed below.

Exposure to animal suffering and death

Ten participants described witnessing extreme animal suffering caused by the bushfires. For example, one

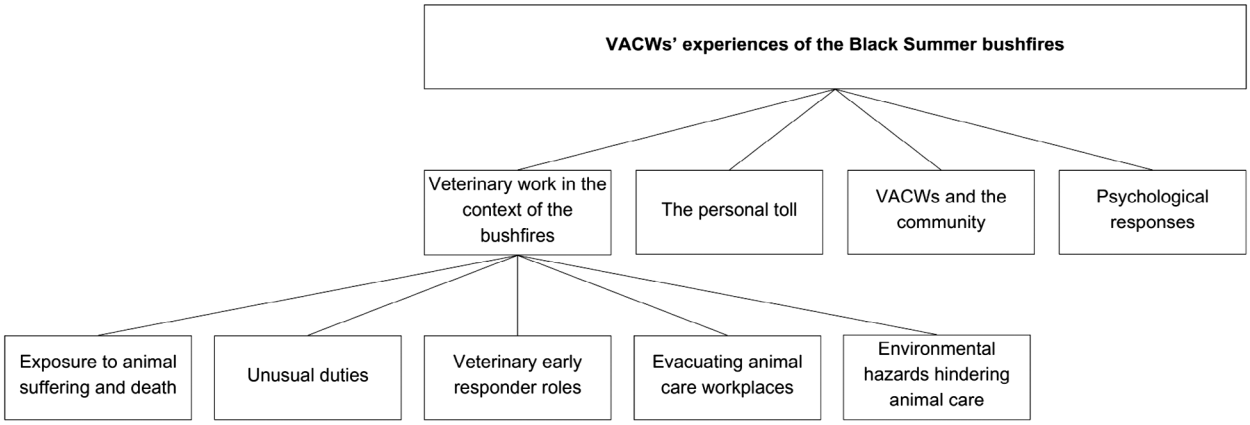

FIGURE 1 Thematic map of qualitative results ($n = 33$). VACWs, veterinary and animal care workers

participant described, 'Bushfire animal victims, seeing then [*sic*] getting burnt in real time', and another 'Had to euthanase wildlife that had been burnt to the bone'. VACWs were also exposed to mass animal deaths, as described by this participant: 'Birds could get out and some kangaroos and possums, but the rest were basically cremated. All we found were bones …'. Furthermore, one participant described 'having to see the animals die, first from fire and then starvation', pointing to ongoing animal deaths from multiple causes. Several species were affected, with one participant describing how they 'saw hundreds of dead wildlife and production animals …'.

Unusual veterinary duties

Six participants described non-routine veterinary duties arising from animal suffering and death caused by the Black Summer bushfires. These duties included 'treating burnt domestic and native wildlife' and 'triaging and treating wildlife injured via bushfire'. Two participants indicated that these unusual duties sometimes led to disagreements among VACWs, for example:

> One brushtail possum I picked up from a vet should have been euthanased as soon as it entered care instead it had suffered for hours with burns through to bone on all four paws and tail and had severe burns right up inside the ear canals which would have caused unimaginable pain. I found another vet to euthanase for us.

Two VACWs described the requirement to euthanase an unusually large number of animals, as illustrated by one participant who '… performed euthanasia on 17 animals in 1 day'. The circumstances surrounding euthanasia may have also been unusual, with one participant describing euthanasing alert and responsive animals in the field: 'I had to select kangaroos for instant euthenaisure [*sic*]. These proud and fearless male eastern greys attempted to stand their ground on severely burnt feet before their deaths'.

Veterinary early responder roles

The requirement to euthanase animals in the field reflected participants occupying early responder roles during the Black Summer as 'part of the search and rescue team doing frontline rescuing'. Seven participants described such roles, including entering fire grounds for animal rescue and recovery. For example, this VACW:

> [went] straight into the effected [*sic*] areas as soon as we had the go ahead to score [*sic*] the areas for any remaining/surviving animals. Even though the fires were extinguished, there were still some parts burning, and many embers flying. Our mission was to save the effected [*sic*] animals.

