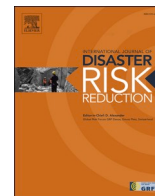




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# Experiences, beliefs, and attitudes of lifeguards from Australia and the United Kingdom toward lifeguard involvement in flood mitigation and response

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## ABSTRACT

**Introduction:** Flooding causes significant mortality and morbidity, with impacts expected to increase with climate change. Ensuring adequate country-level flood mitigation and response capacity is key. Lifeguards, traditionally used for drowning prevention, may represent an additional workforce for flood emergency response.

**Methods:** Through an anonymous, online survey, we explored experiences, beliefs, and attitudes of a convenience sample of surf lifeguards from Australia and England towards lifeguards' involvement in flood response. Respondents were recruited via Surf Life Saving Australia and Great Britain and had prior training in flood rescue. Analysis comprised descriptive statistics and thematic coding of free-text responses.

**Results:** Forty-four responses were received (93.2% male, 34.1% aged 50–59 years; 61.4% from Australia; 61.4% with  $\geq 16$  years lifesaving experience). Twenty-nine respondents (65.9%) self-reported having previously responded to flooding, 15 of which responded prior to receiving flood training. Lifeguards commonly reported being involved in the flood response phase ( $n = 28$ ). Respondents identified rescue skills ( $n = 43$ ; 97.7%), awareness of water conditions ( $n = 40$ ; 90.9%), and radio communication protocols ( $n = 40$ ; 90.9%) as relevant in a flood scenario. Respondents broadly agreed lifeguards were an asset in flood response due to transferrable skills, including to bolster existing capacity. However, respondents noted need for greater recognition, for involvement earlier in flood response and for flood-specific training and equipment prior to deployment.

**Discussion & Conclusions:** Lifeguards represent a willing and able workforce to support flood mitigation and response, some of whom are already being tasked with such work. Provision of flood-specific training and equipment are vital, as is addressing interoperability tensions.

**Abbreviations:** CPR, Cardio Pulmonary Resuscitation; DEFRA, Department of Environment, Farming and Rural Affairs; RNLI, Royal National Lifeboat Institution; SLS, Surf Life Saving; SLSA, Surf Life Saving Australia; SLSGB, Surf Life Saving Great Britain; SLST, Surf Life Saving Tasmania.

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## 1. Introduction

Globally flooding is a leading cause of disaster-related mortality and morbidity [1]. In addition, flooding causes homelessness and results in significant economic losses. The United Nations Sendai Framework for Disaster Risk Reduction 2015–2030 estimates that in the decade between 2005 and 2015, 700,000 people have lost their lives and 1.4 million people have been injured [2]. In addition, 23 million people have been made homeless with the total economic cost of flooding amounting to \$1.3 trillion dollars between 2008 and 2012 [2]. More recently, it is estimated that the 3,254 floods between 2000 and 2019 resulted in 104,614 deaths [3].

In future, estimates of flooding from researchers in numerous countries predict an increase in incidence and severity due to the effects of climate change [4]. This risk is compounded by over 600 million people living less than 10 m above sea level [5,6]. Drowning is a leading cause of mortality and morbidity during times of flood [1] and, as such, the increased likelihood of aquatic disasters impacting individuals and communities will mean an increase in fatal and non-fatal drowning.

Although there can be challenges associated with multi-agency responses, including communication, coordination and leadership [7], it has been argued that as the frequency and intensity of flooding increases, there is a need for coordination and collaboration between government, non-government organisations and the private sector in order to best respond to these emerging challenges [8, 9].

Lifeguards, those trained in rescue and resuscitation techniques to respond in instances of drowning or injury in the water, represent a previously under-utilised workforce for flood response [10]. Anecdotally people become involved with lifesaving as an active drowning prevention surveillance activity through a variety of reasons, including family/friends, altruistically to develop skills that may enable them to save a life, or to support their children's involvement in organised youth programmes. They can then broaden their involvement through lifesaving sport, becoming a professional lifeguard or through opportunities to be involved in governance.

