Natural Disasters and Suicide

Prof. Diego De Leo
with
Dr. Kairi Kolves
Ms. Keili Kolves

Australian Institute for Suicide Research and Prevention
WHO Collaborating Centre for Research and Training in Suicide Prevention
National Centre of Excellence in Suicide Prevention
Life Promotion Clinic
Increase in natural disasters

Number of disasters
per year

Trends in number of reported disasters

Much of the increase in the number of hazardous events reported is probably due to significant improvements in information access and also to population growth, but the number of floods and cyclones reported is still rising compared to earthquakes. Is global warming affecting the frequency of natural hazards?

Natural disasters here considered: climatic and tectonic (purple box)

man-made
- war
- industry
- energy production
- transport
- agriculture and unsustainable resource management

natural
- climatic
- tectonic

a typology of hazards
- nuclear/chemical/biological weapons
- unexploded ordnance / landmines
- chemical release
- chemical / industrial waste
- nuclear accidents
- radioactive waste
- oil spills
- overfishing
- overgrazing
- deforestation
- forest fires
- desertification
- pest invasion

sea level rise / coastal erosion
- heat waves
- droughts
- floods
- cyclones
- landslides

tsunamis
- earthquakes
- volcanic eruptions

Adapted from Pascal Poduzzi, UNEP/GRID-Europe, 2004.
Data for this presentation were obtained from a **systematic literature review** of natural disasters and suicide mortality.

Consulted Databases: SCOPUS, Medline, Web of Knowledge, Proquest and Safetylit
Results

19 papers about natural disasters and suicide mortality:

• 11 papers were about earthquakes:
  - 6 papers about Nantou, Taiwan (21 Sept 1999)
  - 2 papers about Kobe, Japan (17 Jan 1995)
  - 2 papers about Northridge, US (17 Jan 1994)
  - 1 paper about Niigata-Chuetsu, Japan (23 Oct 2004)

• 2 papers about cyclone (hurricane):
  - 2 papers about hurricane Andrew, US (24 Aug 1992)

• 2 papers about heat waves:
  - 1 paper about heat waves (extremely hot days) in Catalonia, Spain
  - 1 paper about 2 heat waves (temperature) in England
• 1 paper about tsunami:
  - 1 paper about Indian Ocean tsunami (impact on suicides in Sri Lanka), 26 Dec 2004

• 1 paper about floods:
  - 1 paper about periodic flooding in the Yangtze Basin, China

• 1 paper about droughts:
  - 1 paper about drought in New South Wales, Australia

• 1 paper including analyses of floods, hurricanes, earthquakes, (severe storms and tornadoes):
  - 1 paper about drought in floods, hurricanes, earthquakes (severe storms and tornadoes) in US during 1982-1989

*Suicide mortality was not always the main focus; some papers analysed different types of mortality including suicides.
Some selected results from the studies
Analyses of suicide rates and natural disasters in US

<table>
<thead>
<tr>
<th>TYPE OF DISASTER</th>
<th>NO. OF COUNTIES</th>
<th>PRE-DISASTER RATE</th>
<th>POST-DISASTER RATE</th>
<th>PERCENT CHANGE</th>
<th>DIFFERENCE IN RATES</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>All disasters</td>
<td>377</td>
<td>12.33</td>
<td>12.28</td>
<td>+0.4</td>
<td>+0.05</td>
<td>0.79</td>
</tr>
<tr>
<td>Flood</td>
<td>308</td>
<td>12.22</td>
<td>12.46</td>
<td>+2.0</td>
<td>+0.24</td>
<td>0.32</td>
</tr>
<tr>
<td>Hurricane</td>
<td>24</td>
<td>12.00</td>
<td>12.17</td>
<td>+1.4</td>
<td>+0.17</td>
<td>0.70</td>
</tr>
<tr>
<td>Severe storm</td>
<td>24</td>
<td>11.27</td>
<td>10.29</td>
<td>-9.7</td>
<td>-0.98</td>
<td>0.07</td>
</tr>
<tr>
<td>Tornado</td>
<td>15</td>
<td>12.24</td>
<td>12.15</td>
<td>-0.7</td>
<td>-0.09</td>
<td>0.91</td>
</tr>
<tr>
<td>Earthquake</td>
<td>4</td>
<td>19.20</td>
<td>18.96</td>
<td>-1.3</td>
<td>-0.24</td>
<td>0.84</td>
</tr>
</tbody>
</table>

*Disaster-specific information is not presented for the two counties that experienced severe winter weather.