The unpredictability of the bushfires meant these duties sometimes resulted in considerable physical risk to VACWs, as described by this participant:

> checking property for burnt wildlife with two other volunteers. Wind change. Fire broke out all around us. … Could not get out of farm same way as came in. Lost radio contact with head office. Managed to get out.

Additionally, one participant indicated that VACWs may have been filling early responder positions as volunteers while continuing their paid veterinary and animal care roles, resulting in a relentless workload over an extended period: '[Organisation] volunteer so for 8 weeks strait [*sic*] over Christmas and New Year period I did not have a day off between work and [organisation] volunteer'. Finally, two participants carried out dual early responder roles as VACWs and firefighters, leading to prolonged and intense duties: 'I

am also with the [volunteer firefighting organisation] and spent 42 days actively working on the fires'.

Evacuating veterinary and animal care workplaces

Amidst these intense pressures, some VACWs were forced to evacuate when fire threatened animal shelters and wildlife sanctuaries. Eight participants described evacuating with the animals in their care, for example, 'The stress of having to relocate animals large and small, whilst the smoke was horrendous, ash falling from the sky like snow, everybody on edge'. Additionally, three participants indicated they were not guaranteed a safe haven, as described by this participant: 'Major bush fire front approaching our sanctuary and needing to pack up 30+ sick, injured and rehabilitating patients into two four-wheel drive vehicles and our destination sanctuaries were either burnt already or also in the process of evacuating as well'. Furthermore, three VACWs described evacuating multiple times, for example, 'Our wildlife sanctuary was subject to four evacuations of 30 patients'.

Environmental hazards and veterinary work

In addition to the threats posed by ember attacks and fire fronts, six participants described environmental hazards that hindered veterinary and animal care work during and after the Black Summer. For example, one participant described how 'Significant smoke seriously impacted my health and ability to work due to asthma'. The smoke and ash from the bushfires also tainted water supplies (e.g., 'Smoke contamination in water for roughly 2 months after fires were finished') and widespread habitat destruction led to additional challenges:

> Once we were allowed back onto to land [*sic*] we struggled to source appropriate fodder for our patients through both finding the feed as well as the financial burden as we now had wild patients who were coming in for food as well as our in-care patients.

The personal toll of the Black Summer bushfires on VACWs

While VACWs were responding to the animal toll of the bushfires, several were also dealing with threats and damage to their own properties. Nine participants described damage to their homes, including one participant who lost 'the majority of our property in the 2019 [location] bushfire'. Additionally, one participant who volunteered as an animal early responder described how 'My garden died at home due to lack of rain and me being away', pointing to the cost of dedicating their time to rescuing animals.

VACWs and the community during the Black Summer bushfires

When asked about ways they were affected by the Black Summer bushfires, eight participants described the impact of the crisis on people in their communities. These effects included witnessing friends and family members losing their homes; one participant's 'uncle lost all livestock and everything he owned bar [the] house'. Furthermore, two participants identified exposure to the human toll of the bushfires as part of their veterinary work. One VACW assisted 'clients that were evacuating, had evacuated, lost or defended property once our clinic was re-opened', and another described how they 'had numerous interactions with [emergency workers] at both fires. I saw the distress of the public and emergency workers'.

VACWs' psychological responses to the Black Summer bushfires

Eight participants described psychological reactions they experienced during and shortly after the Black Summer. Short-term reactions included fear (e.g., 'It was an extremely terrifying and stressful time'), sadness (e.g., 'I cried continuously week in and week out, and I can't remember a time I have ever been so constantly in sorrow and mourning') and lack of sleep and uncertainty (e.g., 'The sleepless nights of not knowing if the house was still standing took a heavy toll …'). Furthermore, two participants described persistent psychological reactions, including distressing memories, intrusive imagery and ongoing negative emotions:

> I am haunted by places I went to and things that I saw during the bushfire. I live with the guilt of not being able to help so many more animals that were suffering despite having rescued and treated so many.

