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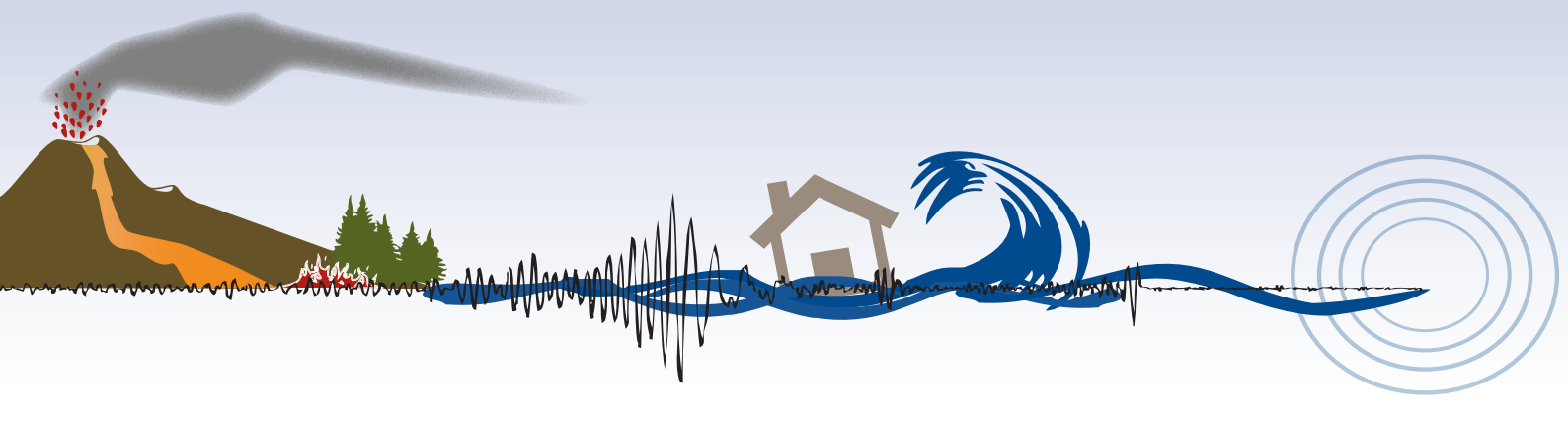

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Does a disaster worsen anxiety when you are already anxious? Psychological consequences following exposure to a M7.1 earthquake in an outpatient anxiety disorder population

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Abstract

Research of clinical patients with a pre-existing psychological disorder involved in a disaster is limited. This study investigated relationships between pre- and post-earthquake psychopathology (i.e., anxiety, depression, and posttraumatic stress), peritraumatic distress, work and social impairment, perceived support post-earthquake, and personality dimensions in an outpatient, anxiety disorder population. Thirty-seven patients with pre-existing anxiety disorders completed standard clinical assessments pre-earthquake. They then completed a second set of questionnaires 3 months after exposure to the 2010 Christchurch, Aotearoa New Zealand, earthquake. Bivariate correlations on the variables determined what relationships were present, and paired samples t-tests assessed differences in pre- and post-earthquake anxiety, depression, and alcohol and drug consumption as well as relationships with peritraumatic distress, posttraumatic stress, and personality variables. Significant relationships were found between pre-earthquake psychopathology, peritraumatic distress, post-earthquake psychopathology, and impairment. Paired samples t-tests demonstrated anxiety and depression scores were significantly lower post-earthquake. However, prior anxiety and depression, as well as peritraumatic distress, were significantly associated with post-earthquake psychopathology, including posttraumatic stress and impaired work and social functioning. There were no differences between pre- and post-event alcohol and drug consumption. The personality dimensions of harm avoidance, self-directedness, and persistence significantly associated with post-disaster anxiety and depression. Promisingly, post-earthquake perceived support was significantly negatively correlated with depression and posttraumatic stress.

Keywords: *Anxiety, depression, posttraumatic stress, peritraumatic distress, personality temperament, earthquake*

The negative effects of a disaster triggered by a natural hazard event (hereafter termed disaster) on psychological functioning include risk for posttraumatic stress disorder (PTSD), depression, generalised anxiety disorder (GAD), panic disorder, and elevated levels of distress (Dorahy & Kannis-Dymand, 2012; Morganstein, & Ursano, 2020; Neria et al., 2008; Norris et al., 2002; Reifels et al., 2017; Warsini et al., 2014). Prevalence of mental health issues can be two to three times higher in disaster-affected populations than that of the general population (Math et al., 2015). Research on the psychological sequelae of disasters has predominantly examined effects on the general population and only a limited number of studies have investigated the impact of disasters on those with pre-existing psychological disorders.

To date, limited evidence suggests that pre-existing mental health problems increase the risk of developing post-trauma psychopathology following a disaster. For example, Hurricane Katrina (2005) survivors who were outpatients of a psychiatric clinic (N = 156) experienced significantly increased depressive symptoms 1 month post-hurricane (McLeish & Del Ben, 2008). Variables that predicted depressive symptoms included exposure to television coverage of the looting that occurred in New Orleans post-hurricane and the duration without electricity. Posttraumatic stress disorder symptoms following the hurricane were predicted by using television as a coping strategy and time spent watching televised looting.

An investigation of male veterans with (n = 249) and without (n = 250) pre-existing psychological disorders prior to Hurricane Katrina showed that those with pre-existing disorders were 6.8 times more likely to develop a new psychological disorder in contrast to those without pre-existing disorders (Constans et al., 2012). Those with pre-existing PTSD, schizophrenia, or affective disorders (depression or bipolar) were 11.9, 9.1, and 4.4 times more likely, respectively, to develop new disorders. Seventy-two percent of those with a pre-existing disorder developed a new psychological disorder following the hurricane, in contrast to only 31% of those with no pre-existing disorder. Of those with pre-existing disorders who developed a new disorder post-hurricane, 32% developed depression and 23% developed PTSD.

In contrast, Bystritsky et al. (2000) reported that patients with panic disorder (n = 22) and obsessive-compulsive disorder (OCD; n =19) did not experience acute worsening of their panic disorder or obsessive-compulsive symptoms in the week following the Northridge Earthquake (California, 1994, M6.9). However, patients in the panic disorder group experienced significantly increased general anxiety and depression scores compared to the OCD group. That is, core diagnostic OCD or panic symptoms did not worsen but general anxiety and depressive symptoms did for the panic disorder patients.

An earlier study (Stout & Knight, 1989) explored the emotional and cognitive impact of a serious flood on 121 psychiatric inpatients who were evacuated and relocated for 2 weeks. At 2 months post-evacuation, of those patients who returned a follow-up “flood impact” survey (n = 19), only three experienced ongoing fears or dreams about the flood. Based on qualitative survey responses from these patients, Stout and Knight reported that post-flood the emphasis in therapy on developing coping skills, as well as patients’ sense of unity with staff and other patients, appeared to buffer an exacerbation of symptoms. However, the low follow-up response rate limits the conclusions of the study.

One study on the impact of the Great East Japan earthquake (2011) on psychiatric patients found that only 5.4% of the 294 outpatients demonstrated a change in symptoms at 2 months post-event: 4.1% had worse symptoms and 1.4% improved (Funayama & Mizushima, 2013). A further study on the same event investigating 1,273 psychiatric outpatients at 1 month post-earthquake found that most patients experienced minimal change in their psychological disorder; however, those with bipolar (23.4%), anxiety, or somatoform disorders (13.8%) were more likely to experience increased symptoms (Matsumoto et al., 2014).

In a review of 33 patients with a severe mental illness who were exposed to the Canadian Ice Storm (1998) and endured several days without power and displacement from their homes, those with existing psychological disorders were no more likely to be admitted to hospital during the storm than at other times, with only one person requiring hospitalisation due to storm-related distress (McMurray & Steiner, 2000). The remainder of the patients reported that they experienced no significant distress. The authors suggested that psychiatric patients may not have experienced significant difficulties during and after the crisis because the integrity of the service delivery structure was maintained, and patients were assured continued access to psychiatric care. However, there may have been more complex situational factors responsible for this outcome (e.g., access to support and/or food).

In summary, research exploring the psychological impact of disasters on mental health patients demonstrates that pre-existing psychopathology increases symptom severity in some situations, although not uniformly. Likewise, some diagnostic groups may be more likely to have elevated distress compared to others. Many of the previous studies have relied on data obtained well after the disaster event, with very few investigating the impact immediately following the event. Further, there is very little known about the effects of disasters on patients with pre-existing psychological disorders who were receiving psychological treatment at the time of the event, particularly an earthquake.

Research in the general population (Ozer et al., 2003) as well as with survivors of the 2010 Canterbury, Aotearoa

New Zealand, earthquake demonstrated *peritraumatic distress* (distress experienced during and immediately after a traumatic event) as a factor in post-trauma outcomes (Dorahy & Kannis-Dymand, 2012). Similarly, Thomas et al. (2014) noted that personality traits may play a complex role in the development of posttraumatic symptomology following trauma and peritraumatic distress. Specifically, temperament appeared to be more related to the intensity of symptomology, whereas the interpersonal component related more to the duration of experiencing distress. Further, a recent review suggested that personality temperaments such as harm avoidance, behavioural inhibition, hypervigilance, and trait anxiety contribute to PTSD symptomology following trauma (Allen et al., 2019).

The Current Study

At 4.35 a.m. on September 4th, 2010, the New Zealand city of Christchurch was struck by a M7.1 earthquake (i.e., the Darfield earthquake). This earthquake caused significant physical damage to the city's buildings, including loss of homes and businesses, but no deaths occurred. In the period following the earthquake, power and water were unavailable for many days (Dorahay & Kannis-Dymand, 2012). Between September 2010 and February 2011, Christchurch experienced a further 4,000 aftershocks, including a M5.9 earthquake on December 26th, 2010 (GeoNet, 2011; Stramondo et al., 2011). Previous investigations of the Christchurch community following the September 2010 earthquake documented elevated levels of depression, GAD, and acute stress disorder (Kannis-Dymand et al., 2015).

This exploratory study examined the effects of the 2010 Darfield earthquake on outpatients attending a specialist anxiety disorder service, who had a diagnosis of at least one primary anxiety disorder at the time of the disaster. In addition, the study investigated the relationships between pre-earthquake psychopathology (i.e., anxiety and depression), distress during the earthquake (i.e., peritraumatic distress), psychopathology following the event (i.e., anxiety, depression, and posttraumatic stress symptoms), and impairment following the event. We also evaluated the relationship between personality and post-earthquake psychopathology, as well as situational factors including support immediately following the earthquake, perceived threat of the earthquake/aftershocks, and concern over the uncontrollable nature of the earthquake/aftershocks. Substance and alcohol use pre- and post-earthquake was also evaluated.

Method

Participants

The sample (N = 37) comprised 67.6% females, aged 21 to 63 (M = 36 years, SD = 13.29). The mean age of male participants was 38 years (range 18-63, SD = 13.91). Fourteen (37.8%) participants were single, 19 (51.4%) were married or in committed relationships, and four (10.8%) were divorced or separated. Thirty-five percent were parents. All participants had a diagnosis of at least one DSM-IV-TR disorder (American Psychiatric Association, 2013) and were under the care of the Anxiety Disorders Service (ADS), Canterbury District Health Board, Christchurch, New Zealand, before the earthquake. Specifically, 51.4% of the sample was diagnosed with GAD, 13.5% were diagnosed with depression, 10.8% were diagnosed with OCD, 10.8% were diagnosed with a specific phobia, 5.4% were diagnosed with bi-polar disorder, 2.7% were diagnosed with panic disorder (with agoraphobia), and 5.4% were diagnosed with multiple disorders.

Measures

Peritraumatic distress. The *Peritraumatic Distress Inventory* (PDI; Brunet et al., 2001) is a 13-item self-report measure which quantifies emotional distress during and immediately after a traumatic event. Instructions for the PDI include rating the extent to which each item (e.g., "I felt sadness and grief") was experienced on a 5-point Likert-type scale (0 = Not at all to 4 = Extremely true), resulting in a total score between 0 and 52, with higher scores indicative of elevated distress. The PDI has good internal consistency (α = .83), test–retest reliability, and convergent and divergent validity (Brunet et al., 2001; Cénat & Derivois, 2014). The instructions for the PDI were modified to ask participants specifically about their experience during the earthquake.

Depressive symptoms. The *Beck Depression Inventory* (BDI-II; Beck et al., 1996) is a 21-item self-report measure for screening and assessing the severity of depressive symptoms over the past fortnight. Responses to each item consist of four statements ranging in score from 0 to 3, arranged in increasing severity about a particular symptom of depression (e.g., "I do not feel sad"; "I am so sad and unhappy that I can't stand it"). The 21 items are summed to obtain a total score. A total score of 0 to 13 is considered minimal range, 14 to 19 is mild, 20 to 28 is moderate, and 29 to 63 is severe. The BDI-II has been reported to be highly reliable with strong psychometric properties (Beck et al., 1996; Segal et al., 2008).

Anxiety symptoms. The *Beck Anxiety Inventory* (BAI; Beck et al., 1988) is a 21-item scale for measuring the severity of self-reported anxiety. Participants rated the extent to which each item (e.g., "unable to relax") was experienced during the previous week, using a scale ranging from 0 to 3 (0 = Not at all to 3 = Severely). A total score is obtained by summing all items; scores of 0 to 7 are considered minimal range, 8 to 15 is mild, 16 to 25 is moderate, and 26 to 63 is severe. The BAI is psychometrically sound and has high internal consistency (ranges from .92 to .94) and test-retest (1 week interval) reliability (.75; Beck et al., 1988).

Posttraumatic stress. The *PTSD Checklist – Civilian version* (PCL-C; Blanchard et al., 1996) is a 17-item questionnaire measuring posttraumatic stress symptomology. Participants rated the extent to which they had been bothered in the last month by items (e.g., "repeated disturbing memories, thoughts or images of a stressful experience from the past") using a 5-point Likert-type scale (1 = Not at all to 5 = Extremely). The PCL-C has demonstrated good psychometric properties, validity, and excellent internal consistency (α = .90; Gelaye et al., 2017).

Personality factors. The *Temperament and Character Inventory* (TCI-R; Cloninger et al., 1994) is a 240-item self-report questionnaire measuring seven dimensions of personality, including four temperament dimensions (i.e., novelty seeking, harm avoidance, reward dependence, and persistence) and three character dimensions (i.e., self-directedness, cooperativeness, and self-transcendence). Participants rated the degree to which each item was true or false, using a Likert-type scale ranging from 0 to 5 (0 = Definitely false to 5 = Definitely true); scores were obtained for each subscale. The factorial structure of the TCI-R is well-defined (Cloninger et al., 1994). All dimensions have consistently obtained high internal consistency (α ranging from .79 to .91; Martinotti et al., 2008).

Work and social impairment. The *Work and Social Adjustment Scale* (WSAS; Mundt et al., 2002) is a five-item self-report questionnaire measuring the degree of impairment individuals were currently experiencing at work and socially. Each item (e.g., "Because of my mental health, my ability to work is impaired.") is rated on an 8-point scale (1 = Not at all to 8 = Very severely), with higher scores indicating higher levels of impairment. However, for this study items were reworded to target the mental responses to the earthquake, rather than general mental health (e.g., "Because of my reactions to the earthquake and aftershocks, my ability to work is impaired."). The WSAS has good internal consistency (α = .70 to .94), test-retest reliability (r = .73), and associations with existing measures and psychopathology (e.g., depression, obsessive-compulsive symptoms; Mundt et al., 2002).

General information. Age, gender, marital status, and the number of children were included. Further items evaluated were: the support they perceived they received after the earthquake, rated using a 5-point scale (1 = Not at all to 5 = Excellent); how concerned they were by the uncontrollable nature of the earthquakes and aftershocks (1 = Not at all to 5 = Extremely); their level of perceived threat during the earthquakes and aftershocks (1 = Not at all to 5 = Extremely); and pre- and post-earthquake consumption of alcohol and illicit drugs per week (1 = None to 5 = 20+ drinks/drugs).

Procedure

Clinical assessments were completed by the ADS multidisciplinary clinicians, as per standard practice, when the patients were accepted to the outpatient service for treatment prior to the earthquake. This included the diagnosis of a present psychological disorder and additional assessment through self-report questionnaires (i.e., the BDI-II and the BAI). All participants were under the care of an ADS clinician when the earthquake occurred on September 4th, 2010. Following institutional ethics committee approval, participants were invited to complete a second set of self-report questionnaires (i.e., BDI-II, BAI, PDI, TCI-R, PCL-C, WSAS, and general information items) in December 2010, 3 months post-earthquake. This occurred during planned appointments with patients in December 2010. Patients without scheduled appointments during this period were contacted by their clinician, informed about the research, and invited to participate by completing the questionnaires, returning via a prepaid envelope. Patients were informed that participation in the study would not affect their treatment at the ADS, that participation was voluntary, and they could withdraw from the study at any time.

Data analyses. Data were analysed using SPSS (Version 23). All variables were checked for normality, linearity, and spread. To investigate relationships between the BDI-II, BAI, PDI, TCI-R, PCL-C, WSAS, and general information items (i.e., concern over uncontrollably and threat; alcohol and substance use), bivariate correlations were performed. Pairwise cases were excluded except for the correlations involving the TCI-R, as cases had

missing data exceeding 10% (Osborne & Overbay, 2004); a listwise removal procedure was used. The small sample size was considered when planning the analysis; sample sizes of 25 (David, 1938) and 30 (Field, 2013) are adequate for correlational analyses, with consideration to the limitation of detecting smaller effects. To investigate differences between drug and alcohol consumption and psychopathology (anxiety, depression) between pre- and post-earthquake scores, four paired sample *t*-tests were performed. Correlations were interpreted using Cohen's (1988) suggestions (.10 = *small*, .30 = *medium*, .50 = *large*).

Results

Descriptive statistics showed that all variables were of appropriate normality, linearity, and spread (see Table 1). Of note, post-earthquake, 11 participants had PCL-C scores indicating PTSD, 6 participants had BAI scores in the severe range, and 6 had BDI-II scores in the severe range.

Relationships between Psychopathology, Peritraumatic Distress, and Impairment

All data conformed with assumption tests, and pairwise cases were excluded due to non-random data removal. Bivariate correlations showed that pre-earthquake anxiety had a significant medium-to-strong positive relationship with pre-earthquake depression (r = .54), peritraumatic distress (r = .46), post-earthquake anxiety (r = .72), and post-earthquake depression (r = .40). Pre-earthquake depression had a significant medium-to-strong relationship with post-earthquake anxiety (r = .42), post-earthquake depression (r = .64), and PTSD (r = .52). Peritraumatic distress strongly and positively related to post-earthquake anxiety (r = .59), posttraumatic stress (r = .66), and impairment following the earthquake (r = .59). Finally, post-event psychopathology factors (anxiety, depression, and posttraumatic stress) were significantly correlated and had a moderate positive relationship with impairment (rs = .50, .40, and .44 respectively). The means, standard deviations, internal consistency, and bivariate correlations can be found in Table 1.

Relationships with Temperament and Characteristic Dimensions

Regarding personality dimensions, all data conformed with assumption tests and listwise cases were excluded due to randomised missing data attributed to the length of the TCI-R, leaving a sample of 25 participants for the analysis. As per classifications suggested by Gutiérrez-Zotes et al. (2004), the mean scores for harm avoidance (M = 122.74) were considered very high, novelty seeking (M = 97.66), reward dependence (M = 96.60) self-directedness (M = 65.37) and persistence (M = 106.37) were average, and self-transcendence (M = 126.69) and cooperativeness (M = 127.56) were low. Bivariate correlations showed that harm avoidance was significantly and positively correlated with post-earthquake anxiety (r = .58), persistence was negatively correlated with post-earthquake anxiety (r = -.41), and self-directedness was negatively related to post-earthquake depression (r = -.64). Posttraumatic stress did not significantly correlate with any of the temperament and characteristic dimensions. Table 2 shows the means, standard deviations, internal consistency, and bivariate correlations.

Relationships with Threat, Uncontrollability, and Support

Bivariate correlations showed that threat perception of the earthquake was significantly and positively correlated with peritraumatic distress during the earthquake (r = .67) and post-earthquake impairment (r = .42). Concern over the earthquake's uncontrollability was significantly and positively correlated with post-earthquake anxiety (r = .34) and peritraumatic distress (r = .59). Threat perception

Table 1
Descriptive Statistics and Bivariate Correlations of Psychopathology, Distress, and Impairment Variables

Variable	*M*	*SD*	*N*	α	Pre-BAI	Pre-BDI-II	PDI	Post-BAI	Post- BDI-II	PCL-C
Pre-BAI	20.68	13.07	28	-						
Pre-BDI-II	20.71	13.34	28	-	.54*					
PDI	16.05	10.24	37	.89	.46*	.22				
Post-BAI	15.28	11.87	36	.94	.72**	.42*	.59**			
Post-BDI-II	15.49	14.07	35	.96	.40*	.64**	.27	.54**		
PCL-C	32.52	11.88	25	.95	.27	.52*	.66**	.55*	.64**	
WSAS	4.65	7.98	37	.94	.29	.29	.59**	.50*	.40*	.44*

Note. *p < .05; **p =< .001; reliability coefficients for pre-earthquake anxiety/depression not available, due to data loss in February 2011 earthquake. BAI = anxiety; BDI-II = depression; PDI = peritraumatic stress; PCL-C = posttraumatic stress; WSAS = work and social impairment

of the aftershocks was significantly and positively related to posttraumatic stress (r = .50), peritraumatic distress (r = .63), and impairment (r = .46). Concern over the aftershocks' uncontrollability was positively related to peritraumatic distress (r = .51). Support following the earthquake was negatively related to post-earthquake depression (r = -.39), posttraumatic stress (r = -.71), and peritraumatic distress (r = -.37). Table 3 shows the means, standard deviations, and bivariate correlations.

Changes in Alcohol/Drug Consumption and Psychopathology

All data met the appropriate assumptions for the analyses. Four paired samples t-tests results showed no significant differences in mean scores for alcohol (t(36) = 0.62, p = .539) and drug consumption (t(36) = 1.43, p = .160). However, this was not the case for psychopathology, as both anxiety (t(36) = 3.30, p = .003) and depression (t(36) = 2.14, p = .042) scores were lower post-earthquake. The means of each group, along with t-scores, are presented in Table 4.