Whatever the motivation, the commitment, and responsibilities are quite demanding with annual physical fitness proficiency assessment [11], as well as currency in the application of first aid, and cardio pulmonary resuscitation (CPR) as a mainstay requirement with additional activities involving radio communication and the use of specialist equipment from tractors, side by side vehicles, personal protection equipment, personal water craft, and inflatable rescue boats [12]. Minimum standards for the certification of lifeguards are mandated by individual organisations as well as the International Life Saving Federation [13].

To further explore the role of lifeguards in flood mitigation and response, this study aimed to understand lifeguards' previous training and experiences in flood rescue and their individual and organisational perceptions of flood response across both Australia and England.

## 2. Methods

This study comprised an online survey of a convenience sample of lifeguards from Australia and England who had previously participated in flood training.

### 2.1. Survey design and development

The survey comprised 18 questions across four domains – demographics, flood response experience and capacity, individual perceptions of lifeguards' role in flood response, and organisational responses. The survey used predominately check box questions, with 7 open ended responses. The full survey can be found in Supplementary File 1.

The survey was designed by the study authors (AP, AM, SB) based on experience in drowning prevention, research and design, flood mitigation response, and training. The survey was then imported into Qualtrics and piloted by all three members of the research team for functionality and comprehension. In addition, the survey was also sent to the Surf Life Saving Great Britain (SLSGB) national instructor group comprising six SLSGB flood rescue unit managers, for additional piloting. After piloting, minor changes were made to wording to enhance comprehension.

Regarding terminology used in the survey and study, the term lifeguard has been used exclusively to remove any confusion on terminology and refers to any person that has the necessary training and accreditation to carry out the duties of a lifeguard. The confusion in this regard is in Australia where the term lifesaver is used to identify a volunteer, whereas a lifeguard is performing a similar duty for payment.

**Table 1**  
Flood training modules.

Flood Training Modules [14]		
Modules	Unit	Target Group
Module 1	Inland Water Safety Awareness	All operators and managers
Module 2	Flood Water Responder	Non-technical, wading only, able to use inflatable boats
Module 3	Flood Rescue Technician	Swim rescuer, lateral rope systems, non-powered craft
Module 4	Flood Rescue Boat Operator	Prerequisite is a basic power boat award and Module 3
Module 5	Water Incident Manager	Prerequisite is Module 1 only
Module 6	Flood Tactical Advisor	Emergency managers specialising in flood disaster
Module 7	Flood Rescue Strategic Advisor	Provide advice at National/Strategic level of flood response

## 2.2. Recruitment

Lifeguards from England via Surf Life Saving Great Britain (SLSGB) and Australia via Surf Life Saving Tasmania (SLST) were initially recruited to participate in this study. Recruitment focused on these organisations due to previous participation in flood technician training. The ages of those who participated in training ranged from 22 to 51 years.

### 2.2.1. Flood technician training

The training that has been conducted for members of both SLSGB and SLST is based on the program developed in England after a major flood in 2007 (see Table 1). A pilot team was set up under the then UK Government Department of Environment, Farming and Rural Affairs (DEFRA) National Flood Rescue Enhancement Project, to understand the requirements and necessities for a volunteer team to operate in collaboration with the statutory emergency services. The outcome led to further teams being developed across the United Kingdom. Standards for training and equipment are outlined in the DEFRA Concept of Operations Document [14]. Furthermore, the boats used are in accordance with the Maritime Coastal Agency Rescue Boat Code [15].

In addition, since 2017 SLSGB operate five flood rescue type B teams (Boat) that are on the DEFRA National Asset Register with a further two teams supporting regional areas for flood (currently DEFRA type C). In line with the DEFRA Concept of Operations the team with flood rescue awards must be able to demonstrate continual personal development, which has to be audited to show competency whilst holding the award [14]. The training must include both policy, risk management, planning, and in water training to a rating of that shows enough hydrological features.

In Australia, the initial interest arose following a flood emergency request in June 2016 from Emergency Services to SLST in Hobart, Tasmania. This experience highlighted a strong level of interoperability, but also suggested that there was more to learn and that Surf Life Saving Great Britain had significant experience and development in applying their skills and knowledge in swift water and flood environments. SLST organised a Flood Rescue Forum in November 2017 and hosted delegates from other Surf Life Saving (SLS) branches in Australia, SLS New Zealand, State Emergency Services New South Wales, and Victoria Police.