Ultimately, for both these participants, the psychological aftermath of the Black Summer bushfires centred on a sense of not being able to save enough animals:

> I haven't for a minute been able to forget the imagery placed in front of my eyes. I only wished I could have saved them. Knowing how many millions of animals went through this pain and suffering and losing their lives troubles me still deeply.

DISCUSSION

Research on VACWs' disaster-related experiences has centred on veterinarians responding to disease outbreaks. Here, we expand this evidence by examining veterinary and animal care work in the context of a different type of disaster, the Black Summer bushfires, and by encompassing VACWs who work in

collaboration with veterinarians. Participants' accounts of early response work, which included entering areas that were smouldering or in flames, contribute new insight into the dangers confronted by some VACWs during the Black Summer. Additionally, descriptions of smoke pollution, habitat destruction, water contamination and feed shortages shed light on environmental conditions that hampered some VACWs' efforts to safeguard animals. Moreover, accounts of VACWs' experiences during the disaster, combined with data from quantitative measures, contribute new and vital information about VACWs' psychological wellbeing in the aftermath of the Black Summer.

VACWs' mental health following the Black Summer bushfires

About one-quarter of VACWs in our sample identified the Black Summer bushfires as their worst traumatic event, and based on an established cut-off,[35] three of these participants produced a PCL-5 score indicative of PTSD. Additionally, in their responses to open questions, several participants recounted Black Summer experiences aligned with the diagnostic definition of a traumatic event,[43] identified stressors known to be linked to PTSD (e.g., euthanasing multiple animals, treating burns),[44,45] or described reactions that are consistent with PTSD symptoms (e.g., persistent guilt, intrusive memories).[43] This convergence of quantitative and qualitative evidence points to PTSD as a concern for VACWs working in the context of disasters such as the Black Summer bushfires that warrants further investigation. Our results suggest that this investigation may benefit from deeper analysis of the effects on VACWs of disaster-related factors such as mass animal casualties, euthanasing multiple animals over a short period of time, dangers presented by search and rescue work, and treating severe injuries.

In addition to PTSD, our data underscore psychological distress, burnout and grief as potential concerns for VACWs in the post-disaster context. Overall, our sample demonstrated a high incidence of mental ill-health, although quantitative results were similar to a separate sample of VACWs who were not directly impacted by the bushfires.[30] However, our results indicate that known contributors to these symptoms in VACWs (e.g., heavy workloads, limited resources)[46–49] may have been qualitatively different during the Black Summer. For example, heavy workloads arose from mass casualties and from occupying volunteer and paid roles concurrently, while limited resources stemmed from water contamination and habitat destruction. It is thus evident that the psychological hazards typically associated with veterinary and animal care work may exhibit unique characteristics in disaster scenarios. Efforts to safeguard VACWs from psychological ill-health may therefore benefit from a deeper investigation of the influence of these hazards during disaster response and recovery.

Implications for public policy and veterinary practice

Our data accentuate the pivotal role that VACWs occupy during disaster response and recovery. This role is poorly acknowledged, with various disaster preparedness efforts in Australia, the wider Asia-Pacific and Europe failing to consider animals.[50–52] Reflecting this oversight, wildlife rescuers reported insufficient government support during the Black Summer bushfires,[53] despite governments holding the legal responsibility for Australian wildlife[54] and the public's expectation that native animals be protected.[55] Our participants also reported circumstances that pointed to insufficient resources, including occupying multiple roles, volunteering while maintaining paid employment, and financial constraints on assisting displaced animals. These circumstances caused relentless veterinary workloads and sometimes compromised animal welfare. Therefore, our results suggest that entities responsible for protecting animal welfare, including governments, allocate funding for paid veterinary response positions and other resources to safeguard VACWs' wellbeing during disasters.