Discussion

The September 2010 earthquake in Canterbury presented the ADS with a unique opportunity to explore the impact of a disaster on their current clinical outpatients. To our knowledge, this is one of few studies exploring pre- and post-disaster measures, as well as relationships between temperament, character, and anxiety variables in an outpatient clinical population. The purpose of this exploratory study was to investigate: a) the relationships between pre-earthquake psychopathology (i.e., anxiety and depression), post-earthquake psychopathology (i.e., anxiety, depression, and posttraumatic stress), peritraumatic distress, impairment, personality dimensions (novelty seeking, reward dependence, harm avoidance, persistence, self-transcendence, cooperativeness, and self-directedness), and situational factors (i.e., support, perceived threat, concern over uncontrollability); and b) the differences between alcohol/drug consumption and anxiety and depression measurements before and after the earthquake.

Table 2
Descriptive Statistics for Temperament and Character Variables; Correlations with Psychopathology, Distress, and Impairment

Variable	*M*	*SD*	α	Post-BAI	Post-BDI-II	PCL-C
Novelty Seeking	97.66	15.16	.63	-.23	.16	.02
Reward Dependence	96.60	17.37	.77	.05	-.09	-.18
Harm Avoidance	122.74	18.47	.80	.58*	.37	.22
Persistence	106.37	21.30	.89	-.41*	-.27	-.04
Self-Transcendence	126.69	20.56	.76	-.27	-.17	.09
Cooperativeness	127.56	17.26	.74	-.17	-.34	-.33
Self-Directedness	65.37	14.25	.71	-.34	-.64*	-.33

Note. N = 25; *p < .05; **p =/< .001; BAI = anxiety; BDI-II = depression; PCL-C = posttraumatic stress

Table 3
Descriptive Statistics of General Items and Bivariate Correlations with Psychopathology, Distress, and Impairment Variables

Variable	*M*	*SD*	*N*	Post-BAI	Post-BDI-II	PCL-C	PDI	WSAS
Initial EQ - Threat	3.27	1.45	37	.29	.10	.32	.67**	.42*
Initial EQ - Uncontrollable	3.27	1.31	37	.34*	-.06	.19	.59**	.12
Aftershocks - Threat	2.43	1.14	37	.25	.28	.50*	.63**	.46*
Aftershocks - Uncontrollable	2.70	1.08	37	.29	.08	.29	.51**	.17
Support	4.17	.89	37	-.31	-.39*	-.71**	-.37*	-.29

Note. *p < .05; **p =< .001; BAI = anxiety; BDI-II = depression; PDI = peritraumatic stress; PCL-C = posttraumatic stress; WSAS = work and social impairment

Table 4
Changes in Mean Alcohol/Drug Consumption and Psychopathology

Variable	Pre-Earthquake Mean	Post-Earthquake Mean	Mean Change	*t*	*p*
Alcohol Consumption	2.00	1.92	-0.08	0.62	.539
Illicit Drug Consumption	1.24	1.19	-0.03	1.43	.160
BAI	20.89	14.78	-6.11	3.30	.003
BDI-II	19.35	14.89	-4.46	2.14	.042

Note. BAI = anxiety; BDI-II = depression

Relationships Between Psychopathology, Peritraumatic Distress, and Impairment

Psychopathology before the disaster was associated with several post-disaster negative impacts. Pre-earthquake anxiety was shown to positively relate to peritraumatic distress experienced during the earthquakes and post-earthquake anxiety and depression. These relationships are consistent with the existing research and theory, as those with trait elevated levels of anxiety are more likely to experience higher levels of peritraumatic distress during a traumatic event (Schweizer et al., 2017). Similarly, pre-earthquake depression was positively associated with both post-earthquake anxiety and depression and posttraumatic symptomology. This may be due to depression often occurring comorbidly with posttraumatic stress (Adams et al., 2019; Rosebrock et al., 2019), because of the effect that trauma has on the individual or because of secondary factors such as loss, lack of support, or a reduction in cognitive resources.

Peritraumatic distress during the event was shown to be positively related to post-earthquake anxiety, posttraumatic stress, and impairment, supporting previous research on peritraumatic reactions (Kannis-Dymand et al., 2019; Sugar & Ford, 2012). Unsurprisingly, our results indicated that the more peritraumatic distress participants experienced during the earthquakes, the more psychopathology was present afterward. This relationship with post-earthquake psychopathology also appeared to increase work and social impairment, as evidenced by significant positive correlations between impairment and post-earthquake anxiety, depression, and posttraumatic stress. These results are consistent with earlier findings that peritraumatic distress is a strong predictor of peritraumatic symptomology (Marmar et al., 2006: Vance et al., 2018).

Relationships with Temperament and Characteristic Dimensions

There was a positive relationship between post-earthquake anxiety and harm avoidance, and a negative relationship with persistence in line with previous research (Farmer et al., 2003; Jylha & Isometsa, 2006; Marteinsdottir et al., 2004; Matsudaira & Kitamura, 2006). Individuals who score highly on harm avoidance are characterised by excessive worrying, pessimism, fearfulness, doubtfulness, and being easily fatigued (Cloninger et al., 1993). It is therefore understandable that such people high on these traits in our sample, exposed to a primary earthquake event followed by unpredictable and recurrent aftershocks, experienced higher anxiety post-earthquake. In contrast, persistent individuals have been shown to perceive frustration and fatigue as a personal challenge and do not give up easily (Rossi et al., 2011), as they are industrious and determined (Cloninger et al., 1997). This persistence may have allowed participants to re-engage with everyday life more effectively, therefore reducing their post-earthquake anxiety as indicated in the present sample.

Post-earthquake depression was negatively related to self-directedness, in alignment with previous research (Jylha & Isometsa, 2006; Lim et al., 2018). Self-directedness is a trait of self-determination involving "willpower" and the perception of an integrated organised self (Cloninger et al., 1993; 1994). Participants in the current study with more self-directedness appeared potentially more resilient to the adversity caused by the disaster and its aftermath. Posttraumatic stress was not significantly related to personality temperaments or characteristics.

Relationships with Threat, Uncontrollability, and Support

Peritraumatic distress during the earthquake was significantly, positively related to variables concerning the uncontrollability and threat of the earthquakes and aftershocks and post-disaster anxiety, posttraumatic stress, and impairment in work or social domains. Other than the expected relationships between the perceived threat and experienced peritraumatic distress, this finding suggests that concerns over the uncontrollability of the earthquake and aftershocks affect the amount of peritraumatic distress experienced, which is consistent with Dorahy and Kannis-Dymand's (2012) results.

Peritraumatic distress was negatively related to social support. Support appears to play an important role in mitigating distress, possibly by altering patients' retrospective, negative perceptions of the earthquake at the time of the research. Alternatively, those who received support may not have been as severely affected by the event. Support is known to increase self-efficacy, change coping perceptions, and provide distraction and an emotional outlet (House et al, 1988; Nurullah, 2012; Taylor, 2011). Anecdotally, the ADS staff contacted all patients under their care within days after the earthquake and provided ongoing support; however, support was not specifically quantified in this study regarding ADS clinical support versus family or community support.

Of the psychopathology variables, post-earthquake anxiety was related to concern about the uncontrollability of the initial earthquake, which is consistent with

research implicating a sense of loss of control in the maintenance and origins of anxiety (Mineka & Kelly, 1989). Posttraumatic stress was positively related to the perceived threat of the subsequent aftershocks, which is consistent with posttraumatic stress being maintained by an ongoing perception of threat. Support was negatively related to both depression and posttraumatic stress, indicating that more support was related to less symptomology. This is consistent with a multitude of literature surrounding social support and mental health (Wang et al, 2018). Finally, work or social impairment following the earthquakes was associated with perceptions of threat for both the earthquake and the aftershocks. This could possibly be from either the natural associated emergent psychological distress or from damage to participants' lives and/or property. Hobfoll's (1989) conservation of resources theory explains that people strive to attain and protect valued resources and perceive the loss of these resources as personally distressing.

Changes in Alcohol/Drug Consumption and Psychopathology

There were no significant differences in alcohol and drug intake between the two time points. This was unexpected, considering substance abuse is used by some as a method of coping with stress; however, in a study of 10 disasters it was found only 16% of the sample coped with the disaster by consuming alcohol (North et al, 2011). Given this is a clinical population with anxiety disorders who were in treatment, they may have utilised the coping strategies they had learnt in therapy to manage stress or employed their anxiety disorder-related, maladaptive strategies such as safety behaviours or avoidance.

Anxiety and depression in this outpatient sample decreased significantly from pre- to post-earthquake. This is particularly interesting and contrary to our clinical expectations. However, it is consistent with the finding that acute inpatient psychiatric admissions in Christchurch following the February 2011 earthquake were reduced (Beaglehole et al., 2015). Notably, there is substantial empirical evidence that individuals with a psychological disorder may adjust well in the post-disaster period (Bromet et al., 1982; De Lisis et al., 2003; Frattaroli, 1991; Lachance et al., 1994; Sporty et al., 1979). Earlier studies have shown that clinical populations may have a higher threshold for, or improved resilience to, trauma (Lachance et al., 1994; Sporty et al., 1979). McMurray and Steiner (2000) and DeLisis et al. (2003) suggest that psychiatric patients may not experience significant difficulties during a crisis and in the post-disaster period because the integrity of the service delivery structure was maintained, and patients were assured continued access to psychiatric care. This is consistent with the current patient sample as the ADS clinicians ensured they contacted their patients soon after the earthquake and provided continuity of care. However, there may be other reasons for resilience that were not directly evaluated in the current study but have been found to contribute in other research, such as socioeconomic advantage, employment status, and experiencing fewer disaster-related stressors in the aftermath of a disaster (Kukihara et al., 2014; Lowe et al., 2015).

Limitations

One limitation of this study is the small sample size which limits the generalisability of the results to the broader population. The small sample size combined with the high number of items on the primary measures produced a ratio of variables to cases that was less than statistically ideal; this means that more robust data analyses could not be achieved and there may have been difficulties identifying smaller effect sizes. Further, using self-report measures in place of objective measures such as structured clinical interviews means caution is required when interpreting our findings.

Of note, because the ADS building and its contents were destroyed in the February 2011 earthquake, staff only managed to salvage the present 37 participants' hardcopy de-identified surveys and there may in fact have been other surveys that were destroyed. Due to this loss of surveys and ADS's records, the exact number of patients invited to participate in this study and the documentation on who did, and who did not, take part were lost and not able to be reported here. However, considering the specificity of the clinical sample and challenging circumstances for both patients and ADS staff being involved in the disaster, the uniqueness of the sample provides significant utility for research and practitioners to consider.

Implications and Future Directions

The significant decrease in anxiety and depression after the disaster indicates that the type of psychological service provided in the aftermath and assumptions about increased distress and vulnerability need to be considered carefully. Disasters are not unusual events and often involve large numbers of people, which underscores the importance of clinicians working in post-disaster environments to accurately identify those who may have

increased risk of developing psychopathology. Doing so means that appropriately focused early intervention can be implemented to treat initial acute distress and potentially prevent long-term negative psychological consequences. Although the current study found that the intensity of pre-existing psychopathology (i.e., BAI and BDI-II scores) was associated with worse psychological functioning after the event for some participants, it also revealed that at a group level, those with a pre-existing psychiatric condition experienced less psychopathology after the traumatic event. This could potentially be due to some participants having developed effective tools for coping with stress, family support, ADS's integrity of continued care, or community or government responses that may be protective for mental health.

Identifying the key variables that influence responses to trauma in outpatients was beyond the scope of this study, but this would be an important focus for future studies. That is, what evidence-based strategies during the disaster and its aftermath (e.g., psychological first-aid, cognitive behavioural intervention) enhance resilience in outpatients under current care. Further, while we demonstrated that personality features should be considered, it is likely that a wider range of influences (e.g., social support, past experiences) are important for individuals with pre-existing psychiatric conditions who are in treatment at the time of a disaster.

In conclusion, our research demonstrated that outpatients with an anxiety disorder who experienced an earthquake and ongoing aftershocks had reduced anxiety and depression post-earthquake. However, those participants with higher anxiety and depression levels pre-earthquake were more likely to experience post-disaster anxiety, depression, and posttraumatic stress. Peritraumatic distress was also a significant factor in post-earthquake anxiety, posttraumatic stress, and work and social impairment. Personality temperaments, such as harm avoidance, self-directedness, and persistence were also demonstrated to be important in the development of PTSD symptomology, in that they may act as attenuating or agitating factors in the cognitive-affective reaction to stress. Promisingly, support and service integrity may have beneficially influenced post-earthquake depression and posttraumatic stress.

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Memories for the emotions that you and others experienced during COVID-19 lockdown

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Abstract

People's memory for emotion is often biased by their beliefs of what they should have felt. This bias may be stronger when people estimate the emotions of others. We hypothesised that people might remember a lockdown as worse than it really was for them, and, especially if their own was not too bad, they might believe that others had a worse experience. We investigated people's memories of their own emotions experienced during a national COVID-19 lockdown and the emotions they estimated others were feeling. Two hundred and thirty-four participants from Aotearoa New Zealand each completed two matched questionnaires, one during a lockdown and one after the lockdown had ended. The questionnaires asked them to rate eight different emotions, some positive and some negative, and their life satisfaction. They also rated the government's current performance on managing COVID-19 at both time points. Participants had a relatively good memory for their emotions but, as predicted, they tended to recall the lockdown experience as more negative than they had originally experienced it. They also estimated the experiences of others to be more negative than their own. These results agree with our predictions and suggest that we should be cautious about accepting people's memories of how they actually felt during disasters as accurate.

Keywords: *Biases in memory, COVID-19 lockdown, emotion of others, memory for emotion*

On March 21, 2020, Aotearoa New Zealand (NZ) began a national lockdown to stop the spread of COVID-19. The lockdown required people to stay at home and all non-essential businesses to close, therefore immensely impacting everyone's lives. In this paper, we examine the emotional and remembered emotional effects of this lockdown by exploring three main questions: How did people perceive their experience during that period? When the lockdown was over, how did they perceive the experience in retrospect? How did they perceive their experience as differing from those of others? We explore the remembered affective experience of our participants themselves and their beliefs about the affective experience of an average other person in two linked surveys, one focusing on the experience over the previous day during the lockdown and the other on the remembered/imagined experience of a typical lockdown day several months after the lockdown was lifted.

Memory is known to be a constructive process influenced by multiple factors (e.g., Bransford & Johnson, 1972; Conway, 2005; Grant & Ceci, 2000; Loftus, 1975; Shiffman, 2000; see Schacter, 2012, for a review). The constructive nature of memory also applies to people's affective memories (Burt et al., 1998; Christianson & Safer, 1995; Eich et al., 1985; Fredrickson & Kahneman, 1993; Levine, 1997; Redelmeier & Kahneman, 1996). For example, in a now-classic study, Redelmeier and Kahneman asked patients undergoing a medical procedure to report the intensity of pain in real time and then to recall the overall pain of the procedure afterwards. The results showed that the patients' retrospective evaluations of the pain were reasonably approximated by a *peak/end* rule (i.e., the ratings of the pain approximated the weighted average of the end moment and the most intense moment). Although later studies found that memories of past emotions do not always obey the peak/end rule, especially when the experience in question is pleasant, lasts an extended period of time, and changes intensity during its course (e.g., Ariely & Loewenstein, 2000; Ariely & Zauberman, 2000; Burt et al., 1998; Kemp et al., 2008; Kemp & Chen, 2012; Wirtz et al., 2003), the suggestion that memories of emotions are not always remembered correctly and that recall depends on a limited number of moments remains true.

In addition to the disproportionate influence of a few moments, several other factors have been shown to affect memories of past emotions (see Levine et al., 2006, for a review). One of these factors is the experience or post-event knowledge at the time that memories of a past experience are retrieved (Levine, 1997; Safer et al., 2002). Safer et al. (2002) show that students' recollection of their pre-exam anxiety was influenced by the grades they received in the exam; those who did well remembered being less anxious about the exam while those who did not do well remembered being more anxious. This bias was larger for those who had positive personality traits, suggesting that memories of past emotions are influenced jointly by post-event knowledge and individual differences.

Another factor that affects the accuracy of recalled emotions is one's expectation or belief about the type of emotion people typically experience in a specific situation (e.g., Kemp et al., 2008; Sprecher, 1999; Wilson et al., 1989). For example, going on holiday and being in a romantic relationship are usually associated with positive feelings. If memories are biased in the direction of one's expectation or belief, people would remember their holiday or love experience as being more positive than their actual experience at the time. This pattern of data has been found in previous research; for example, in one study participants rated daily their happiness over the previous 24 hours throughout a vacation and recalled the experience of the vacation twice after it was over (Kemp et al., 2008). The level of happiness was rated higher in the recall than the average happiness reported during the vacation. Similarly, in a study of the feelings of partners in romantic relationships over 4 years, those who had intact relationships reported a greater degree of love, commitment, and satisfaction in the recall than in their actual experience (Sprecher, 1999). These results indicate that our fond memories of the past are often exaggerated, perhaps partly due to the paucity of information stored in the memory (Kahneman & Riis, 2005) or the limited amount of information accessible at the time of retrieval (Robinson & Clore, 2002).

Given the belief-consistent bias in memories of past emotions, it seems possible that belief would also play a role in the imagined affective experience of another person: that is, what someone thinks others experience emotionally (e.g., Decety & Somerville, 2003; Ruby & Decety, 2004). For example, Wilson et al. (1982) found that people have shared beliefs about the types of events that influence mood. In their study, one group of participants (i.e., the actors) rated their mood and possible predictors of mood every day for several weeks. Afterwards, they judged the relationship between each of the predictors and their mood. Another group of participants (i.e., the observers), who had not taken part in the rating exercise, judged the typical relationship between these same predictors and mood in general. Interestingly, the judgements of the observers were similar to the judgments of the actors, and both deviated substantially from the results obtained in an objective measure based on the participants' actual data. These results show that, when it comes to causal inferences, belief plays a role in the understanding of one's own mood and the mood of another person.

To summarise, people's memory for the emotion experienced over an extended period of time is often inaccurate, biased, and obtained from a small sample of moments in the period. One source of bias may be the beliefs people have about the emotions they think they should have experienced at the time. The present study concentrated on this source.

We took the opportunity of the NZ lockdown to investigate how this belief would influence memories of past emotions and whether it would play a larger role in the imagined affective experience of an average person than in one's own experience. The lockdown in NZ, like those elsewhere in the world, had a massive impact on people's lives. Lockdowns have been widely perceived as events associated with isolation, psychological distress, and negative emotions generally (e.g., Alivernini et al., 2021; Groarke et al., 2020). Moreover, the lockdown was itself a governmental response to people's fear of the real dangers of COVID-19. This perception indicated, firstly, that memories for the lockdown experience would be more negative than they were at the time, and, secondly, that if people did not have negative experiences themselves, they might still assume that others did.

The NZ lockdown experience was different to that of many other countries, and perhaps particularly well suited for our research. The initial NZ lockdown was a Level 4 lockdown (higher level numbers correspond to more severe lockdowns, with 4 being the highest) which lasted from March 25 to April 26, 2020. During this period, the vast majority of people could only leave their residences to shop at supermarkets, seek medical attention, or to exercise locally. After April 26, there was a gradual easing of restrictions and after June 8 until near the end of our research period there were no active reported cases. During this time there were very few restrictions and life within NZ was close to normal,

although the external borders were largely closed. Some restrictions were reimposed on August 12, but these restrictions were limited to the Auckland region. The Canterbury region, where we recruited our participants, had fewer restrictions. To summarise, the initial lockdown was quite severe by international standards, and it was followed by a long period of little restriction.

We conducted two surveys with the same participants completing both. In the first, which was administered during the lockdown, participants reported their affective experiences of the previous day. In the second, which was completed several months after the lockdown, the same participants reported their affective experiences of a typical day during the lockdown. These surveys also asked participants to estimate the affective experiences of the "average New Zealander".

We made two predictions. First, participants would on average recall the lockdown period as a more negative experience than they had actually had. Second, they would believe others had a more negative experience than they did themselves.

Method

Two hundred and thirty-four participants each completed two online questionnaires, one during and one following the March to April 2020 COVID-19 lockdown described above. In both questionnaires they reported on their emotional state during the lockdown. They did this both for their own emotional state and for that of an "average New Zealander".

Participants and Procedure

There were two samples, one consisting of 135 students and one of 99 members of the (non-student) general public. We used these two different samples to check if the results would generalise over two different groups of people, especially given that students are a common sample in psychological research. All participants completed their first questionnaires between April 12 and April 26, 2020. Their second questionnaires were completed between July 21 and August 18. All but seven of the second questionnaires were completed during light Level 1 restrictions; the remaining seven were completed under Level 2 restrictions that commenced on August 12. Encouragement to complete the second questionnaire was given electronically to all original participants.

Three hundred and eleven completed the first questionnaire. One hundred and thirty-five students completed both questionnaires and could be matched from the university email addresses supplied. Ten completed both but could not be matched. Students were recruited from, and received some credit towards, an introductory course in psychology. This course ended in June, hence the low rate of completions for the second questionnaire. The students were predominantly female (112/135) and 127 of them were aged 24 years and under. One student had already completed a Bachelor's degree. Of the 162 non-students who completed the first questionnaire, 99 completed both and could be matched from codewords supplied (a further three completed both but could not be matched.) Sixty-five non-students were female. Seven were aged 24 or under, 14 were aged 25-34, 25 35-44, 25 45-54, 20 55-64, and eight were 65 or over. Sixty-nine non-students possessed a Bachelor's or higher degree. The non-students were recruited through social media.

Only results obtained from the 234 participants who completed two matched questionnaires are presented. Ethics approval was obtained from the University of Canterbury Human Ethics Committee (HEC 2020/27/LR-PS).

Questionnaires

Apart from somewhat different requests for information to enable matching the first and second questionnaires, the questionnaires given to the two samples (student and general public) were identical. All questionnaires were completed online via Qualtrics.