The skills and knowledge developed through the experience from England could be applied in the Australian context with minimal change due to the common skillsets and equipment that is utilised by the members of both lifesaving organisations. The proven impact from the English application was also instrumental in the training being accepted and adopted by the wider emergency response personnel from the police, rescue and emergency services in Australia.

### 2.2.2. England

Potential respondents from SLSGB were recruited via email. The approach was coordinated through the six SLSGB flood rescue unit managers whose email addresses were accessed via the SLSGB membership information system by author AM. Information about the study (including the information sheet and a link to the survey) was sent to each unit manager who then provided this (via email) and asked if their SLSGB search and rescue teams involved in basic water rescue response (typically 10–16 team members per unit) would be interested in volunteering for the study. Follow-up reminders, again coordinated through the Unit Managers, were sent 4–6 weeks after the initial request.

### 2.2.3. Australia

Recruitment initially commenced with an email to Surf Life Saving Tasmania (SLST) lifeguards due to their previous participation in flood technician training. The information sheet and a link to complete the survey was sent out via the SLST training and community programs manager.

Given the potential broader engagement and involvement of surf life savers nationally with flood activity and flood technician training, after several weeks of recruitment via SLST, recruitment was broadened to be national in scope. The information sheet and link to the survey was emailed to Surf Life Saving Australia (SLSA) lifesaving and lifeguard managers around the country by the SLSA general manager of coastal safety. Reminders were sent by both SLST and SLSA approximately two weeks after the initial invitation was sent.

## 2.3. Data collection, cleaning, coding and analysis

The survey was open online for three months, opening in August 2021 and closing in October 2021. Upon closure of the survey, the raw data were downloaded from Qualtrics in SPSS format. Responses were loaded into SPSS V25 for analysis. Free text and open-ended responses were thematically coded for ease of analysis by two researchers using the multi-phase approach described by Braun and Clarke [16]. Select quotes were included verbatim to contextualise responses; these were presented alongside the respondent's sex, country of residency, age group and grouped years of experience as a lifeguard).

Age group was coded into five categories for ease of analysis (19–29 years; 30–39 years; 40–49 years; 50–59 years; and 60 years and older). Responses regarding number of floods attended prior to training was recoded into 'yes – attended floods without training' and 'no – have not attended floods without training'. Percentage of flood response across pre-flood mitigation, flood response, and post-event activities were recoded into two categories: <50%; and 50% or more. Statistical analysis comprised descriptive and chi square analysis ( $p < 0.05$ ), as well as thematic coding of free text responses. Chi square analysis was used to explore significant associations in responses based on previous experience responding to floods and country of residence.

## 2.4. Ethics

This study received human research ethics approval from the University of Southern Queensland (H21REA073 v1).

### 3. Results

In total, 46 respondents attempted the survey. Of these, 44 completed the survey, with the remaining two incomplete responses removed from the dataset used for analysis.

#### 3.1. Demographics

Of the 44 complete responses, 40 (93.0%) were male and 26 (60.5%) resided in Australia. The age of respondents varied from 19 to 68 years (mean age 46.3 years [SD = 13.5]). The largest proportion of respondents had been lifeguards for 16 years or more (n = 27; 61.4%) (Table 2).

#### 3.2. Flood response experience and capacity

Sixty six percent of respondents (n = 29; 65.9%) self-reported having ever responded to flooding in their country. There were no significant differences in having responded to flooding based on country of residence ( $X^2 = 0.583$ ; p = 0.445). This was most commonly one flood event (n = 7; 24.1%) or two flood events (n = 7; 24.1%) with one respondent having responded to 20 flood events, and another respondent more than 50 flood events.

Those who had previously responded to flood events were asked if this was in a formal capacity (i.e., as a lifeguard) or an informal capacity (as a bystander) or both. Respondents commonly responded in a formal capacity (n = 22; 50.0%) or in both formal and informal capacities (n = 5; 11.4%). Regardless of whether respondents had been involved in flood response in a formal and/or informal capacity, respondents were asked if they had responded to floods prior to receiving training. Fifteen respondents indicated they had responded to floods prior to receiving flood training. Respondents most commonly reported attending in the flood response (i.e. flood rescue) phase (n = 28 respondents) and reported 50% or more of their flood involvement comprised such activities (Table 3).

