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Has the Suicide Rate Risen with the 2011 Queensland Floods?

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This study compared the prevalence and characteristics of suicides following the January 2011 Queensland floods to the 11 years prior (for the period January–June) for two severely affected locations: Ipswich and Toowoomba. Findings showed no significant increase in suicide rates during the 6 months after the floods. This may be explained by the elevated level of social support and care available in this period, which protected residents against risk factors for suicide. Nonetheless, the floods may have a delayed effect on suicide mortality. This highlights the importance of continued monitoring of suicidal behaviors and providing support to the people affected.

KEYWORDS natural disasters, Queensland floods, suicide

Research indicates that natural disasters may produce long-term psychological and somatic damage on affected populations (Abrahams, Price, Whitlock, & Williams, 1976; Ben-Ezra, 2004; Jones, 2006; Steptoe, 2009). Evidence also suggests that those left behind following a natural disaster may experience suicidal ideation and attempts (Chuang & Huang, 2007; Kessler et al., 2008). A recent review of the prevalence of death due to suicide following disasters failed to provide conclusive empirical evidence of an increase in suicide rates (Rezaeian, 2008). Instead, a number of studies suggest an initial

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decrease (Kessler, Galea, Jones, & Parker, 2006; Shioiri, Nishimura, Nushida, Tatsuno, & Tang, 1999) followed by a later increase in suicide risk in the post-disaster period (Chuang & Huang, 2007; Green et al., 1994; Kessler et al., 2008). The former phenomenon has been explained by the "pulling together" of community members through volunteering in recovery efforts (Gordon, Bresin, Dombeck, Routledge, & Wonderlich, 2011) and the availability of short-term psychological care (Madianos & Evi, 2010) after a natural disaster. However, once these short-term support services are withdrawn, victims may be left to deal relatively unassisted with the longer-term psychological strains of the disaster (Khan, 2010).

In January 2011, several regions of the Australian state of Queensland were hit by flash flooding after prolonged and intensive rainfall resulting from a strong "La Niña" weather event in the Pacific Ocean (Queensland Government, 2011). The floods have been categorized as the worst natural disaster in Queensland in 30 years: Three-quarters of the state was declared a disaster zone, 35 people died, over 2.5 million people were affected, and approximately 29,000 homes and businesses were inundated (Queensland Government, 2011).

The present study originated from a coronial inquest convened on the assumption that the suicide rate would be significantly higher among those populations most severely affected by the floods (Brisbane Court hearing, 2 November 2011). This assumption was tested using data available in the Queensland Suicide Register (QSR) (for details about the QSR, see De Leo, Klieve, & Milner, 2006). Suicide mortality and characteristics of suicide deaths after the 2011 Queensland floods were compared with those for the 11 years prior in two of the most severely inundated locations—the cities of Ipswich and Toowoomba (see Bureau of Meteorology, 2011, for the map of flooded Queensland towns). Due to a lack of available data for the second half of 2011 at the time of conducting this investigation, the study only included suicides occurring in the first 6 months of each year (January–June) for the period 2000 to 2011.

METHOD

Data Sources

All suicide cases occurring in Ipswich and Toowoomba for the period 2000–2008 were identified through the Queensland Suicide Register. The QSR includes information on possible deaths by suicide for Queensland residents, gathered from four sources: Form 1 submissions, postmortem reports, toxicology results, and coroner's findings. Form 1 consists of a standard police report and a psychological autopsy questionnaire. It contains information on the individual's history of physical and mental illness, past suicidality, and critical life events preceding the suicide, obtained during

police interviews with the deceased's next of kin. Due to the limited data sources (lack of postmortem reports, toxicology results, and coroner's findings) for suicide cases in the period 2009–2011, these suicides were mainly identified through Form 1 submissions, supplemented by coroner's findings (provided by the Office of the State Coroner in Queensland) where available.

Analysis

The crude suicide rates in Ipswich and Toowoomba during the first 6 months of 2011 were compared to the rates for the 11 years prior, for the same months. The rates were calculated using estimated population data for the years 2000 to 2010 (Australian Bureau of Statistics, 2000–2010). As data for 2011 were not yet available and population numbers over the period 2000 to 2010 were relatively stable, with an average annual difference of 2.8% for Ipswich and 1.3% for Toowoomba, population data for 2011 were substituted with data for 2010. A Poisson regression analysis was performed to determine any significant linear and nonlinear trends in suicide for both locations. Results were then transformed into rate ratios to aid interpretation. Furthermore, a chi-square test of independence was used to compare characteristics of suicides occurring (in January–June) between the period 2000–2010 and the year 2011. Fisher's exact probability test was applied when more than 20% of cells had expected counts smaller than five.