Questionnaire completed during lockdown. Following introductory information summarising the purpose of the research, ethical requirements, and matching procedures, the questionnaire asked first for demographic data and general life satisfaction. This question asked "On a scale from 0 to 10 where 0 indicates "completely dissatisfied" and 10 indicates "completely satisfied", how satisfied are you with your life as a whole these days?".

Then followed a request to "Please take a moment to think about your experiences yesterday. On a scale from 0 to 10 please rate your experience of the following emotions." This was followed by seven questions asking "How much of yesterday did you spend feeling angry/depressed/joyful/happy/sad/stressed/worried"? Below each question was a scale from 0 "I felt no… at all" to 10 "I felt … all day". An eighth question asked "Would you like to have more days like yesterday?", again answered on a scale from 0 to 10 with anchors "Not at all" to "Definitely".

These eight questions were followed by parallel questions asking how they imagined the average New

Zealander had felt yesterday. As an example, the anger question read: "How much of yesterday do you think the average New Zealander spent feeling angry?" We made no attempt to influence or limit how the participants should define or consider the "average New Zealander".

Finally, we asked: "Do you think that the New Zealand government is doing enough to fight COVID-19?" to be answered on a scale from 0 ("Not at all") to 10 ("Definitely"). We also asked whether the US and Chinese governments were doing enough.

Recall questionnaire completed after lockdown. The second questionnaire was structured similarly to the first, except without requests for demographic data. Wording was similar except for appropriate changes to focus the participants on their lockdown experience. The changes are outlined in the next paragraph.

The second life satisfaction question read "On a scale from 0 to 10 … how satisfied were you with your life as a whole during Level 4 lockdown?" The eight personal emotional statements began by asking participants "to remember a typical day during the Level 4 lockdown. Try to remember as many sensory details as possible (e.g. sight, sound, smell etc.). Please think about that day before answering the questions." Wording of the following questions was identical to that of the first questionnaire with the substitution of "that day" for "yesterday". The eight "average New Zealander" questions were also identical with the same substitution. The government response question substituted "has been doing" for "is doing".

Results

The analyses of emotional states below feature analyses of variance and correlations. Analyses of variance were carried out using questionnaire order; that is, lockdown versus recall as one within-subjects factor and ratings of self or other (except for life satisfaction) as another within-subjects factor. Correlations were between self and other (average New Zealanders) ratings and also between ratings for the two questionnaires (lockdown and recall of lockdown).

Life Satisfaction

Students (Mean = 6.1, *SD* = 1.7) were significantly less satisfied with their lives than the non-students (Mean = 6.9, *SD* = 1.9, $F(1, 232) = 12.64$, $p = .0005$), but there was no significant ($p < .05$) difference between lockdown and recalled life satisfaction or interactive effect (see Tables 1 and 2).

Emotion Measures

In addition to the individual emotion measures, a composite emotion scale was constructed. Principal component analysis of the eight lockdown self ratings suggested the existence of a single factor (First Eigenvalue = 4.50; second eigenvalue = 1.11; Cronbach's α = .88), which clearly represented positive versus negative emotion. Accordingly, we compiled a single Emotion Scale that averaged the eight different measures (reverse scored for anger, depression, sadness, stressed, and worried) for all four variants (Lockdown other, α = .81; Recall self α = .91; Recall other α = .85). Results obtained with this Emotion Scale are included in the following analyses. Larger scale values indicate more positive emotions.

Table 1 shows the average ratings for each emotion and the Emotion Scale for self versus other at both lockdown and recall. Summaries of the analyses of variance are also given. A number of important features can be noted from the table. First, the lockdown experiences were overall not that bad. Second, unsurprisingly, there was considerable variation in the individual experiences. This is indicated by the large standard deviations of the self ratings, both during lockdown and subsequently. Third, people generally rated their own experiences as more positive than those of the average New Zealander. Specifically, the ratings for the average New Zealanders were higher than the ratings for oneself for

Table 1
Mean Emotion Ratings for Self and Other at Both Lockdown and Recall for Eight Emotion Measures, the Composite Emotion Scale, and Life Satisfaction

	Self		Other		
Measures	Lockdown	Recall	Lockdown	Recall	F-test sign.
Anger	2.0 (1.9)	2.3 (1.9)	3.9 (1.6)	4.4 (1.8)	S/O; L/R
Depression	2.7 (2.7)	3.2 (2.7)	4.7 (1.8)	5.0 (1.8)	S/O; L/R
Enjoyment	5.8 (1.9)	5.7 (2.0)	5.4 (1.5)	5.1 (1.5)	S/O
Happiness	6.0 (2.1)	5.9 (2.1)	5.6 (1.4)	5.3 (1.5)	S/O; L/R
Sadness	3.0 (2.4)	3.4 (2.4)	4.4 (1.8)	4.7 (1.7)	S/O; L/R
Stressed	4.3 (3.0)	4.5 (2.7)	5.9 (1.8)	6.2 (1.9)	S/O
Worried	4.1 (2.7)	4.2 (2.7)	5.8 (1.9)	6.2 (1.9)	S/O; L/R
Repeat day	5.2 (2.8)	5.6 (3.0)	3.9 (1.9)	3.8 (1.9)	L/R; X
Emotion Scale	6.4 (1.8)	6.2 (1.9)	5.0 (1.1)	4.7 (1.2)	S/O; L/R
Life Satisfaction	6.4 (1.8)	6.4 (2.3)			

Note. Numbers in parentheses are standard deviations. All measures on a scale from 0 to 10. Summaries of 2 X 2 analyses of variance results are given in the final column. S/O = Significant ($p < .05$) difference between self and other; L/R = Significant ($p < .05$) difference between lockdown and recall; X = Significant ($p < .05$) interactive effect.

negative emotions (e.g., anger, depression, sadness, stressed, and worry) and vice versa for positive emotions (e.g., enjoyment and happiness). Fourth, the recalled experience of the typical day is less positive than most people's rating of yesterday during the actual lockdown. The results are consistent with people having a general impression that lockdown should be worse than they actually experienced. They tended to recall it as a little worse than it was and think that, even if they had a reasonable time, others did not.

Such an interpretation is supported by two additional features of the results. First, the smaller standard deviations for the experiences of others (both at the time and later) suggest a comparatively common impression, perhaps derived from the media, of what lockdown was like that was not solely based on the participants' own experience. Second, there is only one significant interaction effect, suggesting that people's retrospective view that lockdown was worse than it actually was applied generally to both their own recalled experience and to that of the average New Zealander.

Table 2
Pearson Correlations Between Lockdown and Recall Ratings for the Eight Emotion Measures, the Composite Emotion Scale, and Life Satisfaction

	Ratings	
Measures	Self	Other
Anger	.46	.52
Depression	.69	.50
Enjoyment	.46	.37
Happiness	.55	.38
Sadness	.68	.47
Stressed	.59	.47
Worried	.64	.45
Repeat day	.46	.35
Emotion Scale	.68	.55
Life Satisfaction	.59	

Note. All correlations significant at $p < .05$.

Table 3
Pearson Correlations Between Self and Other Ratings for the Eight Emotion Measures and the Composite Emotion Scale

	Questionnaire	
Measures	Lockdown	Recall
Anger	.27	.33
Depression	.23	.34
Enjoyment	.24	.35
Happiness	.25	.37
Sadness	.30	.39
Stressed	.30	.39
Worried	.45	.40
Repeat day	.42	.46
Emotion Scale	.33	.40

Note. All correlations were significant at $p < .05$.

Table 2 shows the Pearson correlations for the emotion measures and scale between the lockdown and recall ratings. The strong correlations indicate that participants were largely but not entirely accurate in remembering their own experiences.

Table 3 shows the Pearson correlations between the self and other ratings at both lockdown and recall. All correlations are positive, indicating that individuals considered the experiences of others to be generally like their own. However, the relatively small size of these correlations suggests that our participants recognized other people as having similar but not the same experiences as them. As Table 1 shows, others were seen as doing a little worse.

Sample Differences

We also included sample (student versus non-student) in our analyses. Consistent with the finding that the students had lower life satisfaction we also found that students were significantly more angry, depressed, sad, stressed, and worried, and less joyful and desirous of repeat days than non-students (all *p*s < .05). There were also occasional significant interactive effects with the sample. A 2 x 2 x 2 analysis of variance of the Emotion Scale results found significant effects of the sample ($F(1, 232) = 38.7$, $p < .0001$; Partial $\eta^2 = .14$), lockdown/recall ($F(1, 232) = 10.7$, $p = .001$, Partial $\eta^2 = .04$); self/other ($F(1, 232) = 179.7$, $p < .0001$, Partial $\eta^2 = .44$), sample X self/other ($F(1, 232) = 10.8$, $p = .001$, Partial $\eta^2 = .04$), and sample X self/other X lockdown/recall ($F(1, 232) = 4.21$, $p = .04$, Partial $\eta^2 = .02$). Table 4 shows the mean results for this breakdown.

Table 4
Average Emotion Scale Score as a Function of Sample, Lockdown and Recall, and Self Versus Other Rating

	Students	Non-students
Lockdown		
Self	5.6 (1.7)	7.1 (1.8)
Other	4.8 (1.2)	5.3 (1.1)
Recall		
Self	5.7 (1.7)	6.8 (2.1)
Other	4.4 (1.2)	5.0 (1.2)

Note. Numbers in parentheses are standard deviations. All scores on a scale from 0 to 10, with higher numbers indicating more positive emotions.

Government Response

On average, the NZ government's response to COVID-19 was rated as 8.6 on the first questionnaire and 8.5 on the second (*SD* = 1.4; *t*(234) = .55, *n.s.*). Table 5 shows the correlations between the Emotion Scale and Life Satisfaction measures and ratings of the NZ government response. The significant correlations during lockdown were in the expected direction but they were not high.

Taken over the two questionnaires, the average rating of the Chinese government's response was 5.5 while that of the US government was 1.9. Clearly our NZ sample saw the NZ government as dealing with COVID-19 more effectively than the Chinese government and very much more effectively than the US government (*F*(2,466) = 941.3, *p* < .0001). The high rating of the NZ government performance combined with its low variability may be a statistical reason for the low correlations shown in Table 5.

Table 5
Correlations Between the Emotion Scale and Life Satisfaction Scores and Ratings of the New Zealand Government's Response

	Emotion Scale self	Emotion Scale other	Life Satisfaction
Lockdown	.13*	.05	.15*
Recall	.04	.10	.08

Note. * Significantly different from zero, two-tailed, *p* < .05.

Discussion

The results generally supported our expectation that people's memory for their emotions and ideas about what others were feeling would change in line with what they might be expected to feel from a general "lockdowns are unpleasant" belief. The change in their own memories was statistically significant but not large. The size of the effect indicates that they generally retained reasonable memories of the time, as also indicated by the moderately high correlations shown in Table 2. The other prediction, that they would believe that others had a worse experience than they did, was also upheld, and this effect was somewhat larger. Here we would expect the participants to rely more on their general beliefs about lockdowns, and proportionally less on their own memories which could be regarded as atypically positive.

Average personal life satisfaction during lockdown did not differ on recall and was also reasonably high. This is in line with a recent World Happiness Report showing that, in a number of countries where death rates were not high, life satisfaction was not drastically reduced by COVID-19 (Helliwell et al., 2021). It is possible that this reflects the general perception by our participants that the government was acting appropriately.

Although not central to the focus of this study, it was noticeable that students had lower life satisfaction in lockdown than the general public, possibly due to a greater need for social life and/or fewer financial resources. Our other unpublished research indicates that student life satisfaction is lower than that of the general public in normal times, although there seems little published research on the issue. In this study, we used two rather different samples mainly to see if the same kinds of bias might be shown by them. The results suggest that both samples saw the experience of others as worse than their own.

In sum, the 2020 NZ national COVID-19 lockdown provided an opportunity to see whether previous findings concerning the recall of emotion from largely more individual and often shorter events would extend to a relatively long event which was shared by many people. We found that they do.

Limitations

The NZ lockdown and its aftermath provided a rather unusual example of a shared, largely negative event that was succeeded by a longer period of relative normalcy. There were also few deaths (totalling 24 up to the close of our data gathering). It would be unwise to generalise the results obtained here with those obtained in other countries with rather different COVID-19 experiences. Indeed, if our participants' judgement of the performance of the Chinese and, especially, US governments is accurate, one might expect a very different pattern of response in these countries.

One idiosyncratic feature of the NZ lockdown was that it was accompanied by unusually pleasant weather and this, coupled with the freedom to go outside to walk or cycle individually, may have not only made the lockdown experience actually more enjoyable but also contributed to a relatively enjoyable memory of it.

The first questionnaire asked for participant's feelings from yesterday, while the second asked for their perceptions of a typical day. It is likely then that the judgements made in the second questionnaire extended over a longer time period than the first, and this may have led to a different way of evaluating the experience. We could also think of this as a difference in abstraction level (Robinson & Clore, 2002). Ideally, it would have been better to have asked each respondent to complete a series of questionnaires over different

days during lockdown. Getting a relatively large sample to complete such a series, however, would not have been straightforward. To some extent this confound was mitigated by different participants answering the first questionnaire at different times.

Implications

This study contributes to our knowledge of how people remember emotion by showing that the influence of belief on remembered emotion can extend to a long-term shared real-life event such as a lockdown. However, there are also important lessons for our understanding of the impact of disasters. As a general although not universal rule, when we assess the impact of a disaster or similar event on people, we do so after the event. However, the results of the present study indicate that people's memories for how they felt during these events are likely to be biased. If you recall an event which is generally thought to be unpleasant, as disasters are, you may be likely to report at a later time that it was more unpleasant than you actually found it at the time. Our findings show that even if your own experience was not so bad, you may still be likely to think that of others was bad.

It would be unwise to assume that people necessarily remember all disasters as more unpleasant than they really experienced at the time. Indeed, as indicated in the limitations above, it would be unwise even to assume this is true of all lockdowns. However, the key point is that memories of the emotion experienced in an event are not always accurate, and they are subject to biases.

It is, of course, not easy to solve the research problem this raises. Simply knowing that recalled emotion may differ from that experienced takes us only so far. Ideally, one should evaluate the psychological and emotional impact of disasters either as they happen or very shortly afterwards, but this is not always possible or desirable. People fleeing a bushfire or reeling from the shock of an earthquake are unlikely to prioritise questionnaire completion, nor is anyone likely to think they should. Given that some delay in recording the response is probably inevitable it might then be useful to record more than one later response, but at different times. In this way one could establish if there is a trend in the recall bias.

Another, perhaps even trickier, issue raised here is whether in considering the impact of disasters, it is more important to consider the experience at the time or what people remember of it. We make no attempt to resolve this issue, which is by no means straightforward (e.g. Kahneman, 2000), but it is worth bearing in mind that it might often exist.

Open Practices Statement

The data for the study are publicly available from the Open Science Framework under Simon Kemp's Quick Files/COVID Lockdown Emotion (Chen et al Lockdown Emotion Study.xlsx). Experiments were not preregistered.

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Barriers to seeking help for an emotional or mental health condition among Australian emergency services workers

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Abstract

Not all emergency services workers with a developing mental health condition seek help. Barriers to help-seeking in this population include stigma, being seen as weak, career and confidentiality concerns, and not being able to take time off from work. Barriers are widespread across the sector and appropriate interventions need to be tailored to this population. The literature refers to research mostly undertaken in single sectors or organisations, which this study sought to address by examining data from "Answering the Call", a national study of the mental health and wellbeing of a large cohort of emergency services personnel. We aimed to see if help-seeking barriers could be grouped in some way and, if so, which demographic and psychological factors were associated with those groups. Latent class analysis found people could be grouped according to the number of barriers reported (i.e., lots, some, or a few) but not by the types of barriers reported. Factors associated with reporting lots of barriers included being in the police sector, being male, having severe levels of probable PTSD or psychological distress, low levels of receiving support, and high levels of workplace stress. The most commonly reported barrier was preferring to handle problems on one's own or with family/friends. This implies that the large, complex array of factors affecting people's help-seeking leads to a sense of feeling overwhelmed and preferring to deal with problems on their own. Increased training in mental health literacy for managers, while alleviating career concerns and perceptions of stigma among all personnel, is recommended.

Keywords: *Help-seeking barriers, emergency services workers, mental health, first responders*

Work in the emergency services can be physically and mentally demanding and coupled with the high level of exposure to traumatic events there is an increased risk of mental injury (Jones et al., 2020). That is why access to, and use of, support services for mental health problems is vital. However, not all emergency services workers (ambulance, fire and rescue, police, and state emergency services) with a developing mental health condition seek help in a timely way or even do so at all (Rikkers & Lawrence, 2021). This can be problematic as research shows that, amid an often stressful and traumatic working environment, seeking appropriate help when it is needed leads to the best long-term outcomes (Bacharach & Bamberger, 2007). Barriers to mental health help-seeking in the general population are manifold and complex in nature (Andrade et al., 2014; Vogel et al., 2007), and for emergency services personnel they can be compounded by additional factors including perceptions of stigma and being seen as weak, concerns about career impacts, and difficulty finding time away from work (Chapman et al., 2012, 2014; Fox et al., 2012; Haugen et al., 2017; Hom et al., 2016; Jones et al., 2020). Moreover, the in-house support services available to personnel appear to be the least preferred option for help-seeking (Tamrakar et al., 2020). This large and complex array of barriers is particularly problematic in such an at-risk population, whose rates of post-traumatic stress disorder (PTSD) are twice that of the general population (Kyron et al., 2021).

Tailoring appropriate interventions for emergency services personnel is advised (Kutcher et al., 2016); however, relatively few studies have quantitatively assessed barriers to care in this population, with the majority assessing single sectors or organisations and relatively narrow in scope (Haugen et al., 2017; Jones et al., 2020; Varker et al., 2018). Therefore, we used data recently collected from a large cohort of Australian emergency services workers to examine barriers to help-seeking in a way that might facilitate the design of suitable interventions. "Answering the Call", the

national survey of the mental health and wellbeing of police and emergency services in Australia, was a world-first cross-sectional study which encompassed all four emergency sectors: ambulance, fire and rescue, police, and state emergency services (Beyond Blue Ltd., 2018). The survey captured detailed, wide-ranging mental health and wellbeing information encompassing mental health problems, resilience, social support, workplace risk factors for mental health, perceived need for help, barriers to help-seeking, and service use (Kyron et al., 2021).

We used survey results to test the hypothesis that emergency services employees with a need for mental health care, but not seeking it, would be able to be classified into groups reporting similar types of barriers to help-seeking. We predicted that if it were possible to identify groups reporting similar barriers, it may be possible to target interventions based on characteristics associated with those groups. Using this data, we sought to determine associations between reported barriers and demographic characteristics (i.e., emergency services sector, age, sex, and rank), selected mental health problems (i.e., probable PTSD, psychological distress, and suicidal ideation), levels of social support, and workplace stressors.

Method

Participants and Procedure

The methodology of "Answering the Call", response bias, and demographic statistics of the participants have been previously described in detail (Beyond Blue Ltd., 2018; Kyron et al., 2021). Briefly, 33 out of a possible 36 police, ambulance, fire and rescue, and state emergence service agencies around Australia participated in the online survey. The purposes of the survey were to assess the mental health of employees, identify the associated risk factors, identify barriers to help-seeking, and measure service use. In total, 14,868 employees participated in the survey (Police = 8,088, Ambulance = 3,473, Fire and Rescue = 2,975, State Emergency Service = 332), with an estimated response rate of 22%. Selected demographic characteristics are contained in Appendix 2 (Table A1). The sample was determined to be largely representative of the emergency services population, with slightly higher representation of females and older employees. These and other minor differences were taken into account during the weighting procedure. Ethics approval was obtained from The University of Western Australia Human Research Ethics Committee (RA/4/1/9036).

Measures

Barriers to help-seeking. Respondents who did not seek help or delayed seeking help were asked a 12-item question to assess barriers to help-seeking: "Here is a list of concerns that a person might have when they consider seeking support or treatment for stress, emotional or mental health issues. Please indicate how much you agree or disagree that each of these concerns might have affected your decision whether or not to seek support or treatment". They were offered a list of 12 barriers (I wouldn't know where to get help; I would have difficulty getting time off work to attend a session; I wouldn't be able to do it confidentially; It would harm my career or career prospects; People would treat me differently; I would be seen as weak; It would stop me from doing operational work; I would be seen as a burden to my team or family; I prefer to deal with my problems by myself or with family/friends; I was concerned it would negatively impact on my colleagues; I don't believe that treatments are effective; I don't trust mental health professionals) to which they indicated their level of agreement (1= Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree). Participants were considered to have endorsed a barrier to help seeking if they agreed or strongly agreed with that statement.

Diagnosed mental health conditions are dependent on having sought help, and as the purpose of this paper is to examine barriers to help-seeking, we have chosen to focus on the conditions identified through the screening scales included in the survey: post-traumatic stress disorder, psychological distress, and suicidal ideation.

Post-Traumatic Stress Disorder (PTSD). PTSD was assessed using a scale developed for "Answering the Call" and based on the PCL-5 PTSD screening scale (Blevins et al., 2015). Six items from the PCL-5 were used: loss of interest in things you used to enjoy, feeling emotionally distant or cut off from other people, feeling jumpy or easily startled, having difficulty concentrating, having trouble falling or staying asleep, and feeling irritable or having angry outbursts. Additional questions were added to measure functional impairment and severity and duration of symptoms (see Appendix 1 for full scale). This approach was chosen to address three shortcomings of the PCL-5 for use with an emergency services population, and to make it more relevant to the emergency services in the following ways: (i) to be

more sensitive to the impact of cumulative trauma by asking symptom questions in relation to any previous traumatic experience rather than one specific traumatic event; (ii) to add questions about functional impairment to assess DSM-5 Criterion G that "the disturbance(s) cause clinically significant distress or impairment in social, occupational, or other important areas of functioning" (American Psychiatric Association, 2013); and (iii) to provide an assessment of severity, with scores grouped into sub-threshold (i.e., people who have some but not all symptoms required for diagnosis and impairment of functioning), mild, moderate, and severe categories in this study. The scale had good internal consistency in the current survey (α = .89). PTSD, as measured by this scale, is referred to in this paper as probable PTSD as respondents were not formally diagnosed and the scale was created for the purposes of this survey (see Appendix 1 for full details and scoring).