#### 3.3. Individual perceptions of lifeguards' role in flood response

Regardless of whether respondents self-reported having been involved in flood response previously, all were asked about their individual perceptions of lifeguards' involvement in flood response. Respondents were initially asked to identify the skills they possessed as lifeguards that would be most beneficial in a flood scenario. Rescue skills (n = 43; 97.7%), awareness of water conditions, and radio communication protocols (n = 40; 90.9% respectively) were the three most commonly chosen skills (Table 4). Thirteen respondents (29.5%) provided additional free text responses, the most common being first aid and CPR skills (n = 4); emergency management (n = 3); teamwork (n = 2); leadership (n = 1); multi-agency collaboration (n = 1); risk assessment (n = 1); search and rescue (n = 1); and swift water training (n = 1).

Respondents were asked to rank the flood phases (pre-flood mitigation, flood response, and post-event response) from 1 (most impactful) to 3 (least impactful) in terms of which phases lifeguards could have the greatest impact. Eighty-six percent of respondents (n = 38; 86.4%) ranked flood response as the phase where lifeguards could be the most impactful. This was followed by pre-flood mitigation, ranked second most impactful by 21 respondents (47.7%) and post-event response, ranked third by 24 respondents (54.5%).

When asked if respondents believed lifeguards were an asset in flood response, 42 respondents (95.5%) replied yes. One respondent replied don't know and a further respondent qualified their 'other' response as follows: "Without any training of no benefit. With training would need to be part of a controlled response under the control of emergency services" (Male, Australia, 50–59 years of age, 16 years or more experience as a lifeguard).

If respondents believed that lifeguards were an asset in flood response, they were asked to expand on their answer in a free text

**Table 2**  
Demographics of survey respondents (N = 44).

	Number (n)	Percent (%)
Total	44	100.0
Sex		
Male	41	93.2
Female	3	6.8
Age group		
19–29 years	5	11.4
30–39 years	9	20.5
40–49 years	10	22.7
50–59 years	15	34.1
60 years and older	5	11.4
Country of residence		
Australia	27	61.4
England	17	38.6
Years as a lifeguard		
1–2 years	1	2.3
3–5 years	1	2.3
6–10 years	7	15.9
11–15 years	8	18.2
16 years or more	27	61.4

**Table 3**  
Number and proportion of respondents' flood response by type.

Flood phase actions	<50%		≥50%	
	n	%	n	%
Pre-flood mitigation (i.e., sand bagging, pre-emptive evacuations) (n = 16)	14	87.5	2	12.5
Flood response (i.e., flood rescues) (n = 28)	16	57.1	12	42.9
Post-event response (i.e., clean up) (n = 15)	13	86.7	2	13.3

**Table 4**  
Number and proportion of respondents who chose skills listed as being an advantage as lifeguards when responding to flooding.

Skills	N	%
Awareness of water conditions	40	90.9
Boat crewing	39	88.6
Radio communication protocols	40	90.9
Rescue skills	43	97.7
Swimming skills	38	86.4
Use of ropes	36	81.8
Other	13	29.5

response. Coded responses identified several commonly occurring themes. An overarching theme (n = 13 respondents) comprised lifeguards as possessing relevant skills and abilities. Expanding upon the importance of this, one respondent stated: "*Lifeguards already have a great skill base that often other flood rescue teams do not have. Also, I believe it takes less training to enable Lifeguards to carry out flood rescue vs someone not from a water rescue background, many of our skills are transferable*" (Male, England, 20–29 years of age, 11–15 years experience as a lifeguard).

Swimming skills and water knowledge was a prominent theme mentioned by 18 respondents. In support of this theme, one respondent stated: "*Surf Life Savers are consistently and routinely required to demonstrate physical ability negotiating complex aquatic environments and performing water based rescues. Due to the highly dynamic yet somewhat predictable nature of floodwater and swift water this makes surf life savers ideal for this role*" (Male, Australia, 19–29 years of age, 1–2 years experience as a lifeguard).