The analysis included only suicide cases classified as "beyond reasonable doubt" and "probable," where evidence is highly and consistently indicative of suicide. The boundaries for the areas defined as Ipswich and Toowoomba, the latter including Grantham and the Lockyer Valley, were based on Australia Standard Geographical Classifications (Australian Bureau of Statistics, 2006).

RESULTS

Prevalence of Suicides

In Ipswich, crude suicide rates fluctuated over the period 2000–2011 (January–June) (Figure 1). Despite visible increases in suicide rates within the first 6 months of 2011 in the region, a Poisson regression analysis indicated no significant linear or non-linear trends. This is likely to be a reflection of instability in local suicide rates due to a low number of deaths overall. On the contrary, in Toowoomba, suicide rates increased until the year 2006 (RR = 1.32, 95% CI = 0.99, 1.76, $p = .057$) before declining significantly over the period 2006–2011 (RR = 0.96, 95% CI = 0.94, 0.99, $p < .05$) (Figure 1). Post-estimation tests revealed that the Poisson model was an appropriate fit for the data.

FIGURE 1 Crude suicide rates in Ipswich and Toowoomba during the first 6 months of the years 2000 to 2011.

Comparison of Characteristics of Suicides Occurring in 2011 and in 2000–2010.

Ipswich

Compared to suicide deaths occurring during the first 6 months of the years 2000 to 2010, suicide victims in the first half of 2011 were significantly more likely to have made a previous suicide attempt (53.8% vs. 23.3%; Fisher's exact test =.040) and to have communicated their suicidal intent before death (76.9% vs. 45.6%), $\chi^2(1) = 4.471$, $p < .05$. However, differences in demographic variables, history of physical and mental illness, and preceding stressful life events were not significant (Table 1). None of the individuals who died by suicide in 2011 had reported any life stressors associated with the floods.

Toowoomba

Comparisons of the characteristics of the suicides occurring in the year 2011 and the period 2000–2010 were not performed due to the very small number of suicides identified in the first 6 months of 2011. Among the three suicides identified from the year 2011, there was one case that explicitly reported a flood-related stressor. The victim lost her residence after the 2011 Queensland floods. Subsequently, she resided in a caravan and was later evicted. The victim was also experiencing financial problems, impending bankruptcy, workplace harassment, and unemployment at the time of her death. She had a history of depression and throat cancer and had previously attempted suicide.

TABLE 1 Characteristics of Suicides During the First 6 Months of 2011 and 2000–2010 in Ipswich.

	No. of suicides in 2011 (%)	No. of suicides in 2000–2010 (%)	χ^2	*df*	*P*
Gender			Fisher's exact test =.495		
Male	9 (69.2)	70 (77.8)			
Female	4 (30.8)	20 (22.2)			
Marital status[a]			Fisher's exact test =.501		
Married	3 (30.0)	35 (46.7)			
Not married	7 (70.0)	40 (53.3)			
Ethnicity[a]			Fisher's exact test =.076		
Indigenous	2 (16.7)	2 (2.4)			
Non-indigenous	10 (83.3)	81 (97.6)			
Employment status[a]			.888	2	.641
Employed	4 (40.0)	29 (41.4)			
Unemployed	4 (40.0)	19 (27.1)			
Not in labor force	2 (20.0)	22 (31.4)			
Living arrangements[a]			5.614	3	.132
With spouse	1 (12.5)	22 (32.4)			
Alone	1 (12.5)	23 (33.8)			
Institution	0 (0)	1 (1.5)			
Other arrangements	6 (75.0)	22 (32.4)			
Physical and mental health					
Any physical illnesses	3 (23.1)	33 (36.7)	Fisher's exact test =.535		
Any diagnosed mental illnesses	5 (38.5)	39 (43.3)	.110	1	.740
Illicit drug use	2 (15.4)	20 (22.2)	Fisher's exact test =.730		
Problematic alcohol use	0 (0)	8 (8.9)	Fisher's exact test =.591		
Contact with medical doctor in the last 3 months	2 (15.4)	19 (21.1)	Fisher's exact test = 1.000		
Contact with mental health professional in the last 3 months	3 (23.1)	24 (26.7)	Fisher's exact test = 1.000		
Expressions of suicidality					
Communicated suicidal intent (lifetime)	10 (76.9)	41 (45.6)	4.471	1	.034*
Past suicide attempt (lifetime)	7 (53.8)	21 (23.3)	Fisher's exact test =.040*		
Suicide note	3 (23.1)	36 (40.0)	Fisher's exact test =.361		
Preceding stressful life event					
Relationship problems (separation/conflict)	7 (53.8)	36 (40.0)	.895	1	.344
Bereavement	4 (30.8)	10 (11.1)	Fisher's exact test =.075		
Financial problems	2 (15.4)	11 (12.2)	Fisher's exact test =.667		
Recent unemployment	2 (15.4)	7 (7.8)	Fisher's exact test =.317		

(*Continued*)

TABLE 1 Continued.