Psychological distress. Psychological distress was measured using the Kessler-10 (K10) scale, which assesses symptoms of depression and anxiety (Kessler et al., 2002). Ten items measured emotional states on a 5-point Likert-type scale (1 = None of the time, 2 = A little of the time, 3 = Some of the time, 4 = Most of the time, 5 = All of the time), with higher psychological distress representing a greater likelihood of experiencing a mental health condition. Responses were grouped using standard cut-off scores from the ABS 2017-18 National Health Survey (Australian Bureau of Statistics, 2018) into low (score 10-15), moderate (score 16-21), high (score 22-29), and very high (score 30-50) categories. The K10 is a widely used and well-validated screening tool that is highly correlated with serious mental illness, including anxiety and depression (Furukawara et al., 2003). The K10 scale had very good internal consistency in the current survey (α = .92).

Suicidal ideation. Six questions were asked to determine whether participants had seriously thought about taking their own life, planned to take their life, or attempted to take their own life, both ever and in the last 12 months (Australian Bureau of Statistics, 2008). Response options included "Yes", "No", and "Prefer not to say" for each question, and respondents were not asked subsequent questions after the first time they chose "Prefer not to say" (see Appendix 1). Approximately 7.5% chose this option at the first question, therefore, the estimates of suicidal ideation from this data likely underestimate the true prevalence of suicidal thoughts and behaviours for this population. Responses for this study were categorised as follows: "Yes" included people who said they had seriously thought about taking their own life in the last 12 months while "No" included people who said "No" or "Prefer not to say".

Perceived need for help. Respondents were asked whether they felt the need for help for any emotional or mental health issues in the previous 12 months (1 = "No, I did not have any emotional or mental health issues", 2 = "No, I had emotional or mental health issues, but did not need any help or support", 3 = "Yes"). If they sought help, they were asked how soon they sought help or treatment for their issue, and once they sought help, how long it took to receive it (1 = Immediately, 2 = Within 1-2 weeks, 3 = Within 3-4 weeks, 4 = Within 1-3 months, 5 = Within 4-6 months, 6 = More than a year after I felt I needed it, 7 = Don't remember).

Social support. Social support was measured using an adapted version of the 2-Way Social Support Scale (Shakespeare-Finch & Obst, 2011). Respondents were asked to think about their support and social networks and how true the following statements were in relation to their life: 1: "I am there to listen to other people's problems"; 2: "My family/friends understand my job demands"; 3: "I like helping others"; 4: "There is someone I can talk to about the pressures in my life"; 5: "There is someone in my life that makes me feel worthwhile"; 6: "I lead a fulfilling life outside work"; 7: "There is someone in my life I can get emotional support from"; 8: "I give others a sense of comfort in times of need"; and 9: "I feel that I have a circle of people who value me". Respondents answered using a 5-point scale (1 = Not at all, 2 = Somewhat true, 3 = Quite true, 4 = Very true, 5 = Always true).

Items 1, 4, 5, 7, 8, and 9 were sourced from the 2-Way Social Support Scale, while items 2, 3, and 6 were created for the survey. Separate measures of giving and receiving social support were created by summing the appropriate items. A total score for receiving social support was created by summing the items 2, 4, 5, 6, 7, and 9, creating a score between 6 and 30. Participants were classified as having low levels of receiving social support if their score was in the range 6 to 12, and high levels if their score was in the range 13 to 30. Similarly, a total score for giving social support was created by summing items 1, 3, and 8, creating a score between 3 and 15. Participants were classified as having low levels of social support if their score was in the range 3 to 6, and high levels if their score was in the range 7 to 15. The adapted scale was shown to have good levels of internal consistency (α = .87).

Workplace stressors. Workplace stressors were based on the Copenhagen Psychosocial Questionnaire (COPSOQ; Pejtersen et al., 2010). Eighteen items were included in the survey but only six items were used in the current study. They were grouped into three categories: Supervisor support ("How often is your manager willing to listen to your problems at work?"; "How often do you get help and support from your manager?"); Emotional exhaustion ("Do you feel that your work drains so much of your energy that it has a negative effect on your private life?"; "Do you feel that your work drains so much of your time that it has a negative effect on your private life?"); and Rewards ("Is your work recognised and appreciated by the management?"; "Are you treated fairly at your workplace?"). For analytical purposes, supervisor support and rewards were reverse scored so that higher scores represent negative experiences. Each item was scored on a scale of 0 to 4 (0 = Never/hardly ever, 1 = Seldom, 2 = Sometimes, 3 = Often, 4 = Always), with the two items for each category added together. The items were then scored as good (score 0-2), moderate (score 3-5), or poor (score 6-8), with poor indicating a high level of stress caused by that item. This scale had acceptable internal consistency in the study (α = .77).

Analytical Approach

The analysis had several stages. First, we examined the prevalence of individual barriers by sector and for emergency services personnel with various markers of distress (high or very high psychological distress, probable PTSD, suicidal ideation). Second, we grouped 10 individual barriers into four conceptual categories containing similar barrier types to examine the frequency of reporting for each category. Any differences referred to in the text have been fully tested, and confidence intervals provided in Appendix 2 where appropriate. We then undertook a latent class analysis to examine if emergency services personnel could be grouped according to their reported barrier(s), either by type or by number.

Barrier groups. A key question was whether respondents could be grouped according to common or similar barrier *type*; therefore, 10 of the barriers were grouped into four different categories of similar type:

- Didn't know how to access ("I wouldn't know where to get help"; "I would have difficulty getting time off work to attend a session");
- Concerned about career impact ("It would harm my career or career prospects"; "People would treat me differently; "I would be seen as weak"; "It would stop me from doing operational work"; "I wouldn't be able to do it confidentially");
- Don't trust mental health treatment ("I don't believe that treatments are effective"; "I don't trust mental health professionals"); and
- Prefer to deal with problems themselves ("I prefer to deal with my problems by myself or with family/ friends").

Only responses of "Agree" or "Strongly agree" were included.

Barrier class. Barrier class relates to the *number* of reported barriers. To investigate patterns associated with barriers to help-seeking, we fitted a latent class analysis model using Mplus Version 7. The optimal number of classes was chosen using the Vuong-Lo-Mendell-Rubin test and the parametric bootstrapped likelihood ratio test. The profile of reported barriers within each class was then examined to assign descriptive labels to each class.

Finally, several logistic regression models were fitted to assess associations between each barrier group and each barrier class and sectors, demographic characteristics (i.e., age and sex), mental health conditions (i.e., probable PTSD severity, psychological distress, and suicidal ideation), social support, and workplace stressors. All analyses were performed using the *surveylogistic* procedure in SAS version 9.4 and confidence intervals were calculated using the method of linearisation in Taylor Series (Wolter, 1985).

Results

Patterns of Reported Barriers to Help-Seeking

There was relative consistency across sectors regarding the patterns of most to least commonly reported barriers (Table 1). High proportions of police employees reported barriers related to concerns about being treated differently or their careers being damaged. Around half of all employees reported stigmatising barriers such as being treated differently (54.1%), negative career impacts (51.6%), or being seen as weak (46.9%).

Employees who perceived barriers to help-seeking in high proportions had high or very high levels of psychological distress (N = 4,414) and probable PTSD (N = 1,388; see Table 1). In particular, they were concerned about being treated differently, their career prospects being harmed, and being seen as weak.

Table 1

Proportion of Employees Needing Help who Reported Each Barrier to Help-Seeking by Sector and Mental Health Condition

Barrier to help-seeking	Sector					Condition		
	Ambulance	Fire and Rescue	Police	SES	**Total**	Probable PTSD	Psychological Distress	Suicidal Ideation
	%	%	%	%	**%**	%	%	%
I prefer to deal with my problems by myself or with family/friends	74.3	75.0	77.5	73.0	**76.6**	76.9	77.2	74.1
People would treat me differently	37.7	47.9	59.3	49.4	**54.1**	73.9	65.0	67.0
It would harm my career prospects	38.2	44.0	56.4	40.6	**51.6**	72.3	62.5	65.3
I would be seen as weak	31.3	38.8	52.3	39.5	**46.9**	69.5	59.2	60.7
I was concerned it would negatively impact on my colleagues	35.3	44.0	49.3	43.1	**46.3**	55.7	54.0	46.9
I wouldn't be able to do it confidentially	32.4	36.8	49.1	34.3	**44.5**	59.3	53.2	50.5
It would stop me from doing operational work	27.5	37.8	48.8	34.6	**43.6**	59.4	51.8	53.2
I would be seen as a burden to my team or family	31.9	37.1	46.3	32.4	**42.6**	65.1	51.6	59.1
I would have difficulty getting time off work	34.2	22.3	35.5	14.3	**33.3**	49.4	42.9	38.3
I don't trust mental health professionals	9.3	9.8	12.7	15.4	**12.5**	19.1	17.1	18.6
I don't believe that treatments are effective	8.0	9.6	14.2	5.7	**12.3**	22.0	15.7	20.2
I wouldn't know where to get help	10.2	12.3	12.8	9.9	**11.7**	15.9	15.2	11.6

Note. SES = State Emergency Service. See Appendix Table A2 for confidence intervals.

Analysis of Groupings by Barrier Type or Barrier Number

We undertook a latent class analysis to see if employees could be grouped according to whether they endorsed similar types of barriers (i.e., barrier group) or numbers of barriers (i.e., barrier class; see Table 2). The latent class analysis revealed that the clusters were evident only in the numbers of barriers chosen rather than revealing any systematic grouping of respondents according to the types of barriers chosen. A three-class solution provided the best fit, based on fit statistics and entropy. For the two-class model entropy was 0.89 and BIC was 73301; for the three-class model, entropy was 0.91 and BIC was 66088; and for the four-class model, entropy was 0.85 and BIC was 65398. Comparing three classes to two classes, both Vuong-Lo-Mendell-Rubin test (VLMR) and the parametric bootstrapped likelihood ratio test (LLRT) indicated improved fit (VLMR p = .0000, LLRT p = .0000), while four classes was not significantly better than three classes (VLMR p = .0838, LLRT p = .072). Respondents could be grouped into those who endorsed lots of barriers (mean = 7.1 barriers), some barriers (mean = 2.1 barriers), or a few barriers (mean = 1.5 barriers). There was no discernible pattern between number of barriers reported (barrier class) and respondents' perceived need for help with an emotional or mental health condition. However, a much higher proportion of respondents who reported lots of barriers felt they did not need help for their condition (25.3% lots of barriers; 13.1% few barriers; Z = 7.47, p < .0001).

Characteristics Associated with Barrier Type or Barrier Number

Similar barriers were grouped into four conceptual categories to determine associations. Over one in 10 (10.6%) employees needing help endorsed all four groups of barriers, while 33.7% reported three of the four groups of barriers. Barrier groups were compared by sector type, age, sex, PTSD severity, level of psychological distress, suicidal ideation, and barrier class. There was very little variation across demographic groups, except for females being less concerned about career impacts (68.8% females; 79.8% males; Z =

9.53, $p < .001$; see Table 3). Across the sectors, more than half (59.2%) of police employees did not know how to access help and had significantly higher levels of concern about career impact (80.7%) than ambulance workers ($Z = 9.18$, $p < .0001$) and fire and rescue workers ($Z = 7.02$, $p < .0001$). Police also had higher levels of lack of trust in mental health treatments (19.2%) than all other sectors (police vs ambulance, $Z = 2.34$, $p = .019$; police vs fire and rescue, $Z = 2.30$, $p = .021$; police vs SES, $Z = 2.62$, $p = .009$). Otherwise, patterns of response were similar across all sectors; therefore, more detailed results are not reported here.

Table 2
Barrier Class Membership by Average Number of Barriers to Help-Seeking, and by Perceived Need for Help

Barrier Class	# Perceived barriers	Perceived need for help: No need for help[a] (*n* = 3,419)	Perceived need for help: Didn't need help[b] (*n* = 1,276)	Perceived need for help: Delayed seeking help (*n* = 1,429)
	Mean	% (CI 95%)	% (CI 95%)	% (CI 95%)
Lots of barriers	7.1	50.4 (48.7-52.2)	25.3 (23.7-26.8)	24.3 (22.7-25.8)
Some barriers	2.1	61.5 (59.6-63.4)	17.1 (15.6-18.6)	21.3 (19.7-22.9)
Few barriers	1.5	59.6 (55.5-63.7)	13.1 (10.3-15.9)	27.3 (23.6-31.0)

Note. [a] Included respondents who had no emotional or mental health issues requiring support.

[b] Included respondents who had an emotional or mental health issue but felt they did not need any help or support.

Higher levels of probable PTSD and suicidal ideation were associated with higher proportions for each barrier group being reported. Those with very high levels of distress mostly reported the barrier of preferring to deal with their problems on their own or with family/friends, with much lower proportions expressed for the other barriers.

Patterns for those reporting high numbers of barriers were markedly different to those reporting few barriers, with much higher numbers across all barrier groups. For example, 99.9% with many barriers reported concerns about career impact compared to only 40.4% of those with few barriers ($Z = 28.4$, $p < .0001$).

To determine predictors for each type of barrier group, separate logistic regression models were fitted with demographic characteristics (i.e., age and sex), sector type, mental health conditions (i.e., probable PTSD, psychological distress, and suicidal ideation), social support measures, and workplace stressors. Predictors did not vary significantly for each barrier group, and we chose not to present these results in detail here because the latent class analysis revealed that it was the numbers rather than the types of barriers that created significant grouping of respondents. The only notable difference in pattern between the barrier groups was for those with severe PTSD, as they were four times more likely to choose concern about impacts on career (OR = 4.42, $p < .001$) but were least likely to prefer to handle problems on their own (OR = 0.79, $p < .001$).

To calculate predictors for barrier class, a regression model was fitted with sector, sex, age, PTSD, psychological distress, social support, and workplace stressors as independent variables. Associations with reporting lots of barriers were found with several demographic characteristics, with police employees (OR = 2.44, $p < .001$) and males (OR = 1.57, $p < .001$) more likely to report lots of barriers, while older employees were the least likely (OR = 0.64, $p < .001$) to report lots of barriers (Table 4). The more severe the level of PTSD or psychological distress, the greater the likelihood of reporting lots of barriers (severe PTSD, OR = 2.76, $p < .001$; very high psychological distress, OR = 2.45, $p < .001$). Similarly, an association was found with low levels of receiving support and reporting lots of barriers. People who reported lots of barriers to help-seeking had high levels of workplace stress, such as poor supervisor support (OR = 1.68, $p < .001$), poor levels of emotional exhaustion (OR = 2.63, $p < .001$), and, in particular, poor reward levels (OR = 3.01, $p < .001$).

Discussion

The main aim of this study was to determine if emergency services workers could be grouped because they reported similar types of barriers for seeking help for an emotional or mental health condition, and if so, what were the demographic and other characteristics common to each group. However, a latent class analysis revealed that it was the numbers of barriers reported, rather than the types of barriers, that was the distinguishing feature between the classes. That is, people could be grouped into those who reported lots of barriers and those who reported only some or a few barriers. The results did not support the hypothesis that people could be grouped according to the types of reported barrier. While there is a small body of Australian literature which focuses on barriers to help-seeking (Haugen et al., 2017), we could not identify other studies either in Australia or

internationally which have examined numbers of barriers in the same way; therefore, we were unable to make comparisons with our findings, and this may indicate that our results are unique.

Factors associated with reporting lots of barriers included being from the police sector, having high levels of probable PTSD and psychological distress, low levels of social support, low levels of supervisor support and recognition, and high levels of emotional exhaustion from work. These organisational barriers illustrate the influence of a negative work environment on mental health outcomes. This finding supports other studies which show links between the development of PTSD and factors such as conflict with management, discrimination, and a lack of support mechanisms including supervisory support (Armstrong et al., 2014; Bacharach et al., 2007; Meyer et al., 2012; Skeffington, 2017). Police workers in particular are known to be at heightened risk of PTSD when they have poor social support and negative work environments (Marmar et al., 2006). The extant literature supports the notion that police are a high-risk population for mental health conditions, are hesitant to source mental health care based on lower levels of mental health literacy, fear losing their careers, and see themselves as needing to be strong in the face of perceived weakness in others (Barocas & Emery, 2017; Flannery, 2015; Reavley et al., 2018). Coupled with severe mental health conditions, which exacerbate feelings of hypervigilance and anger, this combination of factors appears to contribute to a sense of feeling overwhelmed, perhaps resulting in the perception of multiple barriers to help-seeking.

Based on the results from this study, training managers and welfare officers in the behaviours associated with PTSD and psychological distress may be a valuable first step and could assist in the way employees needing help are identified and counselled (Barratt et al., 2018; Burns & Buchanan, 2020). For example, these behaviours may exhibit in anger, avoidance of help-seeking, or lack of acknowledgement of a problem (Andrade et al., 2014), which means providing simple, straightforward, and confidential pathways to support services, while also providing encouragement to do so, is paramount (Burns & Buchanan, 2020; Watson & Andrews, 2018).

We found that similar types of barriers to help-seeking appear to be common across the sectors and are common in single sector studies (Haugen et al., 2017). The implication here is that emergency services workers experience barriers such as career concerns, being seen

Table 3
Key Demographic and Mental Health Characteristics and Barrier Class of Employees Needing Help by Barrier Group

	Barrier Group			
	Didn't know how to access	Concerned about career impact	Don't trust mental health professionals	Prefer to deal with problems themselves
	%	%	%	%
Age group				
Less than 35 years	60.0	72.2	14.9	80.5
35 - 44 years	55.0	77.0	17.7	75.6
45 - 54 years	53.3	76.8	17.0	74.5
55 years or over	45.9	73.4	16.7	73.7
Sex				
Male	56.3	79.8	19.5	76.6
Female	50.5	68.8	12.6	74.9
PES Sector				
Ambulance	52.3	67.8	13.9	75.5
Fire and rescue	42.6	70.2	13.9	72.4
Police	59.2	80.7	19.2	77.3
State emergency service	42.9	73.8	10.3	74.6
PTSD Severity				
None	48.8	70.7	14.0	75.7
Sub-threshold	63.2	83.7	19.3	75.5
Mild	65.7	88.6	26.3	76.6
Moderate	71.8	87.7	25.5	79.5
Severe	78.2	95.2	32.8	75.5
Kessler 10 scale - ABS categories				
Low	36.3	60.8	9.0	70.1
Moderate	51.0	73.3	14.1	77.7
High	61.9	82.0	19.3	77.4
Very high	70.8	88.0	29.7	75.9
Suicidal ideation				
No	53.1	74.4	15.7	75.9
Yes	63.7	86.3	28.7	75.3
Barrier class				
Few barriers	16.9	40.4	5.0	58.0
Some barriers	29.6	53.4	7.4	69.8
Lots of barriers	80.9	99.9	26.5	84.2

Note. See Appendix 2 Table A3 for confidence intervals.

as weak, lack of mental health literacy, and a desire to self-manage in similar ways, regardless of role or organisation type. The most commonly expressed barrier across all sectors, demographic characteristics, and mental health conditions was the preference to handle problems on one's own or with family/friends, consistent with well-established findings in the literature (Andrade et al., 2014; Gulliver et al., 2019; Shi et al., 2020). There is a paucity of research into the factors associated with this barrier (Haugen et al., 2017), and this study did not identify any strongly linked factors.

When viewed with our other finding that lots of barriers were commonly reported, it is possible that some people feel a sense of helplessness in the face of so many perceived obstacles and, therefore, avoid formal help-seeking entirely, preferring to handle their problems on their own. At face value, this particular barrier could also mean a rejection or cynicism towards professional or clinical advice or treatment (Hom et al., 2017). However, it could also be reflective of perceived stigma, whereby emergency services workers believe that others would perceive mental ill health as weakness (Carleton et al., 2020), even though they do not actually believe that

Table 4
Predictors of Barrier Class Membership by Selected Characteristics

Effect	Barrier Class		
	Lots of barriers	Some barriers	Few barriers
	Point Estimate (SE, CI 95%)	Point Estimate (SE, CI 95%)	Point Estimate (SE, CI 95%)
Sector			
Fire and rescue vs Ambulance	1.37 (0.11, 1.10-1.71)	0.81 (0.11, 0.65-1.00)	0.90 (0.18, 0.64-1.28)
Police vs Ambulance	2.44 (0.08, 2.01-2.85)	0.53 (0.08, 0.46-0.62)	0.59 (0.13, 0.45-0.77)
State emergency service vs Ambulance	1.27 (0.22, 0.82-1.96)	0.80 (0.21, 0.53-1.20)	0.99 (0.36, 0.45-2.02)
Sex			
Male vs Female	1.57 (0.08, 1.34-1.84)	0.77 (0.08, 0.66-0.90)	0.63 (0.13, 0.49-0.81)
Age			
35 - 44 years vs less than 35 years	1.06 (0.11, 0.86-1.31)	1.10 0.10, 0.90-1.35)	0.65 (0.17, 0.47-0.91)
45 - 54 years vs less than 35 years	0.94 (0.10, 0.77-1.15)	1.20 (0.10, 0.98-1.46)	0.72 (0.16, 0.52-0.99)
55 years or over vs less than 35 years	0.64 (0.13, 0.50-0.83)	1.69 (0.12, 1.33-2.15)	0.78 (0.19, 0.54-1.14)
PTSD Severity			
Mild vs None	1.17 (0.16, 0.86-1.59)	0.87 (0.15, 0.64-1.17)	0.82 (0.33, 0.43-1.57)
Moderate vs None	1.82 (0.22, 1.49-2.36)	0.61 (0.22, 0.40-0.94)	0.37 (0.61, 0.11-1.24)
Severe vs None	2.76 (0.28, 1.58-4.81)	0.33 (0.30, 0.18-0.59)	0.83 (0.55, 0.28-2.44)
K10 Category			
Moderate vs Low	1.34 (0.11, 1.08-1.65)	0.96 (0.10, 0.78-1.16)	0.67 (0.15, 0.50-0.90)
High vs Low	1.88 (0.12, 1.49-2.36)	0.74 (0.11, 0.59-0.92)	0.52 (0.18, 0.36-0.74)
Very high vs Low	2.46 (0.16, 1.78-3.39)	0.57 (0.16, 0.42-0.78)	0.41 (0.34, 0.21-0.80)
Social Support Scale			
High giving and low receiving vs High giving and receiving	1.64 (0.15, 1.22-2.21)	0.67 (0.15, 0.50-0.90)	0.68 (0.34, 0.35-1.32)
Low giving and high receiving vs High giving and receiving	0.92 (0.14, 0.70-1.20)	1.25 (0.13, 0.97-1.62)	0.51 (0.27, 0.30-0.87)
Low giving and low receiving vs High giving and receiving	1.31 (0.20, 0.88-1.95)	0.94 (0.19, 0.64-1.37)	0.17 (0.61, 0.05-0.58)
Workplace stressors (COPSOQ)			
Supervisor Support: Moderate vs Good	1.24 (0.09, 1.04-1.48)	0.98 (0.09, 0.82-1.16)	0.62 (0.15, 0.46-0.82)
Supervisor Support: Poor vs Good	1.68 (0.12, 1.32-2.14)	0.66 (0.12, 0.52-0.83)	0.81 (0.23, 0.51-1.28)
Emotional Exhaustion: Moderate vs Good	1.84 (0.10, 1.52-2.23)	0.73 (0.09, 0.61-0.87)	0.60 (0.14, 0.46-0.78)
Emotional Exhaustion: Poor vs Good	2.63 (0.12, 2.10-3.29)	0.50 (0.11, 0.41-0.63)	0.52 (0.22, 0.34-0.80)
Rewards: Moderate vs Good	1.79 (0.10, 1.47-2.17)	0.85 (0.09, 0.71-1.02)	0.46 (0.14, 0.35-0.61)
Rewards: Poor vs Good	3.01 (0.15, 2.26-4.01)	0.56 (0.14, 0.42-0.73)	0.24 (0.33, 0.12-0.45)

Note: The degrees of freedom in computing the confidence limits is 6,123.

themselves (Barocas & Emery, 2017; Halbesleben et al., 2007). Other studies confirm that fear of workplace discrimination (Corrigan & Wassel, 2008) due to the associated fear of being seen as weak (Carleton et al., 2020; Hom et al., 2017; Skogstad, et al., 2013) prevents people from disclosing a mental health issue. This perceived weakness in emergency services workers might be seen as career-limiting given the nature of their roles (Barratt et al., 2018), especially for police whose culture celebrates personal strength and self-reliance, which is counterintuitive to expressing the need for help (Burns & Buchanan, 2020). Our findings support this view, with concerns related to career impact being cited as a barrier by almost all of those who also endorsed many barriers, as well as being linked to the barrier of wanting to handle problems on one's own or with family/ friends.