We also recommend that governments support veterinary and animal care organisations to enhance their disaster preparedness. Some VACWs in our sample who tried to evacuate found that their safe zones were not viable, suggesting that animal care workplaces may not have been prepared for the scale of the Black Summer bushfires. This lack of preparedness is understandable, given the unprecedented nature of the disaster,[11] and highlights the need for veterinary organisations to update their disaster plans. Such plans should encompass assistance agreements with other organisations, disaster training for VACWs, animal transport, and food/water sources.[56,57] Additionally, our results underscore the need for veterinary and animal care organisations to consider workers' wellbeing in disaster plans. At a minimum, VACWs should be informed of supports, such as helplines, that are available to them after a disaster. Ideally, animal care organisations should adopt a preventative approach through measures such as pre-deployment briefings on anticipated psychological risks.[8]

Limitations and future research

Our cross-sectional design was appropriate for this study's exploratory objectives. However, this design constrained our ability to compare subgroups within our sample and to statistically test links between the Black Summer bushfires and quantitatively measured psychological variables. Similar levels of psychological ill-health in the current sample to a previous sample of VACWs who were not exposed to the Black

Summer bushfires[30] may indicate that the disaster did not introduce psychological risks beyond the routinely stressful aspects of veterinary and animal care work.[58] However, qualitative descriptions of extraordinary conditions during the disaster suggest that this is unlikely. It is possible that similar levels of mental ill-health in the two samples arose from different combinations of factors (i.e., routine stressors for the previous sample and disaster exposure for the current sample) or that the high levels of mental ill-health experienced by VACWs in general produced a ceiling effect in our data.

A further possibility is that our sampling method introduced a response bias. Several veterinary and animal care organisations told us that their workers could not participate due to persistently high workloads related to the bushfires. Such heavy workloads may have hindered participation by VACWs who were experiencing ongoing pressures resulting from the bushfires. Therefore, our sample may have lacked a sufficient proportion of severely affected VACWs to ensure trends in our quantitative data reflected the full scale of the disaster's impacts on this population.

Future research could address the abovementioned limitations through a follow-up study of VACWs affected by the Black Summer bushfires. Comparing VACWs who work in the context of disasters with those who do not may also yield valuable information, as would monitoring VACWs before, during and after disasters. Finally, larger samples facilitating quantitative analyses such as structural equation modelling may be helpful in determining the combination of factors that contribute to mental ill-health in VACWs across various contexts.

CONCLUSION

This study highlighted the pivotal role of VACWs during and after the Black Summer bushfires and documented the psychological hazards many VACWs faced while fulfilling this role. Many participants recounted conditions during the crisis that are known to be associated with mental ill-health in VACWs, and some described reactions to the bushfires that are consistent with PTSD. Additionally, this sample produced high scores on quantitative measures of psychological adversity; about a quarter identified the Black Summer bushfires as their worst traumatic event, and three of these VACWs potentially had PTSD. This converging evidence suggests several avenues for further investigation into psychological hazards presented by veterinary and animal care work in the context of disasters.

Globally, disaster preparedness largely fails to consider VACWs' wellbeing. This omission is concerning, as climate change increases the frequency of extreme disasters such as the Black Summer bushfires.[21,59] Recurrent disasters mean it is likely that VACWs will be called on repeatedly to protect community interests. Measures should thus be implemented urgently to safeguard the wellbeing of these essential personnel.

AUTHOR CONTRIBUTIONS

Nicola K. Paul and Amy D. Lykins conceived, designed and acquired data for this project. All authors analysed/interpreted the data and contributed to the writing and final review of this manuscript.

ACKNOWLEDGEMENTS

Foremost, the authors express their gratitude to the veterinary and animal care workers who participated in this study. We also wish to thank the individuals and organisations who assisted us by sharing this study with their networks.

Open access publishing facilitated by University of New England, as part of the Wiley - University of New England agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

FUNDING INFORMATION

The authors received no specific funding for this work.

ETHICS STATEMENT

The Human Research Ethics Committee of the University of New England approved this study prior to participant recruitment, in compliance with the National Statement on Ethical Conduct in Human Research (2007).