	No. of suicides in 2011 (%)	No. of suicides in 2000–2010 (%)	χ^2	*df*	*P*
Pending legal matters	2 (15.4)	15 (16.7)	Fisher's exact test = 1.000		
Conflict with other persons	1 (7.7)	11 (12.2)	Fisher's exact test = 1.000		
Work/school problems	0 (0.0)	6 (6.7)	Fisher's exact test = 1.000		

Note: Mean age of suicides was 41.2 years in 2011 and 42.0 years in 2000–2010 ($t = -.172$, $p = .863$).
[a]Cases with unknown or missing values were excluded (marital status: 18, or 17.5%; ethnicity: 8, or 7.8%; employment status: 23, or 22.3%; living arrangements: 27, or 26.2%).
*$p < .05$.

DISCUSSION

Contrary to the assumption that the incidence of suicide would increase in the flood-affected locations of Ipswich and Toowoomba in the post-disaster period, there was in fact no significant increase in suicide rates during the first 6 months of 2011. Notably, in Toowoomba, a significant decline in suicides over the period 2006 to 2011 was observed. As proposed by Gordon et al. (2011), this phenomenon may be accounted for by a "pulling-together" effect following a disaster. People in communities often pull together by providing assistance and support to the affected victims in the ensuing months. Such behaviors help to promote feelings of belonging and reduce perceived burdensomeness during the recovery period, which may moderate risk factors for suicide (Gordon et al., 2011). Madianos and Evi (2010) refer to this phenomenon as the "honeymoon" period; in the 6 months following a disaster, the availability of mental health interventions is also particularly prominent.

Among the cases of suicide identified in Ipswich in 2011, none reported any flood-related stressors, and over 50% had a history of a suicide attempt. Studies show that a previous attempt is a strong predictor of death by suicide (Reid, 2009; Reulbach & Bleich, 2008), which may indicate that more than half of the suicide victims in 2011 were already at high risk of suicide. However, it is also possible that these persons were particularly traumatized by the floods, which thus contributed to their eventual deaths. However, it should be noted that the case reports on these high-risk individuals did not explicitly indicate flood-related stressors. In Toowoomba, there was one suicide case that explicitly noted the 2011 Queensland floods as a possible contributing factor. However, in this particular instance, other factors such as financial problems, preexisting depression, and unemployment were also listed as possible risk factors (Logan, Hall, & Karch, 2011).

The present study was mainly limited by the incompleteness of data sources for the years 2009 to 2011 (only Form 1 submissions were available to classify suicides from these years). The instances of suicide from the years preceding this period were all represented by "closed cases" (all required data sources—Form 1, the postmortem report, toxicology results, and coroner's findings—were available), and had thus undergone the thorough suicide classification process used for the QSR. As a result, the current findings should be interpreted with caution, particularly with regard to information pertaining to the deceased's history of mental and physical illness, alcohol and drug use, and contact with health professionals. Another limitation of this type of study is the use of information from Form 1 submissions. This information is provided by the deceased's next of kin and is therefore potentially influenced by recall bias, resulting from both the complex grief following the suicide of a loved one and the often unreliable nature of the retrospective recollection of events (Hawton et al., 1998; Pouliot & De Leo, 2006). In addition, police officers may have failed to record information regarding the deceased's life stressors brought about by the 2011 Queensland floods, simply because Form 1 does not include questions specifically related to the consequences of a natural disaster. As a result, this study may have been unable to capture all flood-related factors relevant to suicides in 2011. In future research, such limitations should be resolved by the use of interviews to examine factors related to natural disasters that may increase the risk of suicide.

In conclusion, the current findings indicate no significant increase in suicide following the 2011 floods in the two locations studied. This seems also to have been the case in Christchurch, New Zealand, in the aftermath of the earthquake of 22 February 2011 (J. MacLean, personal communication). However, the possibility of increased mental health problems (Abrahams et al., 1976) and a delayed effect on suicide rates following natural disasters (Chuang & Huang, 2007; Kessler et al., 2008) imply the need to continue monitoring these phenomena for at least 2 years after the event. Ongoing surveillance also ensures that appropriate assistance and support are provided to all of those who are affected by the disaster.

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