Interventions based on alleviating concerns about career impacts, as well as changing organisational culture and practice to ensure these impacts are minimised, could be effective (Barratt et al., 2018). Finding ways to ensure a realistic career path both post-mental health condition and also during treatment may reduce career concerns (Skogstad et al., 2013), but will rely on organisations allocating sufficient resources to allow personnel to reduce hours or change functional roles as required. This presents financial challenges, but these may be balanced against the savings in training investment and in reduced workers' compensation claims.

Limitations

The current study used cross-sectional data; therefore, causal relationships cannot be determined. For example, it cannot be determined whether the presence of a mental health condition led to the endorsement of types or numbers of barriers to help-seeking or whether the lack of help-seeking led to the mental health condition. In addition, self-reported screening scales were used to determine mental health conditions, rather than clinical interviews. Although the response rate was relatively low (22%), a post-enumeration analysis showed the sample to be largely representative of the emergency services population in the participating agencies (Beyond Blue Ltd., 2018) and any minor differences were accounted for in the weighting process. Further, this study was conducted in Australia and results may not be applicable in other countries or contexts.

Conclusion

Emergency services workers needing help for emotional or mental health problems but who did not seek help, or did not seek help in a timely way, could be grouped into those who reported either lots of or a few barriers to mental health help-seeking. Specific factors associated with reporting a lot of barriers included being from the police sector, having high levels of probable PTSD and psychological distress, low levels of social support, low levels of supervisor support and recognition, and high levels of emotional exhaustion from work. Although people could not be grouped by the types of barriers reported per se, the pattern in barrier reporting was similar across all emergency services sectors, with the preference to handle problems on one's own or with family/friends the most commonly reported barrier, supporting previous literature.

An important first step is the need to train managers and welfare officers in the behaviours associated with PTSD and psychological distress (Barratt et al., 2018). Alleviating concerns about career impact after disclosure and the introduction of simple, confidential pathways to support are also indicated. The complex array of factors affecting help-seeking in this population makes targeted solutions elusive and difficult (Jones et al., 2020). While specific interventions have been suggested previously, interventions which are more holistic in nature, taking account of the interplay of the many contributing factors rather than simply focussing on one at a time, may be preferable for those feeling overwhelmed by the many perceived obstacles to finding help.

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Appendix 1

Measures used in 'Answering the Call'

Barriers to help-seeking

Q. Here is a list of concerns that a person might have when they consider seeking support or treatment for stress, emotional or mental health issues. Please indicate how much you agree or disagree that each of these concerns might have affected your decision whether or not to seek support or treatment.

(1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree)

a. I wouldn't know where to get help
b. I would have difficulty getting time off work to attend a session
c. I wouldn't be able to do it confidentially
d. It would harm my career or career prospects
e. People would treat me differently
f. I would be seen as weak
g. It would stop me from doing operational work
h. I would be seen as a burden to my team or family
i. I prefer to deal with my problems by myself or with family/friends
j. I was concerned it would negatively impact on my colleagues
k. I don't believe that treatments are effective
l. I don't trust mental health professionals

Probable PTSD Screener

1) Have you ever experienced a stressful event or series of events either at work or away from work that deeply affected you? (Mark all that apply.)
   1 - No [SINGLE]
   2 - Yes, at work in the police and emergency services sector
   3 - Yes, at work outside the police and emergency services sector
   4 - Yes, away from work

Below is a list of reactions that people sometimes have in response to very stressful experiences. Thinking of stressful experiences that may have occurred either at work or away from work at any stage of your life, please read each statement and indicate how much you have been bothered by that problem in the past four weeks.

2) In the past four weeks, how much were you bothered by …
   a. Repeated, disturbing, and unwanted memories or nightmares about any stressful experiences?
   b. Experiencing flashbacks where you suddenly feel or act as if a stressful experience were actually happening again?
   c. Feeling very upset or experiencing strong physical reactions such as heart pounding, having trouble breathing when something reminded you of these stressful experiences?

   1 - Not at all
   2 - A little bit
   3 - Moderately
   4 - Quite a lot
   5 - Extremely

IF 3, 4, 5 to any of 2a, to 2c, THEN ASK.

3) How often do these reactions occur?
   1 - Less than once a month
   2 - 1-2 times a month
   3 - 3-5 times a month
   4 - 6-10 times a month
   5 - More than 10 times a month

4) How much effort do you make to avoid thinking or talking about any stressful events, or doing things which remind you of stressful experiences?
   1 - None
   2 - A little bit
   3 - Moderate
   4 - Quite a lot
   5 - A great deal

ASK ALL

Still thinking about your reactions to any stressful experiences that may have occurred either at work or away from work, please read each statement below and indicate how much you have been bothered by that problem in the past four weeks.

5) In the past four weeks, how much were you bothered by
   a. Loss of interest in things that you used to enjoy?
   b. Feeling emotionally distant or cut off from other people?
   c. Feeling jumpy or easily startled?
   d. Having difficulty concentrating?
   e. Having trouble falling or staying asleep?
   f. Feeling irritable or having angry outbursts?

   1 - Not at all
   2 - A little bit
   3 - Moderately
   4 - Quite a lot
   5 - Extremely

IF 3, 4, 5 TO ANY OF 5a-5f, THEN ASK.

6) How much distress did these feelings or reactions cause you?
   1 - None
   2 - Mild
   3 - Moderate
   4 - Severe
   5 - Very severe

7) How much did these feelings or reactions disrupt or interfere with your normal daily life?
   1 - Not at all
   2 - A little
   3 - Some
   4 - A lot
   5 - Extremely

IF 3, 4, 5 TO EITHER 6 OR 7, THEN ASK.

8) How long have these feelings or reactions been troubling you?
1 - Less than a month
2 - 1 - 2 months
3 - 3 - 6 months
4 - 7 - 12 months
5 - 1-2 years
6 - 3-5 years
7 - More than 5 years

Scoring

DSM-5 defines 7 symptom clusters for PTSD:

A. Exposure to traumatic event (includes repeated or extreme exposure to aversive details of traumatic events in first responders).
B. The traumatic event is persistently re-experienced.
C. Persistent avoidance of stimuli associated with the trauma.
D. Negative alterations in cognitions and mood associated with the traumatic event.
E. Marked alterations in arousal or reactivity.
F. Duration of the disturbance is more than one month.
G. The disturbance causes clinically significant distress or impairment of functioning.

Cluster A: Respondents were considered to have met cluster A if they answered 2, 3, or 4 to Question 1 or 4 or 5 to Question 4.

Cluster B: Respondents were considered to have met cluster B if they answered 3, 4, or 5 to one or more of Questions 2a, 2b, or 2c.

Cluster C: Respondents were considered to have met cluster C if they answered 3, 4 or 5 to Question 4.

Cluster D: Respondents were considered to have met cluster D if they answered 3, 4, or 5 to either Question 5a or 5b.

Cluster E: Respondents were considered to have met cluster E if they answered 3, 4, or 5 to at least two of 5c, 5d, 5e, or 5f.

Cluster F: Respondents were considered to have met cluster F if they answered 2, 3, 4, 5, 6, or 7 in Question 8.

Cluster G: Respondents were considered to have met cluster G if they answered 3 in both Question 6 and Question 7 or if they answered 4 or 5 to both Questions 6 and 7.

Respondents were considered to have probable PTSD if they met the criteria for all of the clusters A-G.

Suicidal Ideation

SB01. Have you ever felt that life was not worth living?

1 - No
2 - Yes
3 - Prefer not to say

SB02. Have you ever seriously thought about taking your own life?

1 - No
2 - Yes
3 - Prefer not to say

IF SB02=2, THEN ASK.

SB03. Have you seriously thought about taking your own life in the last 12 months?

1 - No
2 - Yes
3 - Prefer not to say

SB04. Have you ever made a plan to take your own life?

1 - No
2 - Yes
3 - Prefer not to say

IF SB04=2, THEN ASK.

SB05. Did you make a plan to take your own life in the last 12 months?

1 - No
2 - Yes
3 - Prefer not to say

IF SB05 = 2, 3 show help message before beginning section WE

SB06. Have you ever attempted to take your own life?

1 - No
2 - Yes
3 - Prefer not to say

IF SB06=2, THEN ASK.

SB07. Have you attempted to take your own life in the last 12 months?

1 - No
2 - Yes
3 - Prefer not to say

Appendix 2: Supplementary Tables

Table A1
Demographic Characteristics of Answering the Call Survey Population

	Ambulance (%)	Fire and rescue (%)	Police (%)	State emergency service (%)	Total (%)
Sex					
Male	53.2	83.3	62.6	45.3	64.1
Female	46.8	16.7	37.4	54.7	35.9
Age group					
Less than 35 years	33.4	20.3	27.9	17.1	27.5
35 - 44 years	25.8	24.6	31.7	28.0	29.7
45 - 54 years	25.2	32.6	28.8	34.0	28.8
55 years or over	15.7	22.6	11.6	20.8	14.0
Role					
Operational	74.2	64.9	62.3	15.7	64.2
Non-operational	14.2	13.5	23.2	26.6	20.3
Both operational and non-operational	11.6	21.6	14.5	57.8	15.4
Length of service in organisation					
Less than 12 months	6.9	3.3	4.6	10.3	4.8
1-2 years	8.4	6.7	6.8	11.6	7.0
3-5 years	16.0	12.2	12.7	19.9	13.2
6-10 years	22.0	16.8	16.4	18.0	17.4
More than 10 years	46.8	61.0	59.6	40.2	57.6
Marital status					
Single	14.1	8.4	11.7	13.4	
Married/De facto	77.3	82.7	78.1	74.2	
Widowed, separated, or divorced	8.5	8.9	10.2	12.4	
Highest educational qualification					
Secondary school to Year 12	6.4	15.5	18.9	12.0	
Certificate III/IV	8.3	38.3	11.6	22.6	
Diploma	25.1	22.2	34.2	25.8	
Bachelor degree	40.8	13.3	22.9	19.8	
Postgraduate qualification	19.4	10.8	12.4	19.7	

Note. Group ns: Ambulance = 3,473, Fire and Rescue = 2,975, Police = 8,088, State Emergency Service = 332.

Table A2

Confidence Intervals for Proportion of Employees Needing Help who Reported Each Barrier to Help-Seeking by Sector and Mental Health Condition

	Sector					Condition
Barrier	Ambulance	Fire and rescue	Police	State emergency service	Total	PTSD
	95% CI	95% CI	95% CI	95% CI	95% CI	95% CI
I prefer to deal with my problems by myself or with family/friends	(71.9 - 76.8)	(71.6 - 78.3)	(75.8 - 79.3)	(64.2 - 81.4)	(75.2 - 78.0)	(73.1- 80.5)
People would treat me differently	(35.1 - 40.4)	(43.9 - 51.8)	(57.2 - 61.4)	(40.6 - 59.0)	(52.5 - 55.7)	(70.2 - 77.5)
It would harm my career or career prospects	(35.5 - 40.8)	(40.1 - 47.9)	(54.3 - 58.5)	(31.9 - 49.9)	(49.9 - 53.2)	(68.6 - 76.0)
I would be seen as weak	(28.8 - 33.8)	(35.0 - 42.6)	(50.2 - 54.5)	(29.9 - 48.1)	(45.2 - 48.5)	(65.6 - 73.4)
I was concerned it would negatively impact on my colleagues	(32.7 - 38.0)	(40.1 - 47.9)	(47.2 - 51.5)	(33.6 - 51.6)	(44.6 - 47.9)	(51.4 - 60.0)
I wouldn't be able to do it confidentially	(29.9 - 35.0)	(33.0 - 40.6)	(46.9 - 51.3)	(25.9 - 43.3)	(42.9 - 46.2)	(55.1 - 63.6)
It would stop me from doing operational work	(25.1 - 29.9)	(34.0 - 41.6)	(46.6 - 50.9)	(25.4 - 42.7)	(42.0 - 45.3)	(55.2 - 63.7)
I would be seen as a burden to my team or family	(29.3 - 34.5)	(33.3 - 40.9)	(44.2 - 48.5)	(23.0 - 40.7)	(40.9 - 44.2)	(61.0 - 69.2)
I would have difficulty getting time off work	(31.6 - 36.8)	(19.1 - 25.5)	(33.4 - 37.6)	(7.4 - 21.4)	(31.7 - 34.9)	(45.0 - 53.7)
I don't trust mental health professionals	(6.6 - 9.5)	(7.4 - 11.8)	(12.6 - 15.7)	(1.3 - 8.4)	(11.3 - 13.6)	(15.6 - 22.6)
I don't believe that treatments are effective	(8.6 - 11.9)	(9.6 - 15.0)	(11.4 - 14.3)	(4.1 - 14.1)	(11.2 - 13.4)	(18.4 - 25.7)
I wouldn't know where to get help	(7.7 - 10.9)	(7.4 - 12.2)	(11.2 - 14.1)	(7.7 - 21.6)	(10.6 - 12.8)	(12.6 - 19.2)

Table A3
Confidence Intervals for key Demographic and Mental Health Characteristics and Barrier Class of Employees Needing Help by Barrier Group

	Barrier group							
	Didn't know how to access		Concerned about career impact		Don't trust mental health professionals		Prefer to deal with problems themselves	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age								
Less than 35 years	60.0	(57.2 - 62.7)	72.2	(69.7 - 74.7)	14.9	(12.9 - 16.9)	80.5	(78.3 - 82.7)
35 - 44 years	55.0	(52.6 - 57.3)	77.0	(75.0 - 79.0)	17.7	(15.9 - 19.5)	75.6	(73.6 - 77.6)
45 - 54 years	53.3	(51.2 - 55.4)	76.8	(75.0 - 78.5)	17.0	(15.4 - 18.5)	74.5	(72.6 - 76.3)
55 years or over	45.9	(42.7 - 49.1)	73.4	(70.6 - 76.3)	16.7	(14.3 - 19.1)	73.7	(70.8 - 76.5)
Sex								
Male	56.3	(54.7 - 57.9)	79.8	(78.5 - 81.1)	19.5	(18.2 - 20.7)	76.6	(75.2 - 77.9)
Female	50.5	(48.5 - 52.5)	68.8	(67.0 - 70.7)	12.6	(11.3 - 13.9)	74.9	(73.2 - 76.6)
PES Sector								
Ambulance	52.3	(49.8 - 54.9)	67.8	(65.4 - 70.2)	13.9	(12.1 - 15.7)	75.5	(73.3 - 77.7)
Fire and rescue	42.6	(39.8 - 45.4)	70.2	(67.6 - 72.8)	13.9	(11.9 - 15.9)	72.4	(69.8 - 74.9)
Police	59.2	(57.5 - 60.9)	80.7	(79.3 - 82.0)	19.2	(17.9 - 20.6)	77.3	(75.9 - 78.8)
State emergency service	42.9	(34.2 - 51.5)	73.8	(66.1 - 81.5)	10.3	(5.0 - 15.6)	74.6	(67.0 - 82.2)
PTSD Severity								
None	48.8	(47.3 - 50.2)	70.7	(69.4 - 72.1)	14.0	(12.9 - 15.0)	75.7	(74.4 - 77.0)
Sub-threshold	63.2	(60.0 - 66.3)	83.7	(81.3 - 86.1)	19.3	(16.8 - 21.9)	75.5	(72.7 - 78.3)
Mild	65.7	(61.1 - 70.3)	88.6	(85.6 - 91.7)	26.3	(22.1 - 30.6)	76.6	(72.5 - 80.7)
Moderate	71.8	(65.9 - 77.8)	87.7	(83.4 - 92.1)	25.5	(19.7 - 31.2)	79.5	(74.2 - 84.9)
Severe	78.2	(72.8 - 83.5)	95.2	(92.4 - 98.0)	32.8	(26.7 - 38.8)	75.5	(70.0 - 81.1)
Kessler 10 scale - ABS categories								
Low	36.3	(33.5 - 39.0)	60.8	(58.0 - 63.5)	9.0	(7.4 - 10.6)	70.1	(67.5 - 72.7)
Moderate	51.0	(48.9 - 53.1)	73.3	(71.5 - 75.1)	14.1	(12.6 - 15.5)	77.7	(76.0 - 79.4)
High	61.9	(59.7 - 64.1)	82.0	(80.3 - 83.7)	19.3	(17.6 - 21.1)	77.4	(75.5 - 79.3)
Very high	70.8	(67.6 - 73.9)	88.0	(85.7 - 90.2)	29.7	(26.6 - 32.9)	75.9	(72.9 - 78.9)
Suicidal ideation								
No	53.1	(51.8 - 54.4)	74.4	(73.3 - 75.6)	15.7	(14.7 - 16.6)	75.9	(74.8 - 77.1)
Yes	63.7	(59.4 - 67.9)	86.3	(83.3 - 89.4)	28.7	(24.7 - 32.7)	75.3	(71.5 - 79.1)
Barrier class								
Few barriers	16.9	(13.8 - 20.0)	40.4	(36.3 - 44.5)	5.0	(3.2 - 6.8)	58.0	(53.9 - 62.1)
Some barriers	29.6	(27.8 - 31.4)	53.4	(51.4 - 55.3)	7.4	(6.4 - 8.4)	69.8	(68.0 - 71.5)
Lots of barriers	80.9	(79.5 - 82.3)	99.9	(99.8 - 100.0)	26.5	(25.0 - 28.1)	84.2	(82.9 - 85.5)

Cyclone Harold and the role of traditional knowledge in fostering resilience in Vanuatu

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Abstract

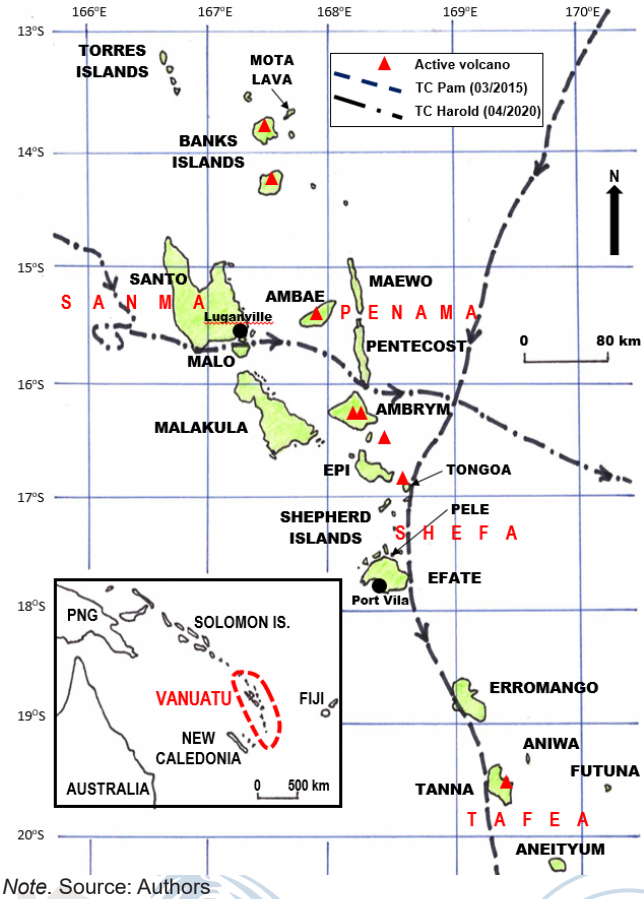
This article examines the role of traditional knowledge, skills, and values in fostering resilience in Vanuatu, the world's most at-risk country from natural hazards. We study responses to severe Tropical Cyclone (TC) Harold, which devastated the nation's northern islands in April 2020 just as a state of emergency had been declared in response to COVID-19. This necessitated severe restrictions on the delivery of relief supplies and a ban on the arrival of overseas humanitarian workers, forcing remote communities to adopt local responses to the emergency and cope with food insecurity through traditional resilience strategies and values that promote resource-sharing and cooperation. We use a mixed methods approach to analyse the content, extent, and transmission of traditional knowledge in Vanuatu and link this to evidence of its usefulness during TC Harold. Quantitative data from field surveys with two groups of respondents are combined with reports on responses to TC Harold both nationally and along the remote western coast of Santo Island. We also review the extent of traditional knowledge in current educational curricula in Vanuatu. Results illustrate how traditional ecological knowledge and social capital played a key role in disaster response and recovery, but such knowledge is mainly held by older people, and its use by younger generations is declining. We conclude that with rising global temperatures predicted to generate more extreme weather events, and external funds for disaster relief likely to decline, there is a need to build greater adaptive capacity at the local level through the revival of centuries-old informal transmission pathways of knowledge and values.