Another respondent noted: "*Strong swimming skills and water knowledge can make the difference in a swift water situation between getting out of danger and being swept away*" (Male, Australia, 19–29 years of age, 6–10 years experience as a lifeguard).

Other commonly identified themes included being trained and experienced with rescue procedures and following chain of command (n = 7 respondents); possessing communication skills (n = 5); access to and skills in using relevant equipment (n = 4); and fitness (n = 3).

One respondent summed up the diversity of factors for utilising lifeguards in flood mitigation and response: "*They are generally very comfortable in the water and hostile environments. Used to dealing with emergencies and caring for people. Have skills to assist someone with first aid, resuscitation, rescue. Also have good skills with working with others, radio comms and are generally fit and healthy*" (Male, Australia, 50–59 years of age, 16 years or more experience as a lifeguard).

Respondents were also asked if they felt lifeguards could be better utilised in flood mitigation and response. Thirty-four respondents (77.3%) stated yes. Two 'other' responses believed lifeguards could be better utilised in a response phase only and only if trained. There was no significant difference in responses based on the having previously responded to flooding ( $X^2 = 0.090$ ;  $p = 0.765$ ) nor based on country of residence ( $X^2 = 3.251$ ;  $p = 0.071$ ).

Those who believed lifeguards could be better utilised in flood mitigation and response were invited to expand on this belief via a free text response. Thematically coding of the 32 responses, some of which spanned multiple themes, highlighted several key themes, including recognition of relevant skills and equipment (15 responses); being utilised earlier in the flood response (6 responses) and as an asset to bolster the existing workforce (6 responses). Other responses included: the need for formal recognition and engagement (i.e., including lifeguards in emergency management acts under flood response) (3 responses), to conduct education about floods in high-risk locations (1 response) and to gain experience to assist in future events (1 response). Three respondents cautioned lifeguards could be better utilised only after specific flood training and provision of the relevant equipment.

A core theme was recognition of the relevant skills and equipment that surf lifeguards possess that are extremely relevant in situations of flooding. As one respondent said: "*Surf rescue boats are designed to be used in shallow water and so are a good asset in a flood response and they come with skilled drivers and crew. Surf life savers are generally compassionate, fit, skilled individuals who above all possess a desire to help others. They can be used for retrievals, rescues, search and rescues and surveillance. Surf Life savers are uniquely positioned as prominent advocates for aquatic safety, so are ideal as spokespersons and advocates for safety in floods and rivers. Generally respected and well liked*" (Male, Australia, 19–29 years of age, 1–2 years experience as a lifeguard).

Another respondent discussed the bi-directional role of skills and training for both lifesaving and flood mitigation and response: "*I'm a lifeguard and flood tech, though not been called out for flood. Water confidence is huge in lifeguards, and experience of working fast in water emergency situations. My lifeguard skills have improved from doing flood training*" (Male, England, 40–49 years of age, 11–15 years experience as a lifeguard).

Another key theme was the utilisation of lifeguards to support and bolster existing flood capacity. As one respondent said lifeguards

could “form an integral response with other agencies, help with education in high risk areas prone to flooding” (Male, England, 50–59 years of age, 16 years or more experience as a lifeguard).

A respondent also alluded to tensions between emergency services; stating lifeguards “Can be used as a tactical asset to local flooding due to knowledge of local topography and local crisis management. Nationally can be deployed with the appropriate skill set which is normally superior to Fire & Rescue with notably the ability and confidence in an Aquatic environment” (Male, England, 50–59 years of age, 16 years or more experience as a lifeguard).

Several respondents identified the need for lifeguards to be brought into flood mitigation and response earlier. One respondent stated lifeguards should be the “first point of contact of police in any water emergency” (Male, Australia, 40–49 years of age, 16 years or more experience as a lifeguard).

Another stated: “Could support [blinded] with pre-flood and evacuation activities. Could be used more in flood situations. Are largely overlooked” (Male, Australia, 40–49 years of age, 16 years or more experience as a lifeguard).