ORCID

Nicola K. Paul https://orcid.org/0000-0001-8423-8742
Suzanne M. Cosh https://orcid.org/0000-0002-8003-3704
Amy D. Lykins https://orcid.org/0000-0003-2930-3964

REFERENCES

1. Ahmed I, Ledger K. Lessons from the 2019/2020 'Black Summer Bushfires' in Australia. Int J Disaster Risk Reduct. 2023;96:103947.
2. World Wildlife Fund. Australia's 2019–2020 bushfires: the wildlife toll. World Wildlife Fund. 2020 [cited 2023 Aug 16]. Available from: https://www.wwf.org.au/news/news/2020/3-billion-animals-impacted-by-australia-bushfire-crisis#gs.gz4brm
3. Cowled BD, Hillman A, Ward MP, Clutterbuck H, Doyle M, Webb Ware J, et al. The Black Summer bushfires: impacts and risk factors for livestock bushfire injury in south-eastern Australia. Aust Vet J. 2022;100(7):306–17.
4. Travers CA. People, pets and communities in natural disasters: a case for One Health promotion. Doctoral Thesis. Wollongong, NSW, Australia: University of Wollongong; 2021. Available from: Accessed 16 Aug 2023. https://ro.uow.edu.au/theses1/1396
5. Ogilvie F. Vet recommends early intervention for bushfire-affected pets suffering anxiety and depression. ABC News. 2020 [cited 2023 Jun 27]. Available from: https://www.abc.net.au/news/2020-03-04/pets-suffer-trauma-after-bushfires-natural-disaster/12021174?utm_medium=