Keywords: *Vanuatu, resilience, tropical cyclone, traditional knowledge (TK), TK transmission, food security*

Resilience and Traditional Knowledge

As a small island developing state in the South Pacific, Vanuatu (Figure 1) is highly vulnerable to the impacts of natural hazard-related disasters and climate change (Connell, 2013; Le Dé et al., 2018). The 2021 World Risk Report (Bündnis Entwicklung Hilft, 2021) calculated disaster risk for 181 countries based on the dimensions of exposure to a range of hazards, vulnerability, susceptibility, and coping and adaptive capacities. Vanuatu's position along the Pacific "Ring of Fire" exposes it to earthquakes, volcanic eruptions, and tsunami, while its location as an archipelago in the tropical south-west Pacific makes it susceptible to cyclones, floods, droughts, landslides, and sea level rise.

Figure 1
Map of Vanuatu Showing Active Volcanoes and the Tracks of Category 5 Cyclones Pam (2015) and Harold (2020)



Note. Source: Authors

Vanuatu's risk index for 2021 was 47.73, considerably higher than that of the next two countries, the Solomon Islands (31.16) and Tonga (30.51). However, ni-Vanuatu, like other Pacific Islanders, have extensive experience in building adaptive capacity to extreme weather events, particularly cyclones and droughts, through their indigenous and local knowledge and traditional values of mutual support and community cohesion (Granderson, 2017; McMillen et al., 2014).

Traditional knowledge (TK) refers to knowledge that has been transmitted inter-generationally within a particular cultural community, primarily through oral means: stories, songs, rituals, memories, experiences, and skills (Rai & Khawas, 2019), including practical demonstration of agricultural practices. Traditional knowledge is also known as traditional wisdom, traditional environmental knowledge (TEK), and indigenous and local knowledge (ILK). It is a key factor in sustainable development, especially when integrated with non-indigenous information sources (Nakamura & Kanemasu, 2020; Walshe & Nunn, 2012). Numerous articles emphasise its role in building resilience through the sustainable management of natural ecosystems and resources (Berkes et al., 2000; Thaman, 2000), and more recently, its capacity for helping communities to mitigate the effects of climate change and extreme weather conditions, especially cyclones (Lefale, 2010; Leonard et al., 2013). In the Pacific Islands, McMillen et al. (2014) point out that ILK systems are critical to understanding resilience and adaptation because of the islands' long exposure to environmental variability. Over thousands of years, islanders have developed adaptive responses to living in marginal habitats for food production that face periodic severe disturbances from drought, cyclones, tsunami, and volcanic eruptions.

In Vanuatu, there is a clear role for traditional values, ecological knowledge, and skills in building resilience (or adaptive capacity). This is emphasized in the Vanuatu Climate Change and Disaster Risk Reduction Policy 2016-2030 (VCCDRRP), which stresses the need to build on, share, and expand existing TK of early warning and coping mechanisms (Government of Vanuatu, 2015). These needs are illustrated by case studies drawn from various islands across the archipelago.

Campbell (1990) found that in the Banks Islands prior to the mid-1800s, food security in the aftermath of cyclones was maintained through the use of resilient crops, agricultural diversity, "famine" and forest foods, and inter-island exchange, whereby customary networks and friendships ensured assistance in terms of surplus crops. However, European contact, colonialism, and independence have led to changing patterns of land-use, involvement in the cash economy, a decline in food surpluses and inter-island trade, and an expectation that external relief will be supplied through the government and overseas donors. In the remote Torres Group, Mondragon (2018) documented how islanders have generated their own environmental and indigenous knowledge in response to risk, that such knowledge is intimately linked to culture, and that it is modified through interactions with external agents and interventions. Pascht (2019) found a similar situation in Siviri, North Efate, stating that climate change is perceived by villagers as occurring within a combined environmental and socio-cultural context. On Tongoa Island, Granderson's research (2017) indicates that five aspects of *kastom save* (TK) are important for building adaptive capacity to climate change: observing and predicting weather and climate, careful management of local resource use, maintaining networks of relations and reciprocity, customary governance and leadership, and cultural beliefs and values such as cooperation and forward planning.

However, such aspects are declining in the face of Western education, a capitalist economy, and urban migration, so that opportunities for transmission to younger generations are much reduced. This sentiment is echoed by McNamara and Prasad (2014) from their work on Tanna and North Efate and supported by Nakamura and Kanemasu (2020) in their research into the resilience of four Fijian communities to the devastation caused by Cyclone Winston in 2016. Similarly, McCarter and Gavin (2011) found that TEK had eroded on Malekula and identified the formal school system as the driver. They proposed the inclusion of certain domains in formal curricula, specifically ethnomedical and agricultural knowledge and practice, and the reinforcement of respect for traditional authority and values.

The central role of traditional and local mechanisms in responding to Cyclone Pam in 2015 has been highlighted by Le Dé et al. (2018), who conducted research in two villages in North Tanna directly in the cyclone's track. Local knowledge of shelter and food, intra- and inter-community cooperation, traditional social security systems, and livelihood diversification were as significant in recovery as the external, top-down assistance to provide medical supplies and repair water systems and schools that followed. On the other hand, Webb's (2020) research in three Tannese villages found that

people were ill-prepared for Cyclone Pam compared with villagers on the neighbouring islands of Erromango and Aniwa, also on the track of the cyclone, because they had not engaged in disaster risk reduction programmes conducted by a non-government organisation during the preceding 3 years. These programmes focussed on modern techniques and fostered the participation of women and other vulnerable groups. The research, however, did not attempt to address the role of indigenous knowledge or values.

In summary, there is a body of research in Vanuatu that demonstrates how resilience to climate change and disasters at a local level is generated not only through close observations of and interactions with the local environment, traditional agricultural techniques, and oral transmission of past experiences, but also through traditional social resources or *social capital*: resources and support created through networks and relationships among and between families, friends, and communities which can be used to help actions such as disaster response and recovery (Adler & Kwoon, 2002). A community's *adaptive capacity* (the ability to adjust and respond and take advantage of opportunities) is best achieved when it is locally led and owned by the community itself, guided by local institutions and taking a more flexible, "whole of island" approach, rather than through being sponsored or driven by an external agency (Westoby et al., 2020a,b). At the same time, rural communities are ready to combine traditional resilience strategies with modern techniques such as cyclone warnings transmitted by text to mobile phones and crop breeds that can withstand extreme weather. While traditional strategies are important in planning for disasters, they may not be so effective in the future, when climate change increases the severity of extreme weather events (McNamara & Prasad, 2014; Nakamura & Kanemasu, 2020).

The current article seeks to contribute to the existing literature on the role of traditional and local knowledge and social capital in building resilience to hazards and climate change in Vanuatu. Data from a survey of holders and recipients of TK on its extent and transmission was linked to a case study on how communities in a remote coastal area benefited from traditional knowledge and values in response to TC Harold, the most recent Category 5 cyclone to strike the country in April 2020. We will demonstrate that the role of traditional knowledge and values in post-TC Harold experiences is an indicator of their future importance, as external aid continues to decline.

We take *resilience* to be broadly synonymous with adaptive capacity (as explained above) and make use of the terms *traditional knowledge* (TK) interchangeably with traditional ecological knowledge (TEK) and indigenous knowledge (IK), as outlined above. *Local knowledge*, however, refers to the fusion of traditional knowledge with other knowledge gained through people's changing interactions with their immediate material, non-material, and social environments (Pascht, 2019).

Vanuatu's Extreme Vulnerability to Hazards and Climate Change

Vanuatu has a high exposure to extreme natural events and current and future sea level rise. This can be explained by its location along the junction of the Pacific and Indo-Australian tectonic plates, with eight active volcanoes (see Figure 1), frequent earthquakes (Walshe & Nunn, 2012), occasional tsunami and landslides, its position in the heart of the cyclone belt of the south-west Pacific, lengthy droughts during El Niño periods, and the concentration of its inhabitants in coastal areas. In the August 2020 national census, Vanuatu had a population of 301,695 (Vanuatu National Statistics Office, 2021), of whom 67,590 (22%) were living in the two main urban areas of Port Vila and Luganville.

Recent impacts of geological hazards include the eruption of Mt Lombenben (Manaro Voui) on Ambae in September 2017, resulting in severe ashfalls over the next 13 months that destroyed food gardens, contaminated water supplies, caused the collapse of homes, and damaged the health of people and animals. This eruption culminated in the evacuation of the island's entire population of over 11,000 to other islands in October 2017 and then again from July to October in 2018, when the eruption ceased (Global Shelter Cluster, 2018; Rovins et al., 2020). The two volcanoes on Ambrym and Mount Yasur on Tanna are continuously degassing. Mount Yasur also ejects intermittent moderate ashfalls, with the latest episode in early 2020.

In Vanuatu, climate change can be viewed as a slow-onset disaster. One of its major impacts is sea level rise and the concomitant coastal erosion that occurs during storms (see Figure 2). Projections of sea level rise for 2015-2090 range from 25 to 59 cm for a very low emissions scenario and 42 to 89 cm for a very high emissions scenario (Pacific Climate Change Science and Adaptation Planning Programme [PACCSAPP], 2015). A warmer atmosphere and oceans are expected to result in the increased intensity, but decreased frequency, of tropical cyclones. Other observed and expected

Figure 2
Coastal Erosion of a Village Graveyard on Pele Island, Vanuatu

Note. Source: Author

environmental impacts include more very hot days and extreme rainfall events, an increase in ocean acidification and decline in the health of reef ecosystems, and reduced terrestrial biodiversity (Taylor & Kumar, 2016).

Two Recent Hydro-Meteorological Disasters: Cyclones Pam and Harold

During the 41-year period between 1969 and 2010, the islands of Vanuatu experienced an average of two to three tropical cyclones per annum, although this figure varied between zero and six (PACCSAPP, 2015). However, between 2015 and 2020, the country suffered from two of the most intense cyclones in recorded history: TC Pam in March 2015 and TC Harold in April 2020, both Category 5 (Food and Agricultural Organisation [FAO], 2020; Secretariat of the Pacific Community [SPC], 2016). Cyclone Pam struck the central and southern islands on the 13th and 14th of March 2015. Sustained winds of 250 kilometres per hour flattened homes, schools, and villages, affecting an estimated 188,000 people and leading to 15 deaths, many injuries, and the displacement of some 65,000 from their homes. In SHEFA and TAFEA provinces, 96% of agricultural crops were destroyed and 81% of homes sustained some level of damage (SPC, 2016). Costs of the damage were almost US$600 million (Mcdonald, 2020). The immediate response was an outpouring of aid from the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and from bilateral donors such as Australia, New Zealand, France, the United Kingdom, Israel, Germany, the European Union, China, and Japan to assist local efforts spearheaded by the National Disaster Management Office (NDMO). One positive outcome of TC Pam was the establishment of the national "cluster" system for managing future disasters. This enables government and humanitarian agencies to develop and implement disaster preparedness activities during non-disaster time, with each cluster led by a government agency and co-led by a humanitarian partner. The eight clusters are: Education; Emergency Telecommunications; Food Security and Agriculture; Gender and Protection; Health and Nutrition; Logistics; Shelter; and Water, Sanitation and Hygiene (NDMO, 2021).

Cyclone Harold, also of Category 5 intensity, was smaller in size than TC Pam, but its passage was slower and with winds gusting up to 294 km per hour, its destructive impacts very similar. It lingered off the west coast of Santo from 4th to 6th April before moving along the south of that island and across to Pentecost (Figure 3), finally leaving Vanuatu waters on the 7th of April. Eighty to 90% of homes and 60% of schools in SANMA province were destroyed, as were up to 95% of homes on Pentecost (where most housing is traditional buildings constructed of leaves and branches), thus displacing an estimated 80,000 people (Ober & Bakumenko, 2020). Many communities were cut off from support due to flooding and destruction of roads. The United Nations estimates that over 160,000 people, or more than half of Vanuatu's population, were affected (OCHA, 2020), and some 17,500 hectares of cropland were damaged, including root crops and other staples that were almost ready for harvesting (FAO, 2020).

TC Harold arrived in Vanuatu shortly after a state of emergency had been declared due to COVID-19 and while the NDMO was already struggling to cope with major ashfalls afflicting Tanna. Despite the severity of

Figure 3
Village of Melsisi, Central Pentecost, Three Weeks After the Impact of TC Harold

Note. The building on the left is the largest church in Vanuatu. Image credit: Ginny Stein (Kenni & Wijewickrama, 2020)

the damage, the NDMO banned foreign aid workers from entering the country because of the pandemic, saying that the response to Harold would be "localised". In terms of foreign aid, $2.5 million was provided from the United Nations Emergency Humanitarian Fund, and $8 million worth of supplies came from Australia, New Zealand, France, and China; however, distribution to communities in need was hampered by strict decontamination and quarantine measures, damage to inter-island vessels, erosion of roads, and the remoteness of many villages (Mcdonald, 2020). In general, there was a significantly weaker external humanitarian response to TC Harold than for TC Pam (Ober & Bakumenko, 2020). Therefore, communities were compelled to adopt local responses to the emergency, such as managing food security through traditional resilience strategies and values.

Theoretical Framework

The definition of resilience provided by the Intergovernmental Panel on Climate Change (IPCC) is used throughout this study:

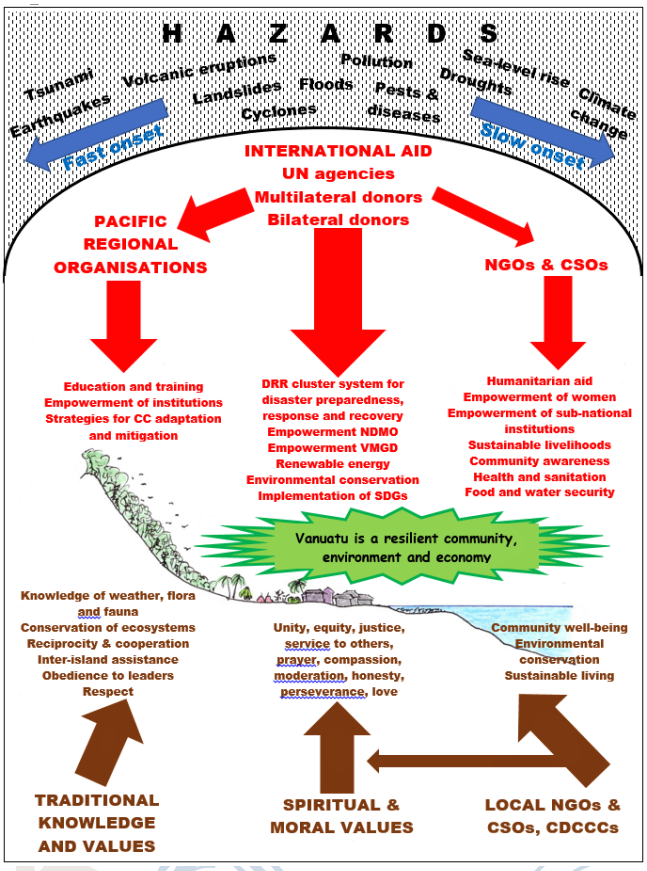
> The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation. (IPCC, 2014, p. 127)

Thus, education to foster resilience, whether in formal school environments, non-formal, community-based settings, or through traditional, informal mechanisms, will help people to learn how to face, cope with, and recover from the impacts of disasters and climate change (McMillen et al., 2014). Traditional knowledge, skills, and values can be seen as informal ways of learning to promote resilience. However, for such wisdom to be effective in the future, this study examines whether and how it is being passed to younger generations and identifies the obstacles to such transmission and use. We also evaluate the extent to which traditional wisdom is contributing to community resilience as compared with other internal and external factors.

The vision of Vanuatu's Climate Change and Disaster Risk Reduction Policy (VCCDRRP) 2016-2030 is that "Vanuatu is a resilient community, environment and economy" (Government of Vanuatu, 2015, p. 2). We have produced a hypothetical model (Figure 4) to suggest how that resilience might be achieved, considering external and internal "drivers" that are involved. The principal hydro-meteorological, geological, and biological hazards are symbolised by torrential rain at the top. Protection is offered through an umbrella of foreign aid (in red), representing financial and technical flows coherent with the UN's 17 Sustainable Development Goals. The stated aim of this top-down assistance is the empowerment of communities in building resilience to natural hazards by reducing disaster risk and adapting to climate change impacts, both direct and indirect, such as sea level rise, loss of food and water security and biodiversity, coastal erosion, and urban migration. However, we further postulate that resilience is also nurtured through bottom-up, largely voluntary processes within civil society (in brown): ordinary people, environmental groups, and faith-based organisations seeking the well-being of communities and building on millennia of experience. We argue that external financial assistance may come and go, but it is ultimately the fostering of self-supporting dynamic and equitable communities that use ecosystem services sustainably which will ensure enduring resilience to environmental change.

What seems to have happened through TC Harold is that external assistance, historically so significant for resilience and recovery in Vanuatu, has weakened at the same time as internal local efforts have strengthened. Response structures established by the NDMO, such as

Figure 4
Model of the Drivers of Resilience in Vanuatu



Provincial Emergency Operation Centres and Community Climate Change and Disaster Committees (CCCDCs), have coordinated response efforts, while traditional structures such as the *Malvatumauri* (National Council of Chiefs) mobilised communities to raise funds and collect relief items (Kenni & Wijewickrama, 2020). The Vanuatu Association of Non-Government Organisations and other NGOs and civil society groups have stepped up their activities. According to interview responses and media reporting, ni-Vanuatu have been inspired by their spiritual, moral, and/or traditional values to demonstrate their willingness to offer food, clothing, building materials, and support to the tens of thousands severely affected.

Within the context of this framework, we aim to examine whether traditional skills, values, and knowledge that provide strategies for mitigation and adaptation are indeed contributing factors in making Vanuatu a "resilient community, economy and environment".

Method

This research uses a mixed methods approach, including a review of literature on TK and Vanuatu's vulnerability to hazards and recent cyclones, field interviews and questionnaires with providers and recipients of TK from seven islands of Vanuatu, questionnaires with ni-Vanuatu students at the University of the South Pacific (USP) in Fiji, a case study of experiences of Cyclone Harold in Santo, and analysis of current formal school curricula in Vanuatu.

Ethical approval for the investigation was granted to the lead author by Bishop Grosseteste University UK and the Vanuatu Cultural Centre as part of his on-going PhD research, and no further permits were required for conducting interviews. The structured interview questions/questionnaire are provided in the appendix.

The selection of known holders of TK, as well as recipients of such knowledge, was through convenience sampling. The aim was to interview participants from as many islands and age groups as possible, based on separate questionnaires for providers and receivers, but acknowledging that providers are also recipients and may wish to complete both sets of questions. Thirty-three structured interviews were conducted in Bislama, the lingua franca of Vanuatu, or else translated into one of the 106 indigenous languages used in the country. Interviewers, comprising the lead author and his research assistants, were known to the interviewees and not regarded as "outsiders" from whom information would be withheld; the lead author had been a permanent resident of Vanuatu for 42 years. The 74 respondents at USP were ni-Vanuatu who volunteered to complete the questionnaires under the supervision of a research assistant. Interviews and surveys were undertaken between March and August 2020. A thematic analysis of the data was carried out, assigning preliminary codes to ascertain the kinds of TK, values, and transmission pathways uncovered and exploring patterns that emerged.

Several limitations to the collection of data through interviews and questionnaires must be acknowledged:

1) Questionnaire completion in Vanuatu was carried out in a slightly different way to that by respondents at USP in Fiji. In Vanuatu, questionnaires were completed face-to-face, with 28 of the 33 participants interviewed in their home village, and five who live in Port Vila or Luganville but have a close connection with their home island. In all cases, the interviewers already had family or friendship ties with the respondents, and it is assumed that information would have been shared freely. In Fiji, questionnaires for a minority of respondents were completed through face-to-face interviews with the research assistant, but most students preferred to complete the questionnaires on their own. It is not thought that such respondents deliberately concealed TK of weather signs or coping strategies, nor of traditional values, but questions may not have been understood in a uniform manner and there may have been misconceptions. This difference between the two groups in the method of questionnaire completion may have influenced the responses.
2) Because convenience sampling was used, and since the majority of the USP sample were young people who have reached a university level of education (Table 1), we cannot say that either sample is representative of all old or young people in Vanuatu. Instead, the findings are more indicative of how young adults who have spent most of their lives exposed to education at secondary and tertiary level in spaces remote from their home villages may not have the same knowledge, skills, or values as those who remained in a rural setting.
3) There is not an even representation of the 33 Vanuatu respondents by geographic area, with almost half of them coming from the one island of Santo, and the majority of those from its west coast. Similarly, 28 of the respondents were male, and only five were female. This skewed representation may have distorted the results, especially since among

the 74 USP respondents, the research assistant endeavoured to ensure an equitable gender balance (Table 2).

Information on the internal and external responses to TC Harold comes from a variety of sources such as ReliefWeb (a service provided by UN OCHA), media outlets, Vanuatu's NDMO, and personal communications with people living along the western coast of Espiritu Santo, one of the most inaccessible areas of Vanuatu. The use of primary quantitative and qualitative data to corroborate information from secondary sources has enabled a more reliable analysis of the role of TK and values in building resilience.