### 3.4. Organisational responses

In the organisational responses section of the survey, respondents were asked which organisations they collaborate with in flood response. Police (n = 17; 38.6%) and fire (n = 12; 27.3%) were the two most commonly listed organisations. Many respondents identified the importance of working with all organisations. Additional organisations identified included 4 × 4 vehicle providers, doctors, the Royal National Lifeboat Institution (RNLI), and mountain rescue.

As a concluding question, respondents were asked if they had any further comments they would like to provide about lifesaving and flood mitigation and response. Many respondents agreed greater involvement of lifeguards in flood mitigation and response was sound with one respondent responding: “Surf Life Saving has a lot to offer with rescue boats and highly skilled members, however also have people for first aid, radio comms through to support for welfare of people” (Male, Australia, 50–59 years of age, 16 years or more experience as a lifeguard).

The need for increased capacity in the face of more disasters was also mentioned by one respondent: “With forecasts of increasing natural disasters, lifesavers provide a huge surge capacity its of skilled and trained members with transferable ability/equipment to support and save lives” (Male, Australia, 40–49 years of age, 16 years or more experience as a lifeguard).

Several respondents felt the involvement of lifeguards in flood response and mitigation was obvious with one saying: “It’s a no brainer ...” (Male, Australia, 30–39 years of age, 11–15 years experience as a lifeguard).

Another respondent stating that in lifeguarding and flood response, there is a “huge cross over in skills” (Male, England, 40–49 years of age, 11–15 years experience as a lifeguard).

Several respondents identified the need for greater recognition of lifeguards with one respondent stating: “It would seem that it is only the command structure that does not recognise the advantage of lifeguard involvement. A system exists that works and is reluctant to change. In a flood, everyone is equal, it is only the skill set of the individual that changes and lifeguard involvement would enhance this scope” (Male, England, 50–59 years of age, 16 years or more experience as a lifeguard).

Another respondent remarked on organisational challenges impeding collaboration: “Utilising different agencies, their skills, people and equipment are essential in saving lives. Put egos to the side and work together” (Male, Australia, 40–49 years of age, 16 years or more experience as a lifeguard).

Several other respondents were cautious regarding lifeguard involvement in flood mitigation and response, noting the need for appropriate flood training. One respondent stated: “Many attributes of Lifeguards cross over to that of Flood Rescue, it is the specialised training that is required to adapt them to the flood mitigation and response environment” (Male, England, 30–39 years of age, 16 years or more experience as a lifeguard).

Another respondent stated: “Being a lifeguard provides a base set understanding of the water environment it does not however make people flood responders and to fully utilize a lifeguards’ water based skill set it needs to be adapted and understood in flood training prior to being applied in anger/response. asking guards to respond without training has the potential to provide a false sense of security in a dangerous and unpredictable environment” (Male, Australia, 30–39 years of age, 16 years or more experience as a lifeguard).

The maintenance of this training was also identified as one respondent said: “The skills need to be formally maintained with regular cadence training, not left to individual members to maintain. Professional emergency services constantly ensure they are ready and trained for responses. This is key to lifeguards being a useful asset and being respected by authorities” (Male, Australia, 50–59 years of age, 16 years of more experience as a lifeguard).

One respondent also identified the organisational challenge in training provision and deployment stating: “Lifeguards have great skills in sea conditions but need significant further practical training and experience to operate effectively in swift water. The critical rescue phase of floods where flood-trained lifeguards are most useful is often sudden and brief. Better organisational structures for rapid deployment could amplify their effectiveness” (Male, England, 60 years or older, 6–10 years experience as a lifeguard).

Conversely one respondent cautioned about overreliance on surf lifeguards as “There can be a conflict of commitment to both as most of [us] have restrictions on our time” (Male, England, 40–49 years of age, 16 years of more experience as a lifeguard).

On the topic of training, a respondent identified gaps in lifesaving response to floods in Australia, compared to the UK: “Lifeguards would be beneficial provided they receive proper accredited training and maintain their skills. There is a need to have a standard Nationally with equipment and training. Lifeguards would need to operate to the same and work at the direction of the lead controlling authority. UK has a National Standard for Flood Response and Responders” (Male, Australia, 50–59 years of age, 16 year or more experience as a lifeguard).