spredfast&utm_source=fb_abc_news&utm_campaign=khoros&sf230972234=1&fbclid=IwAR0bAmcZhNZ3kzziF5_r8YXHCZrVSyh9k5rmC1QCa6iTG-XqxpxGSGPAsuM
6. Cowled BD, Bannister-Tyrrell M, Doyle M, Clutterbuck H, Cave J, Hillman A, et al. The Australian 2019/2020 Black Summer bushfires: analysis of the pathology, treatment strategies and decision making about burnt livestock. Front Vet Sci. 2022; 9:83.
7. Parrott ML, Wicker LV, Lamont A, Banks C, Lang M, Lynch M, et al. Emergency response to Australia's Black Summer 2019–2020: the role of a zoo-based conservation organisation in wildlife triage, rescue, and resilience for the future. Animals. 2021;11(6):1515.
8. Vroegindewey G, Kertis K. Veterinary behavioural health issues associated with disaster response. Aust J Emerg Manage. 2021;36(3):78–84.
9. Kemter M, Fischer M, Luna L, Schönfeldt E, Vogel J, Banerjee A, et al. Cascading hazards in the aftermath of Australia's 2019/2020 Black Summer wildfires. Earths Future. 2021;9(3):1–7.
10. Johnston FH, Borchers-Arriagada N, Morgan GG, Jalaludin B, Palmer AJ, Williamson GJ, et al. Unprecedented health costs of smoke-related PM2.5 from the 2019–20 Australian megafires. Nat Sustain. 2021;4(1):42–47.
11. Davey SM, Sarre A. Editorial: the 2019/20 Black Summer bushfires. Aust For. 2020;83(2):47–51.
12. Filkov AI, Ngo T, Matthews S, Telfer S, Penman TD. Impact of Australia's catastrophic 2019/20 bushfire season on communities and environment. Retrospective analysis and current trends. J Saf Sci Resilience. 2020;1(1):44–56.
13. Natural Hazards Research Australia. Understanding the Black Summer bushfires through research: a summary of key findings from the bushfire and natural hazards CRC. Natural Hazards Research Australia. Report No. 10.2022. 2023. Available from: https://www.naturalhazards.com.au/sites/default/files/2023-01/Understanding%20the%20Black%20Summer%20bushfires%20through%20research_final_web_NHRA.pdf. Accessed 27 Jun 2023.
14. Khatri J, Fitzgerald G, Poudyal Chhetri MB. Health risks in disaster responders: a conceptual framework. Prehosp Disaster Med. 2019;34(2):209–16.
15. Cavanagh A, Wilson CJ, Kavanagh DJ, Caputi P. Men and women's psychological outcomes in communities affected by bushfires. Aust Community Psychol. 2018;29(2):91–107.
16. Humphreys A, Walker EG, Bratman GN, Errett NA. What can we do when the smoke rolls in? An exploratory qualitative analysis of the impacts of rural wildfire smoke on mental health and wellbeing, and opportunities for adaptation. BMC Public Health. 2022;22(1):41.
17. Rohlf VI. Interventions for occupational stress and compassion fatigue in animal care professionals—a systematic review. Traumatology. 2018;24(3):186–92.
18. Arbe Montoya AI, Hazel SJ, Matthew SM, McArthur ML. Why do veterinarians leave clinical practice? A qualitative study using thematic analysis. Vet Rec. 2021;188(1):1–10.
19. Hunt M, Al-Awadi H, Johnson M. Psychological sequelae of pet loss following Hurricane Katrina. Anthrozoos. 2008;21(2):109–21.
20. van Oldenborgh GJ, Krikken F, Lewis S, Leach NJ, Lehner F, Saunders KR, et al. Attribution of the Australian bushfire risk to anthropogenic climate change. Nat Hazards Earth Syst Sci. 2021;21(3):941–60.
21. Pörtner H-O, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, et al. Climate change 2022: impacts, adaptation and vulnerability. Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press; 2022. Available from: https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf. Accessed 27 Jun 2023
22. Kay JM. The role of veterinary medicine in times of disaster. Mod Vet Pract. 1981;62(5):345–46.
23. Pefanis SM, Du Preez JH. National disasters and the veterinarian. J S Afr Vet Assoc. 1987;58(2):63–69.
24. Tennyson AV. Veterinary services in disasters and emergencies. Mil Med. 1989;154(1):41–45.
25. Sássi C, Carvalho GD, de Castro LM, Junior CZ, Nunes VFP, do Nascimento AAT, et al. One decade of environmental disasters in Brazil: the action of veterinary rescue teams. Front Public Health. 2021;9:1–6.
26. Irvine L, Andre C. Pet loss in an urban firestorm: grief and hope after Colorado's Marshall Fire. Animals. 2023;13(3):416.
27. Parker-Graham CA, Ang J, Quijano Cardé EM, Deanovic LA, Stone M, Madigan JE, et al. Fish evacuation and emergency sheltering during wildfire disasters. J Am Vet Med Assoc. 2022;260(7):1–6.
28. Yokokura Y. Japan earthquake 2011 and Fukushima nuclear accident: experience and physicians and veterinarians collaboration to recover. Jpn Med Assoc J. 2016;59(1):3–9.
29. Watson NA. US Army public health and veterinary support in Japan following the Tōhoku earthquake and tsunami, March–April 2011. US Army Med Dep J. 2013:19–24.
30. Paul NK, Cosh SM, Lykins AD. "A love-hate relationship with what I do": protecting the mental health of animal care workers. Anthrozoos. 2023;36(3):489–508.
31. Onwuegbuzie AJ, Collins KMT. A typology of mixed methods sampling designs in social science research. Qual Rep. 2007;12(2):281–316.
32. Doyle L, Brady A-M, Byrne G. An overview of mixed methods research. J Res Nurs. 2016;14(2):175–85.
33. Braun V, Clarke V, Boulton E, Davey L, McEvoy C. The online survey as a qualitative research tool. Int J Soc Res Methodol. 2021;24(6):641–54.
34. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: American Psychiatric Association Publishing; 2013.
35. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP. The PTSD checklist for DSM-5 (PCL-5). National Center for PTSD; 2013 [cited 27 June 2023]. Available from: www.ptsd.va.gov
36. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. 2nd ed. Sydney: Psychology Foundation; 1995.
37. Kristensen TS, Borritz M, Villadsen E, Christensen KB. The Copenhagen Burnout Inventory: a new tool for the assessment of burnout. Work Stress. 2005;19(3):192–207.
38. Clark S, Marley J, Hiller JE, Leahy C, Pratt N. A grief diagnostic instrument for general practice. Omega. 2006;52(2):169–95.
39. Tabachnik B, Fidell L. Using multivariate statistics. 7th ed. NY: Pearson; 2019.
40. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15(9):1277–88.
41. Smith B, McGannon KR. Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology. Int Rev Sport Exerc Psychol. 2018;11(1):101–21.
42. Helen N, Joanna S. Issues of validity and reliability in qualitative research. Evid Based Nurs. 2015;18(2):34.
43. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed., text rev.). Washington, DC: American Psychiatric Association Publishing; 2022.
44. Scotney RL, McLaughlin D, Keates HL. A systematic review of the effects of euthanasia and occupational stress in personnel working with animals in animal shelters, veterinary clinics, and biomedical research facilities. J Am Vet Med Assoc. 2015;247(10):1121–30.
45. Epstein RS, Fullerton CS, Ursano RJ. Posttraumatic stress disorder following an air disaster: a prospective study. Am J Psychiatry. 1998;155(7):934–38.
46. Hayes GM, LaLonde-Paul DF, Perret JL, Steele A, McConkey M, Lane WG, et al. Investigation of burnout syndrome and job-related risk factors in veterinary technicians in specialty teaching hospitals: a multicenter cross-sectional study. J Vet Emerg Crit Care. 2020;30(1):18–27.
47. Rohlf VI, Scotney R, Monaghan H, Bennett P. Predictors of professional quality of life in veterinary professionals. J Vet Med Educ. 2022;49(3):372–81.
48. Moir FM, Van den Brink A. Current insights in veterinarians' psychological wellbeing. N Z Vet J. 2020;68(1):3–12.