Table 1
Age of Respondents, Split by Sex

Age group (years)	Vanuatu adults			USP respondents		
	Male	Female	Total	Male	Female	Total
10-19	-	-	-	-	1	1
20-29	1	-	1	28	32	60
30-39	1	2	3	3	4	7
40-49	3	-	3	1	2	3
50-59	5	1	6	-	-	-
60-69	7	1	8	-	-	-
70-79	7	1	8	-	-	-
80 +	4	-	4	-	-	-
Not stated	-	-	-	3	-	3
TOTAL	28	5	33	35	39	74

Table 2
Home Island of Respondents, Split by Sex

Home island	Vanuatu adults			USP respondents		
	Male	Female	Total	Male	Female	Total
Banks	1	-	1	1	-	1
Santo (west coast)	11	1	12	-	-	-
Santo (other)	4	1	5	9	6	15
Malo	-	-	-	4	-	4
Maewo	-	-	-	2	2	4
Ambae	2	-	2	6	9	15
Pentecost	-	1	1	2	4	6
Malakula + offshore	-	-	-	8	8	16
Ambrym	-	-	-	1	1	2
Paama	-	-	-	-	1	1
Epi	-	-	-	-	-	-
Shepherds	-	-	-	-	1	1
Efate + offshore	6	-	6	1	3	4
Erromango	-	-	-	-	1	1
Tanna	4	1	5	1	1	2
Aniwa	-	-	-	-	-	-
Futuna	-	-	-	-	1	1
Aneityum	-	1	1	-	-	-
Not stated	-	-	-	-	1	1
TOTAL	28	5	33	35	39	74

Results

Extent and Transmission of Traditional Knowledge and Values

Participating groups. Vanuatu-based participants consisted of 33 respondents from the islands of Mota, Santo, Ambae, Pentecost, Efate, Tanna, and Aneityum, with half of them coming from Santo (Table 2). Nearly all (97%) were aged 30 and over, with 61% aged 60 years and over. All but five were male. Twenty respondents classified themselves as providers, 11 as receivers, and 2 as both providers and receivers. Every person was interviewed in the field, using structured questions in Bislama or his/her own language posed by the researcher or a trained assistant.

Overseas ni-Vanuatu participants comprised 74 respondents at USP in Suva, Fiji, of whom 66 were full-time students. Most islands of Vanuatu were represented in this sample, with most respondents coming from Santo, Ambae, and Malekula. Unlike the first sample, 82% of USP participants were under 30 years old, with a more equitable balance between males (47%) and females (53%). Sixty-six classified themselves as both providers and receivers of traditional knowledge. Most respondents preferred not to be interviewed but to complete the questionnaires by themselves, responding in either English or Bislama.

The purpose in having two distinct participant groups was to distinguish between older respondents who have lived entirely or for long periods in a rural setting, and younger respondents who have spent much of their school lives undergoing formal education in secondary and tertiary establishments removed from the village[1], having little contact with natural

1 After primary school (Year 6), nearly all students must leave their village to continue education at secondary level in another location. In 2019, there were 479 primary schools (Years 1-6) and 111 secondary schools (Years 7-14) in Vanuatu (Ministry of Education and Training, 2020). Of those who complete junior secondary school (Years 7-10), approximately half move to a senior secondary school in an urban or non-village rural location, and only one third complete Year 13, the entry point for university. We estimate that the average 20-year-old student who arrives at USP is likely to have spent at least 7 years (one third of their life) away from home influences. For a student who has been born in Port Vila or Luganville and completed primary and secondary education in an urban school, estimated at 25% of all students, it is likely that they have had little direct exposure to their cultural roots in the parents' village(s) of origin.

ecosystems and the possibility of alienation from their cultural roots, a practice dating back for more than 50 years. However, the limitations of the survey mean that results cannot be considered as representative of Vanuatu society as a whole.

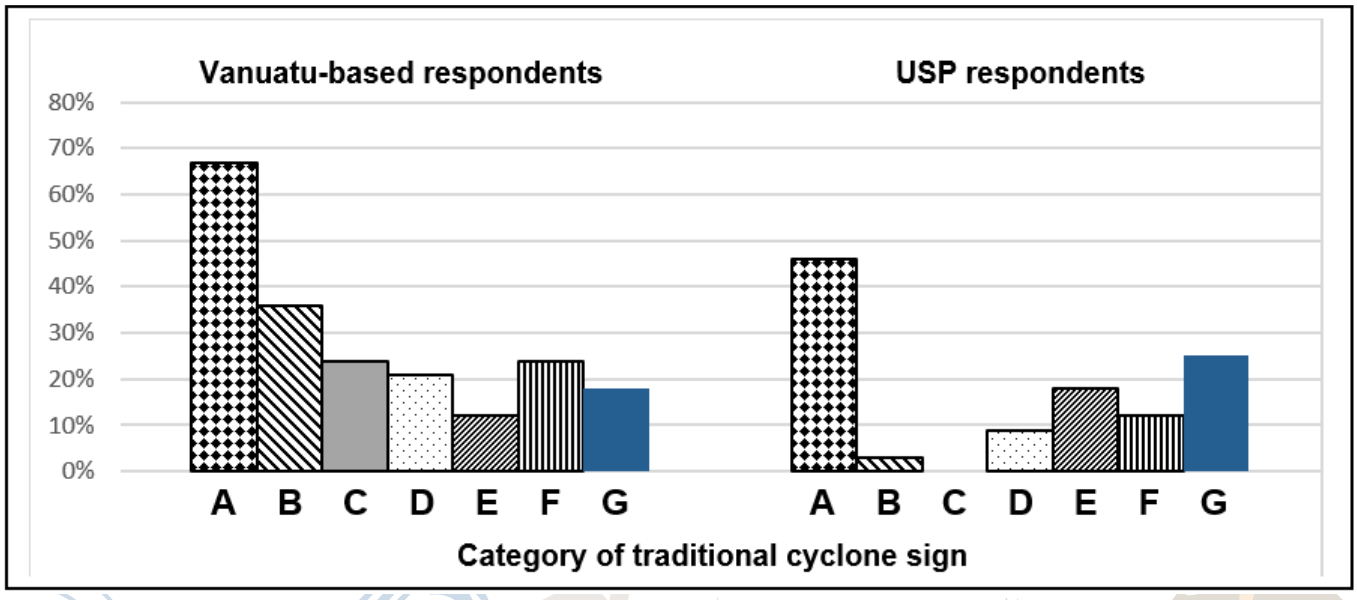
Traditional signs, strategies, and values. A key finding of the research relates to whether respondents could state any traditional environmental signs of approaching disasters and describe any traditional strategies for being resilient to such disasters. Table 3 and Figure 5 show results for traditional cyclone signs, while Table 4 and Figure 6 provide data for traditional cyclone resilience strategies. These signs and strategies were offered by the respondents themselves, without interviewers having to use checklists or prompts.

As expected, Vanuatu-based respondents demonstrated a greater knowledge of traditional cyclone signs than those in the USP sample. Thus 67% of the Vanuatu group stated one or more atmospheric signs, compared to 46% of the USP group. The contrast was particularly marked for observed changes in flora, with 36% of the Vanuatu group identifying an abnormally high output on fruit trees and 24% noting other changes in crops and plants, compared with 3% and 0% respectively for the USP group. For fauna, 21% of the Vanuatu sample knew that cyclones are likely when hornets and birds build their hives/nests close to the ground, compared

Table 3
Traditional Cyclone Signs Stated by Number of Respondents

Traditional cyclone sign	Vanuatu-based respondents			USP respondents		
	M (28)	F (5)	T (33)	M (35)	F (39)	T (74)
A. Atmospheric signs: unusual cloud formations, increasing wind speed, heavy rainfall, unusually hot days and nights, halo around moon, etc.	20	2	22	17	17	34
B. Changes in flora: abnormally high production of flowers and fruit on fruit trees – breadfruit, nakatambol, navel, mango.	9	3	12	0	2	2
C. Other changes in flora: yam vines coil back down the yam stake, new banana shoots remain closed but leaves fall to ground, withering of windiwindi grass, red yam grows under nabanga tree, nalumlum (algal bloom) on sea surface, etc.	8	0	8	0	0	0
D. Changes in fauna: hornets/birds build nests close to the ground, fowl roost under houses, turtles lay eggs in bush, mangrove crabs leave habitat, unusual movements of animals/insects.	6	1	7	4	3	7
E. Changes in fauna: bird flight: frigate birds fly in from the sea, birds fly in unusual patterns/movements.	2	2	4	6	7	13
F. Other environmental signs: rough seas, dirty seas, use of traditional calendar, etc.	6	2	8	2	7	9
G. No traditional signs stated.	5	1	6	13	13	26

Figure 5
Percentage of Total Respondents Identifying Each Category of Cyclone Signs



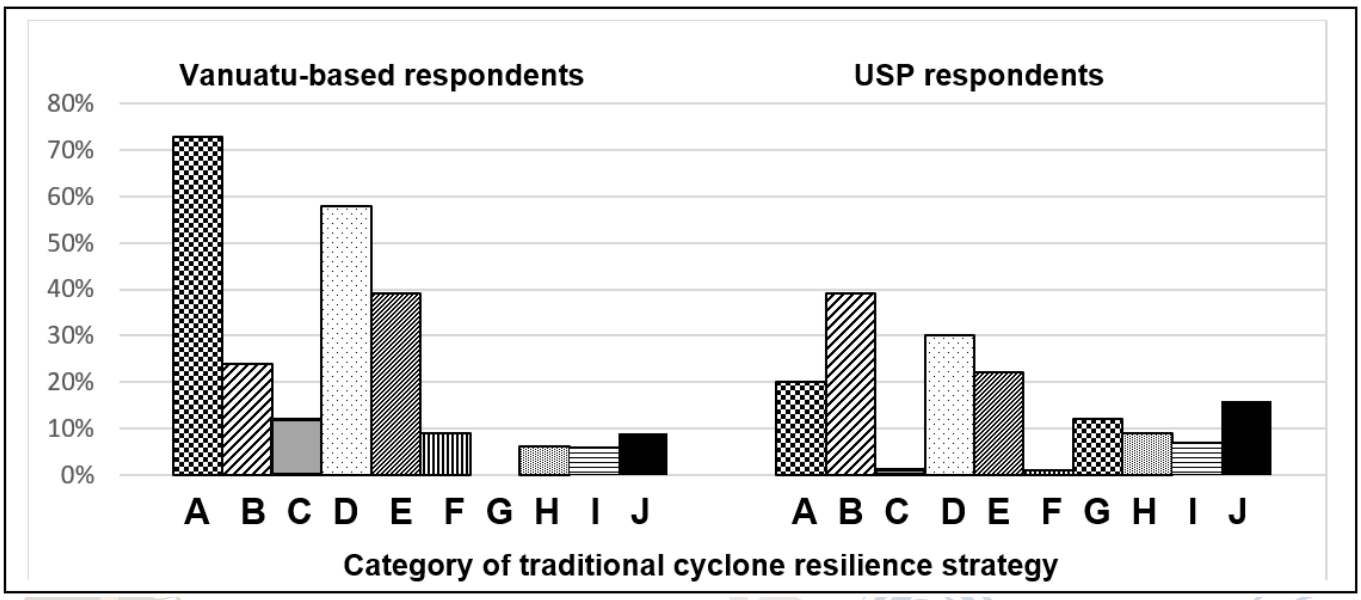
with 9% of the USP group, but a higher proportion of the latter (18% compared to 12%) mentioned the arrival of frigate birds or unusual bird movement. The proportion of USP respondents who could not state any traditional cyclone signs (35%) was almost double that of the Vanuatu-based group (18%). Table 3 suggests that the different responses for the two groups were due to age and experience rather than to sex, demonstrated by the near-identical number of males and females among the USP group identifying atmospheric signs, as well as no signs at all.

Similarly, and without any prompting, a much greater proportion of the Vanuatu-based respondents could demonstrate knowledge of traditional cyclone resilience strategies, particularly those of long-term duration. For example, 73% of the Vanuatu group stated traditional

Table 4
Traditional Cyclone Resilience Strategies by Number of Respondents

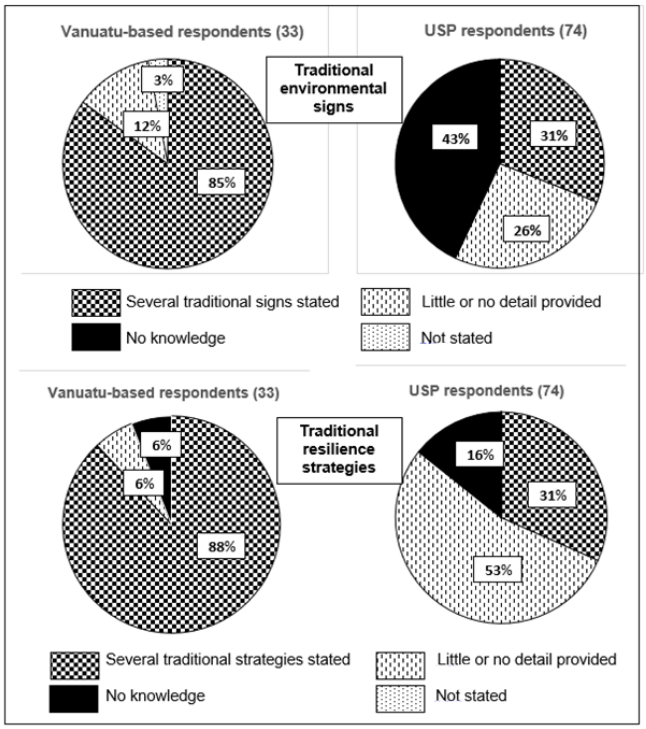
Traditional cyclone strategy	Vanuatu-based respondents			USP respondents		
	M (28)	F (5)	T (33)	M (35)	F (39)	T (74)
A. Traditional house construction and maintenance (long-term): style, shape, site. Construction of permanent houses.	20	4	24	11	4	15
B. House maintenance and preparation (short-term), just before arrival of cyclone: ensuring roof is properly tied down, tying extra coconut leaves to roof, cutting branches of trees close to house, etc.	7	1	8	10	19	29
C. Strengthening of community solidarity/unity (long-term). Maintenance of kastom networks and reciprocal relationships. Obedience to chief.	2	2	4	0	1	1
D. Improving food security (long-term): planting and storing long-life tubers; clearing and planting traditional food gardens; following seasonal planting calendar; traditional food preservation techniques, including burial.	14	5	19	12	10	22
E. Improving food security (short-term): harvesting of manioc, bananas, and other vulnerable crops before cyclone arrives; using wild crops as emergency foods after cyclone passes; storing food in home, etc.	11	2	13	6	10	16
F. Improving water security (long-term), e.g., by finding new sources, cleaning springs.	3	0	3	1	0	1
G. Improving water security (short-term), e.g., by covering water sources/collecting water just before cyclone arrives.	0	0	0	4	5	9
H. Traditional ways of diverting or stopping a cyclone or reducing destruction of home (short-term), e.g., by using special leaves/magic.	2	0	2	2	5	7
I. Other strategies, e.g., trapping crabs and fish, sheltering in caves, clearing path to caves, planting trees on slopes, planting windbreaks.	1	1	2	1	4	5
J. No traditional cyclone strategies stated.	3	0	3	6	6	12

Figure 6
Percentage of Total Respondents Identifying Each Category of Cyclone Resilience Strategies



house construction and maintenance (A) as a key factor in resilience, compared with just 20% of the USP group; common features of such traditional homes include low or no walls, a triangular or semi-circular profile, and use of *natangura* (sago palm) thatch. The Vanuatu group also had much higher proportions stating the strengthening of community solidarity (12% vs. 1%), long-term food security and traditional food preservation (58% vs. 30%), and short-term food security just before and just after the passage of a cyclone (39% vs 22%). However, the USP group had higher percentages for short-term maintenance and preparation of houses (39% vs. 24%) and short-term improvement of water security (12% vs. 0%), possibly reflecting the role of young people in last-minute preparations before a cyclone arrives. Traditional short-term ways of calling upon the spirits or using special leaves or sacred stones to divert a cyclone away from an island or reduce damage to the home were mentioned by 6% of the Vanuatu group and 9% of the USP group. A larger percentage indicated no knowledge of traditional cyclone resilience strategies in the USP sample than in the Vanuatu-based sample (16% vs. 9%), with males and females equally represented among the students.

Figure 7
Knowledge of Traditional Environmental Signs and Resilience Strategies



When examining responses to traditional environmental signs and resilience strategies for *all* hazards (cyclones, droughts, ashfalls, tsunami), the contrast between the two cohorts is reinforced (Figure 7). For example, 85% of the Vanuatu group demonstrated detailed knowledge of several traditional signs, while another 12% made generalised statements. However, only 31% of the USP cohort had detailed information, 26% gave generalised statements, and 43% had no knowledge. For traditional resilience strategies, 88% of the Vanuatu group gave detailed descriptions, 6% had generalised knowledge, and 6% had no knowledge, compared with 31%, 53%, and 16% respectively for the USP cohort. The younger USP cohort appear to have a better knowledge of traditional strategies for disaster resilience than they do of traditional signs of impending disasters, perhaps because they have greater trust in modern alerts

Table 5
Knowledge of Traditional Values and Attitudes That Build Resilience

	Category	Vanuatu-based respondents		USP respondents		Total	
A.	Social capital: unity and solidarity, cooperation, working together, showing respect and obedience to leaders, strong leadership and governance, reciprocity, family bonds, trusted social networks, togetherness.	16	48%	64	86%	80	75%
B.	Personal qualities: integrity, strong work ethic, caring, friendship, love, kindness, hospitality, orderliness.	5	15%	6	8%	11	10%
C.	Traditional resilience strategies: traditional disaster mitigation unspecified; using/passing traditional knowledge, values, and advice; ensuring food supplies through traditional farming, food storage, and food preservation; traditional housing; conserving trees and using traditional ways of promoting crop growth; traditional hazard signs and warnings, including cyclone signs and observation of animal behaviour; sharing food, knowledge, and communications; preparation and planning; valuing caves.	27	82%	37	50%	64	60%
D.	Environmental attitudes: benefits of cyclones, pleasing the spirits.	3	9%	-	-	3	3%
E.	Not stated	3	9%	8	11%	11	10%
	TOTAL number of values mentioned	54		115		169	
	TOTAL persons completing survey	33	100%	74	100%	107	100%

available through mobile phones, the Internet, radio, and television.

When asked to list one or more traditional values and attitudes that build resilience, responses from the older cohort interviewed in Vanuatu were different to those of the USP cohort (Table 5).

Overall, the 107 respondents mentioned a total of 169 values. For both groups, the two most frequently mentioned categories were social capital (A) and traditional resilience strategies (C), with the latter more important for the Vanuatu-based group and the former more important for the younger USP cohort. Regarding specific values, the most common for Vanuatu respondents was identified as "following traditional weather signs", mentioned by 11 out of 33 respondents (33%), while the most common for USP respondents was "working together", mentioned by 23 out of 74 respondents (31%), and "obedience to/ respect for leaders", stated by 17 respondents (23%). The importance of traditional resilience strategies and social capital demonstrated by these findings supports earlier research in Vanuatu and Fiji by Campbell (1990), Granderson (2017), Le Dé et al. (2018), McNamara and Prasad (2014), and Nakamura and Kanemasu (2020).

These findings imply that despite a period of estrangement from their cultural roots, the majority of USP respondents still recognise the importance of social capital and, to a lesser extent, traditional resilience strategies. However, a different picture emerges when we look at responses to a question that was only asked of receivers: they had to recall any basic attitudes or beliefs that the transmitter of TK had passed to them. Of the 71 USP respondents identifying themselves as TK receivers, 45 (63%) remembered traditional resilience strategies but only two (3%) could recall attitudes relating to social capital, or social aspects of community life; a further 18 (25%) could not remember any basic attitudes at all.

Respondents were asked to state whether they had used any of their received TK in their own lives, and to provide a specific example of when or where this had happened (Table 6).

Table 6
Extent to Which Respondents Have Used Traditional Knowledge in Their Own Lives

Category	Vanuatu-based respondents		USP respondents		Total	
Yes, with a specific example	12	36%	37	50%	49	46%
Yes, but no example	21	64%	23	31%	44	41%
Not used	-	-	13	18%	13	12%
Not stated	-	-	1	1%	1	1%
TOTAL	33	100%	74	100%	107	100%

All Vanuatu respondents confirmed that they have used their received TK in their own lives, but only one third (36%) could provide a specific example of this. For the USP respondents, half (50%) could provide a specific example, but 18% said that they had not used any of the TK received; this aligns with the large proportion of USP respondents (69%) who could demonstrate little or no knowledge of traditional hazard signs or of traditional resilience strategies.

Traditional Knowledge (TK) Transmission

Both samples were asked to state the person(s) from whom they had received their TK on weather, climate, and environmental change. Of all 107 respondents, 29 (27%) said that they had received their TK from their fathers, 14 (13%) from their grandfathers, and the remaining 64 (60%) from a variety of family members or other adults. A much larger percentage of the Vanuatu adults said that they had received TK from their fathers (45%) than the USP respondents (19%). Grandparents seem to be more significant for the younger cohort of USP respondents (30%) than they are for the Vanuatu adults (6%). Another important difference is that while none of the Vanuatu adults received their TK from outside their extended families, 15% of USP respondents did so through the Internet or teachers.

Respondents were also asked to indicate the person(s) to whom they would, or have already, transmitted their TK, selecting only one option from several to avoid double counting. One third of the USP respondents (34%) said that their TK should be passed to their children, with the next highest response (12%) for transmission to the first-born son. For Vanuatu adults, on the other hand, the highest response (39%) was for "not stated", followed by 12% each for transmission to the first-born son, to children, and no transmission at all. The common explanation for this non-transmission is that their children, or those around them, are not interested.

A distinction was made between transmission of knowledge and the transmission of skills: TK receivers were asked how much they remembered of each on a scale of 1 to 4, with 4 being everything and 1 very little. The majority of recipients in both cohorts said that they recalled "a lot" or "a little" knowledge and skills (the middle values of the scale). Average scores for memories of knowledge were higher for the USP students than for the

Vanuatu adults (2.9 compared to 2.6), but slightly lower for memories of skills (2.7 compared to 2.8). A surprising 25% of the USP receivers claimed that they remembered all the TK transmitted; however, they could have been thinking of modern knowledge about weather and climate rather than traditional environmental knowledge.