## 4. Discussion

Floods are predicted to increase in frequency and severity due to climate change [4], and demands on services could exceed capacity. Increased demands for assistance, will require a coordinated approach to dealing with expanded flood mitigation and a responsive workforce [17]. A workforce that might be sourced through community volunteers with appropriate training and experience [8].

Lifeguards, whether they are volunteers or paid are traditionally tasked and attuned with the prevention of drowning [18]. However, lifeguards also represent a workforce which may provide additional capacity for flood mitigation and response [19,20]. In this study, we aimed to explore the experiences, beliefs and attitudes of surf life savers from Australia and England regarding flooding and lifeguard involvement beyond the expected emergency response organisations.

Our respondents overwhelmingly identified the many transferrable skills which lifeguards possess may be beneficial in flood mitigation and particularly a response phase [20]. These included awareness of water conditions, rescue and swimming skills, rescue boat operation and crewing, radio communication protocols, and use of ropes and rescue equipment. Additionally, our respondents also identified as a disciplined team that understood the risks and could work with, and alongside, emergency statutory teams. Lifeguard fitness was also identified as another transferrable skill, given the physical demands placed on lifeguards when rescuing casualties [11,21,22], which is vital given the physical demands of flood rescue [23].

Several respondents however, did caution against the involvement of lifeguards in flood mitigation and response prior to the provision of flood-specific training and equipment. Respondents cautioned against the lack of generalisability between coastal water environments and swift water scenarios, urging specific swift water training and/or lifeguards playing a more supportive role for swift water technicians. Of concern, among the respondents who had previously participated in flood management, 52% had done so prior to having received flood training. As has been documented in the use of spontaneous volunteers in flood management, a lack of training produces safety and legal concerns [24].

Respondents highlighted interoperability challenges with tensions between the varied organisations tasked with flood mitigation and response. Such tensions have previously been identified [25], including as a factor which complicates rescues of people who have driven into floodwater in Australia [26]. Cross-organisational collaboration has been identified as a means of improving emergency management and resilience [27]. Such collaboration, as well as decentralisation and broader engagement in decision making [28], could address concerns identified by respondents regarding appropriate and timely use of lifeguards during times of flood, particularly given the often volunteer nature of their work and the flood phases where their skills would be of most use. Similarly, more formal involvement of appropriately trained and equipped lifeguards in flood management may also go some way towards addressing the lack of recognition of the sector's relevant skills and abilities in flood response, which was a concern raised by several respondents.

### 4.1. Strengths and limitations

This study is the first of its kind to explore experiences and beliefs around flood mitigation and response among lifeguards from two countries covering both the northern and southern hemispheres. It identifies a range of opportunities and challenges regarding the involvement of lifeguards in flood mitigation and response. The results should be considered within the context of several limitations. Respondents to this study comprise a convenience sample only, and responses should not be considered to be nationally representative. Similarly, this research only explores the views of lifeguards (albeit some who are also trained in flood response). Further research is needed to explore lifeguard involvement in flood response from the perspective of dedicated flood mitigation and response practitioners and policy makers. Responses are heavily skewed towards males. Though there may be a higher proportion of males involved in lifeguarding and flood mitigation and response than females, research exploring female lifeguards' perceptions on this topic would be of value. As with other data collected via anonymous surveys, the responses provided may be influenced by social desirability and/or demand characteristic bias [29,30].

### 4.2. Conclusion

Lifeguards represent an untapped resource for future flood response, which is predicted to increase in frequency and severity due to climate change. This study of lifeguards from both Australia and England, has highlighted the willingness of those traditionally tasked with drowning prevention, to assist in flood mitigation and response as well as the experiences of those who already do. Despite lifeguards identifying many relevant skills that have a bi-directional impact on lifesaving and flood mitigation and response, challenges remain around interoperability and organisational structures, and the provision of flood specific training and equipment.

### Data availability

Due to the potentially identifying nature of data provided by respondents, data cannot be made publicly available. Data may be available upon reasonable request. For those interested in the data, please contact [a.peden@unsw.edu.au](mailto:a.peden@unsw.edu.au).

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### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to



influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdr.2022.103013>.

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