49. Englefield B, Starling M, McGreevy P. A review of roadkill rescue: who cares for the mental, physical and financial welfare of Australian wildlife carers? Wildl Res. 2018;45(3):103–18.
50. Vroegindewey G. World organization for animal health platform on animal welfare for Europe survey on veterinary service preparedness for natural disasters. Prehosp Disaster Med. 2023;38(S1):S76.
51. Gyanendra G, Roderico HO. Animal welfare, One Health and emergency preparedness and response in the Asia-Pacific region. WHO South East Asia J Public Health. 2020;9(1):50–51.
52. Commonwealth of Australia. National disaster risk reduction framework. Commonwealth of Australia; 2018. Available from: https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf. Accessed 27 Jun 2023.
53. Donkin C. Safeguarding Australia's wildlife: lessons from the 'Black Summer' bushfires. Wildlife Aust. 2021;58(1):20–21.
54. Wilson G, Edwards M, Byron N. Custodianship of wildlife on private land to support conservation—an Australian model. Rangeland J. 2020;42(5):309–21.
55. Byron N, Craik W, Keniry J. A review of biodiversity legislation in NSW. Final Report. State of NSW and the Office of Environment and Heritage; 2014. Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/review-biodiversity-legislation-nsw-final-report-2014.pdf. Accessed 27 Jun 2023.
56. Huston CL, Ebers KL. Assessing disaster preparedness and educational needs of private veterinary practitioners in Mississippi. J Vet Med Educ. 2020;47(2):230–38.
57. American Veterinary Medical Association. Disaster preparedness for veterinary practices. American Veterinary Medical Association; 2008. Available from: https://ebusiness.avma.org/files/productdownloads/vet_practices_brochure.pdf. Accessed 27 Jun 2023.
58. Kramper S, Crosby ES, Waitz-Kudla SN, Weathers F, Witte TK. Highly stressful events and posttraumatic stress disorder symptoms among veterinary professionals: prevalence and associations with mental health and job-related outcomes. Psychol Trauma. 2023;15(Suppl 2):S275–85.
59. Climate Council. The facts about bushfires and climate change. Climate Council. 2019. Available from: https://www.climatecouncil.org.au/not-normal-climate-change-bushfire-web/. Accessed 16 Aug 2023.

How to cite this article: Paul NK, Cosh SM, Lykins AD. 'All we found were bones': Veterinary workers' distress and trauma after Australia's Black Summer bushfires. Vet Rec. 2023;e3614. https://doi.org/10.1002/vetr.3614