Finally, in response to the question on frequency of TK transmission, a majority of Vanuatu adults and USP respondents stated that the person transmitting TK to them did so repeatedly. Among the USP respondents, however, 16 (22%) said that this person transmitted their knowledge only once, possibly because they have had limited contact with that person since leaving their village to pursue secondary and tertiary education.

Reasons for the Decline of Traditional Knowledge

Providers were asked to discuss whether the transmission of TK is changing, and if so, why. Most respondents felt that there is less transmission today than in the past, and hence there is a general decline in the amount of TK currently available. Among reasons for this decrease offered by the older cohort were that their children were no longer with them, are no longer interested in TK, or that young people have lost respect for their elders. Other, more specific, reasons were that knowledge of traditional house design is perceived as no longer relevant because permanent building materials offer better protection from cyclones; that urban living precludes the demonstration of many traditional environmental signs to others; and that when children go away for education, they are removed from home influences and gain preferences for processed rather than traditional foods. Among the younger cohort, however, 28 out of 74 (38%) stated that the decline in TK is because of their use of modern technology, citing the Internet, social media, cell phones, and hazard warnings transmitted through the media. Other factors mentioned were the influence of urbanisation, education, Western culture and lifestyle, and the fact that young people are no longer spending time with their elders.

Analysis and Implications

Evidence of TK Transmission

Results from the survey indicate that older people in rural areas of Vanuatu hold considerable knowledge of traditional weather signs and resilience strategies that they wish to transmit to younger generations, but that the out-migration of their descendants to schools and urban areas means that much of this wisdom is not being transferred. The majority of tertiary students interviewed (69%) confirm that they have little or no knowledge of traditional environmental signs or resilience strategies, but 86% have nevertheless retained awareness of key traditional values relating to social capital - working together, sharing, respect, and preparation - that are important for community well-being and disaster risk reduction. These young people also point out that TK is now being submerged under a tide of digital technology and social media - a trend that is only likely to increase.

Contribution of Traditional Knowledge, Skills, and Values to Resilience during Cyclone Harold

The external response to Cyclone Harold was less than during the previous cyclone of similar intensity, largely because Vanuatu was already in a state of emergency due to the COVID-19 pandemic and there were fears that arriving humanitarian personnel and supplies would carry the virus. Foreign aid workers were banned, and all imported relief supplies (including hygiene kits, tents, and tarpaulins) were delivered under strict quarantine protocols. According to Ober and Bakumenko (2020) of Refugees International, sources on the ground in Vanuatu noted a significantly inferior international humanitarian response to TC Harold as compared to TC Pam in 2015, despite the former's greater destruction on some islands; three weeks after the cyclone, one such source reported that there are "no personnel, no military aircraft, no helicopters---and it's been logistically very challenging. Financially we've received very little." (Ober & Bakumenko, 2020, par. 31). In addition to lower levels of financial assistance, support came from fewer donors than with TC Pam. The FAO's request for US$3 million for seeds, tools, and capacity-building to address food insecurity was underfunded by more than $2.5 million, while UNICEF's appeal for US$7.7 million to support humanitarian operations fell short by more than $6 million (Ober & Bakumenko, 2020).

In contrast to this decline in aid, a significant development was the forced localisation of responses to TC Harold. The NDMO insisted that response efforts would be "internally run" (Kenni & Wijewickrama, 2020); thus, greater responsibility for recovery operations was assumed by national and sub-national institutions. The *Malvatumauri* (National Council of Chiefs) mobilised communities to raise funds and collect relief items. Little external food aid was received, but during the months after TC Harold and under the coordination of the NDMO's Food Security and Agriculture Cluster, communities in central and southern islands donated boatloads of root and fruit crops to affected populations on Pentecost and in SANMA Province (Figure 8).

Figure 8
Root Crops from Central and Southern Islands of Vanuatu Arriving in Pentecost on 31st May 2020

Note. Image credit: Alain Siméon. Reproduced with permission

For example, villages from Tongariki and Buninga contributed 2.3 tonnes of yams and 142 farmers from Emae supplied 11 tonnes of quality yams, while root and fruit crops were also shipped from Erromango, Malakula, Paama, and Tanna (R. Tigona, personal communication, 2020). Such contributions testify to the importance of social capital - traditional values of sharing, cooperation, togetherness, and mutual assistance - together with traditional leadership structures at national, island, and community level. They also confirm the significance of traditional subsistence agriculture, with its emphasis on root crops, bananas, and fruit trees grown through a bush-fallow system.

A major advantage of this sharing of locally grown food is that cyclone victims receive much healthier and more diverse food than would otherwise come through donations of rice, noodles, tinned meat, and fish in food packages from overseas (Kenni & Wijewickrama, 2020). Another benefit is that a proportion of the root crops can be used for replanting in damaged food gardens, strengthening future food security. These initiatives confirm that traditional knowledge and values give Vanuatu the potential to contribute to its own food security during future disasters, reducing its need for overseas aid. Indeed, the role of overseas aid ought to be re-assessed.

With the likelihood of an increasing number of Category 5 cyclones affecting not just Vanuatu but other areas of the world (Carbon Brief, 2015; IPCC, 2014), aid agencies are going to be increasingly hard-pressed to fund reconstruction after such disasters. The reaction to TC Harold and the findings from this survey suggest that effective responses to, and recovery from, disasters lie in building greater capacity for preparedness at household, community, area council, and provincial levels, processes that benefit from the use of traditional resilience strategies combined with on-going education and training on modern coping mechanisms. Building such local capacity can reduce the high cost of accessing the outer islands of Vanuatu, which regularly drains the already stretched annual budget of the NDMO and enables humanitarian aid to reach affected areas more rapidly (Ober & Bakumenko, 2020).

The role of TK in this development is stressed by a senior research officer in Vanuatu's NDMO:

Traditional knowledge definitely needs to be emphasised. Our forefathers have well survived the past disasters and we are proof of that. Traditional knowledge saves lives when modern knowledge is slow or lacking. Studies have shown that Vanuatu will experience more frequent and intense natural disasters. While waiting for modern knowledge to save us from a certain death, let's make use of our traditional knowledge. It is not a simple task, because traditional knowledge is slowly disappearing in the face of rising technology and change of focus from our youths. National leaders should encourage revival of traditional knowledge to ensure best practices are kept and applied when there is a potential disaster occurring.

(NDMO research officer, personal communication, 7 September 2020)

Case Study on the Use of TK in West Coast Santo

The implications of relying on traditional knowledge and values in resilience responses is demonstrated by this case study of events in communities along the remote west coast of Santo Island. This was one of the areas to suffer most from the impacts of TC Harold when it remained offshore for almost 3 days.

This case study draws on an in-depth interview with a young graduate of the first-ever certificate courses on Resilience (Climate Change Adaptation and Disaster Risk Reduction) held in Vanuatu during 2017-2018 as part of a Technical and Vocational Education and Training (TVET) programme. After training, he returned to his home village of Kerepua in western Santo, and was instrumental in promoting awareness of resilience strategies, including traditional techniques, as well as the creation of a local marine and land conservation area that extends from the reef at Kerepua to high montane forests around Mt Tabwemasana, Vanuatu's highest mountain. He co-founded the Santo Sunset Environment Network (SSEN), whose goal is to ensure the protection and conservation of ecosystems and biodiversity through traditional knowledge and customary practices in the 25 villages along the West Coast. For response to and recovery from TC Harold, he reports

that impact assessments were conducted for the whole west coast area, a detailed report was sent to the NDMO, and a locally-constituted team established and trained CDCCCs in 14 villages ready for the coordination of future disaster preparedness, response, and recovery. Community awareness was carried out on health, hygiene, forestry, and environmental conservation, and people were encouraged to plant quick-growing ("three months") crops such as kumala. When asked how TK helped the community to be resilient during the passage of TC Harold, the respondent said:

> We relied on traditional weather indicators. When clouds were moving rapidly across the sky, the *manuinalane* [cyclone birds] were flying in from the sea and our poultry stopped making a noise when roosting in the late afternoon, my father predicted that the cyclone would be very strong, and he was right. We undertook traditional preparations such as lashing down our houses, baking taro and *laplap* [national dish of Vanuatu] in underground ovens ready for food shortages after the cyclone, and moving the family to the safety of the kitchen, which has low roofing. We also knew that if there was fine weather in the middle of the cyclone, then winds would return with even more force."
>
> (Respondent, personal communication, 8 August 2020)

According to the report submitted to the NDMO (Bartlett, 2020), TC Harold completely destroyed over 600 homes, badly damaged nearly all infrastructure and wiped out the agricultural and productive sector livelihoods of over 2,590 people across 25 communities. All primary and junior secondary schools were either totally destroyed or rendered completely inoperable, leaving more than 500 students with no educational opportunity in the foreseeable future. Even before TC Harold struck, West Coast Santo was highly food insecure, largely due to a severe drought which lasted for most of 2019 and into 2020. Planting was delayed by 4 months and only commenced in February 2020. Staple crops like manioc, taro, and sweet potato were not yet ready when the cyclone struck. Banana, the other staple food, was completely decimated and was not available for at least 8 months. Livestock that broke out of their fences ate much of the remaining food, as no fencing materials were available for repairs. The cyclone damaged many existing water systems, breaking pipes, burying source springs, and shattering storage tanks. Because of slow and insufficient external relief, emergency operations were managed by a team of volunteers from the SSEN, Edenhope Foundation, and the Area Council, who helped communities to self-organise and begin their own response and recovery work using their inherent resilience and a wealth of TK practices. Some of these traditional practices include: constructing cyclone-resilient homes from wild cane and black palm, with low roofs supported by posts dug deeply into the ground, held together with strong bush ropes (lianas) and protected by large logs placed on roofs at the start of the cyclone season, and the house aligned north-south so that the long side is facing strong westerly winds; observing environmental signs of forthcoming cyclones and taking the necessary precautions - cloud movements, formations and colours, abundance of fruit, abnormal animal behaviour; collecting and preserving food before a cyclone arrives; using wild yams as disaster food; making home-made salt through the evaporation of sea water for preserving meat and fish; and accessing fresh water through storage in dry bamboo segments and knowledge of perennial upland springs.

The report also suggests that much of this traditional knowledge is confined to older people, with younger people no longer spending time with their elders to absorb this wisdom. Therefore, most communities along the west coast of Santo no longer contain many traditional cyclone-proof houses, and as a result of TC Harold, which was described by older people as being much stronger than anything they had previously experienced during their lifetimes, there is widespread interest to revive, re-learn, and put into practice such traditional resilience and coping strategies (Bartlett, 2020).

Although these two communications from western Santo on the role of TK in building resilience to cyclones cannot be considered as representative of Vanuatu as a whole, they do support two major findings from our survey. Firstly, the traditional cyclone indicators (weather observations, changes in flora, abnormal animal behaviour, cyclone birds) and traditional coping measures for cyclones (distinctive houses, long-term and short-term ways of assuring food and water security) are the same as those identified by both cohorts of survey respondents and correspond to those identified by other authors (e.g., Granderson, 2017; Le Dé et al., 2018; McNamara & Prasad, 2014; Mondragon, 2018; Nakamura & Kanemasu, 2020). Secondly, much of this TK is held by older people, who are unable to pass it on inter-generationally because young people are either not there or not interested, an observation made by some of the older Vanuatu-based survey sample; additionally, over one third of the USP sample said that young

people's use of efficient modern technology (especially mobile phones and the Internet) leads to a reluctance to rely on traditional warning signs or strategies.

Traditional Knowledge in Formal and Non-Formal Education

Primary and secondary educational curricula have been in the process of major revision since 2010, ensuring that both English- and French-medium schools offer common content from Years 1 to 13. The revised curriculum for primary schools includes aspects of resilience in Environmental Studies and Basic Science, with acknowledgement of the role of TK. Revised curricula for the junior cycle of secondary education (Years 9 and 10) are still being developed, so that as of 2020, schools were still reliant on pre-2010 content. This content has limited coverage of climate change and disasters through Basic Science and Social Science, with no inclusion of TK. New syllabi for the senior cycle of education (Years 11 to 13) were followed for the first time in 2020, although education at this level is no longer compulsory and most students have dropped out. In 2019, for example, just 1,064 students were enrolled in Year 13, compared with 8,150 when these same students were in Year 1 during 2007: an 87% attrition rate (Ministry of Education and Training, 2020; Ministry of Education, Youth Development and Training, 2007). In the senior cycle, resilience issues feature in curricula for Geography, Earth Science, and Development Studies, but these are optional subjects and TK is only covered in Development Studies. Since most learning about climate change and disaster risk reduction takes place in the senior cycle and is restricted to three optional subjects, we can conclude that the majority of young people in Vanuatu are not benefiting from formal exposure to resilience education and are not learning about traditional resilience strategies. This contrasts with the VCCDRRP's statement that TK should be "included in formal and informal school curricula" (Government of Vanuatu, 2015, p. 14).

At tertiary level, accredited courses on resilience have been offered through the Certificates I and III TVET programmes at the Vanuatu Institute of Technology since 2017, but the total number of graduates to complete both courses to date is less than 50. Unlike most other programmes, these two courses do contain explicit content on traditional environmental signs of approaching hazards and traditional coping strategies. The University of the South Pacific offers on-line courses that cover climate change and disasters and make reference to TK, but again, the number of participants is limited.

Non-formal public education on resilience is fostered by the NDMO and the Vanuatu Meteorological and Geo-Hazards Department but is largely carried out by non-government and civil society organisations such as Red Cross, Care International, Save the Children, World Vision, Oxfam, Live and Learn Environmental Education, Wan Smolbag Theatre, and the Vanuatu Christian Council. These organisations conduct awareness programmes for village communities and sub-national bodies such as Area Councils and CDCCCs, largely focusing on disaster preparedness and response, but recognising the importance of traditional knowledge, values, and resilience strategies. This is in accord with the implementation of the VCCDRRP, which stresses that adaptation and disaster risk reduction should be "owned and driven by communities through working within traditional and local knowledge and values so that these systems become more resilient" (Government of Vanuatu, 2015, p. 18).

In general, therefore, it seems that TK is largely absent from the formal curricula experienced by the entire school population of Vanuatu but is being fostered among a small minority of young people through TVET programmes and short courses offered by government and non-government actors. Thus, if the use of traditional resilience and coping strategies for cyclones and other hazards is to be fostered, we cannot rely on formal education; it must occur primarily through a re-invigoration of traditional transmission pathways.

Conclusion

Evidence from an ongoing survey of older individuals in rural areas of Vanuatu has demonstrated that traditional knowledge, skills, and values help to equip people with the means of reading natural warning signs that prepare them for cyclones and other hazards, with strategies for mitigating the negative effects of disasters, and with attitudes that enable survival and recovery. Reports from West Coast Santo, a remote area severely affected by Tropical Cyclone Harold in April 2020, demonstrate how such traditional strategies and attitudes, together with skills learned through modern courses and awareness programmes on resilience, helped inhabitants support themselves through their own resources, rather than relying on external aid. Further verification is provided by the forced localisation of responses to TC Harold throughout Vanuatu, with traditional leadership, sharing, and mutual assistance able to mobilise movements of root and fruit crops to stricken populations in the northern islands.

On the other hand, a survey of ni-Vanuatu studying at the University of the South Pacific in Fiji, young people who have spent a significant portion of their lives isolated from their cultural roots and sources of traditional wisdom, indicates that although they still acknowledge many of their traditional social values, 69% of them had little or no knowledge of traditional environmental signs or traditional resilience strategies. Generally, the decline in traditional knowledge is acknowledged by both survey groups as being due to reduced transmission from older to younger generations and by younger people's preference for the acquisition of knowledge through the Internet, social media, and cell phones. Further contributing to the decline in the use of traditional knowledge for building adaptive capacity is its near absence from school curricula, despite this being advocated in Vanuatu's National Climate Change and Disaster Reduction Policy.

However, the experience of Cyclone Harold demonstrates that traditional knowledge, skills, and values have a clear role to play in building resilience in Vanuatu, especially when used in conjunction with modern channels of communication and locally owned institutions such as Community Climate Change and Disaster Committees. This article supports the recommendations of other authors (e.g., Granderson, 2017; McCarter & Gavin, 2011; Nakamura & Kanemasu, 2020) that renewed efforts must be made to document, store, and promote the use of traditional knowledge and social capital. Government and non-government agencies at all levels can provide opportunities for older custodians of knowledge to actively engage and share their specialised skills and wisdom with women, youth, children, and other vulnerable groups. Centuries-old informal transmission pathways for building adaptive capacity for hazards and climate change must be revived and supplemented through formal and non-formal education, while at the same time recognising that resilience is at its most effective when both modern and traditional strategies are allowed to complement each other.

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Appendix: Structured interview questions/questionnaire

QTK1 Questions to be asked of a provider of traditional knowledge

NAME: ..... M☐ F☐ VILLAGE: ..... ISLAND .....
AGE: 10-19☐ 20-29☐ 30-39☐ 40-49☐ 50-59☐ 60-69☐ 70-79☐ 80 +☐

INTERVIEWER: ..... DATE: .....

1. **Wanem samfala saen we i soem se weta/klaemet i stap jenis o wan disasta i stap kam (saeklon, drae taem, etkwek, tsunami, volkeno...)?**
   What are some signs that show that our weather or climate is changing or that a disaster is coming (cyclone, drought, earthquake, tsunami, volcanic eruption)

2. **Yu save eni kastom fasin blo stanap strong lo fes blo ol disasta we i kamaot (saeklon, drae taem, etkwek, tsunami) ? (Olsem fasin blo bildim haos, planem kakae mo nara samting olsem)**
   Do you know of any traditional ways of being resilient to disasters such as cyclones, droughts, earthquakes, tsunamis, volcanic eruptions? (House design, cultivating crops, finding fresh water, etc)

3. **Ol save ia yu holem yu wan o yu stap pasem? Mo yu pasem lo huia?**
   Do you hold on to your traditional knowledge about weather and climate, or do you pass it on to others? If so, to whom?

4. **Hao nao yu stap pasem?**
   How do you pass on such knowledge?

5. **Yu save givim wan eksampol blo las taem we yu bin pasem save ia, mo lo hu?**
   Can you give an example of the last time when you transmitted this traditional knowledge, and to whom?

6. **Long kastom blo yu, yu sud pasem ol tradisonal save blo yu lo huia? Fasbon boe blo yu, ol pikinini blo yu, bubu blo yu, o hu?**
   According to your custom, to whom should you transmit your traditional knowledge? Your first-born son, your children, your grandchildren or who?

7. **Tedei, fasin we yu pasem save blo yu lo narafala man i stap jenis, o no? From wanem?**
These days, are there any changes in the way that you are transmitting your knowledge to others? Why?

8. **Wanem nao ol impotan valiu lo kastom we mekem se wan komuniti i save kam risilient (stanap strong) lo fes blo wan disasta?**
   What are some important traditional values that make a community more resilient in the face of a disaster

QTK2 Questions to be asked of a recipient of traditional knowledge

NAME: ..... M☐ F☐ VILLAGE: ..... ISLAND .....
AGE: 10-19☐ 20-29☐ 30-39☐ 40-49☐ 50-59☐ 60-69☐ 70-79☐ 80 +☐
INTERVIEWER: ..... DATE: .....

1. Yu bin kasem eni save abaot ol disasta mo jenis lo weta mo klaemet tru lo ..... (*nem blo man we hem i talem se hem i bin pasem*)?
Did you receive any knowledge about disasters and changes in weather and climate from ……. (*person who says he/she passed it on to you*)?

2. Aot lo man (woman) ia, yu bin kasem eni save abaot hao blo stanap strong lo fes blo ol disasta o jenis lo klaemet we i kam?
Did this person also pass on some knowledge about how to face and overcome the impacts of the disasters and changes in weather and climate?

3. Talemaot sam samting we yu bin lanem aot lo hem. (*Yusum nara saed blo pepa ia*)
Describe some of the things that you learnt from him/her (*You can write your answers overleaf*)

4. Long saed blo ol save ia, hem i bin talem lo yu o hem i bin soemaot lo yu?
Was this knowledge just received just through talking, or through demonstrating how to do things?

5. Yu bin yusum save ia lo laef blo yu? Givim sam eksampol
Have you used any of this knowledge in your own life? Give some examples.

6. Yu rimemba hamas long ol <u>save</u> we man o woman ia i bin traem pasem lo yu? :

- **Mi rimemba evri samting we hem i talem**
- **Mi rimemba fulap samting we hem i talem**
- **Mi rimemba smol lo wanem hem i talem**
- **Mi fogetem fulap samting we hem i talem**

} *Putum wan sekol raon long wiswan ansa we i stret lo yu*

How much do you remember of the knowledge that he/she tried to transmit to you?

- I remember everything he/she told me.
- I remember quite a lot of what he/she told me.
- I remember a little of what he/she told me.
- I've forgotten most of what he/she told me.

7. Yu rimemba hamas long ol <u>skil</u> we man o woman ia i bin traem soem lo yu? :

- **Mi rimemba evri samting we hem i soem**
- **Mi rimemba fulap samting we hem i soem**
- **Mi rimemba smol lo wanem hem i soem**
- **Mi fogetem fulap samting we hem i soem**

} *Putum wan sekol raon long wiswan ansa we i stret lo yu*

How much do you remember of the skills that he/she tried to demonstrate to you?

- I remember everything he/she showed me.
- I remember quite a lot of what he/she showed me.
- I remember a little of what he/she showed me.
- I've forgotten most of what he/she showed me.

8. Yu rimemba eni stamba advaes, tingting o bilif we man o woman ia i bin traem serem wetem yu? Sipos yes, traem talemaot wanem yu rimemba

Do you remember any basic attitudes or beliefs that he/she shared with you? If so, can you tell me what they were?

9. Taem we hem i talem o soem sam samting abaot weta o klaemet, o fasin blo stanap strong lo ol disasta, hem i talem wan taem nomo, o hem i stap ripitim plante taem ?

When he/she told or showed you something about weather, climate or being resilient, did he/she tell you just once, or did he/she repeat things over and over again?

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