†Values are the average annual suicide rates per 100,000 population.

‡Values were calculated by subtracting the pre-disaster suicide rates from the post-disaster suicide rates. The differences are statistically significant at the 0.05 level if z≥1.96, where

\[
z = \frac{(\text{rate}_{\text{post}} - \text{rate}_{\text{pre}})}{\sqrt{\left(\frac{\text{rate}_{\text{pre}}^2}{\text{deaths}_{\text{pre}}} + \frac{\text{rate}_{\text{post}}^2}{\text{deaths}_{\text{post}}}\right)}}
\]


36 month before and 48 months after disasters was analysed.
Northridge earthquake, US, 17 Jan 1994

Bourque LB, Siegel JM, Shoaf KI (2002). Psychological distress following urban earthquakes in California. Prehospital and Disaster Medicine, 17, 81-90.

Kobe earthquake (Great Hanshin-Awaji Earthquake), Japan, 17 Jan 1995

Figure: Comparisons of annual and monthly suicide rates (per 100,000) between Kobe and Japan as a whole.

(cont.d) Nantou earthquake, Taiwan, 21 Sept 1999

Three-year moving average of age-adjusted death rate from suicide, 1981-2001 in Taiwan and Nantou, the county most seriously damaged by the 1999 earthquake and 3-year moving average of unemployment for Taiwan

Nantou earthquake, Taiwan, 21 Sept 1999

Suicide rate (per 100,000 person year) in Central Taiwan

<table>
<thead>
<tr>
<th></th>
<th>Before earthquake^a</th>
<th>After earthquake^b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate 95% CI</td>
<td>Rate 95% CI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Non-victims</td>
</tr>
<tr>
<td>Unaffected area</td>
<td>11 (9.9, 12.0)</td>
<td>12.5 (11.1, 13.8)</td>
</tr>
<tr>
<td>Affected area</td>
<td>13.2 (11.6, 14.9)</td>
<td>16.3 (14.1, 18.4)</td>
</tr>
<tr>
<td>Total</td>
<td>11.7 (10.8, 12.6)</td>
<td>13.7 (12.6, 14.9)</td>
</tr>
</tbody>
</table>

^a Before earthquake: from 1 January 1998 to 20 September 1999.  
^b After earthquake: from 1 November 1999 to 31 December 2000.

Niigata-Chuetsu earthquake, Japan, 23 Oct 2004

Fig. 2. Secular trends in suicide mortality in the disaster and control areas by sex. Post-earthquake suicide death rates in the disaster appear to increase in women.

Christchurch Self Inflicted Deaths
1 Jul 2007 - 31 October 2011

1st Christchurch Earthquake
4 September 2010

2nd Christchurch Earthquake
22 February 2011

3rd Christchurch Earthquake
13 June 2011
Indian Ocean tsunami; 26 Dec 2004 – impact on suicides in Sri Lanka

Suicide rates per 100,000 in an area affected by the 2004 tsunami and in the unaffected area.

### Suicide rates in the Yangtze Basin

<table>
<thead>
<tr>
<th>China</th>
<th>Suicide rate</th>
<th>Years</th>
<th>Source</th>
<th>% Higher than nationwide rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sichuan Basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sichuan</td>
<td>23.8</td>
<td>1976–1978</td>
<td>Zhou/Yang</td>
<td>29%</td>
</tr>
<tr>
<td><strong>Lower Basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunan</td>
<td>50.2</td>
<td>1970–1987</td>
<td>Zhou/Yang</td>
<td>173%</td>
</tr>
<tr>
<td>Hubei</td>
<td>32.4</td>
<td>1971–1973</td>
<td>CPS</td>
<td>76%</td>
</tr>
<tr>
<td>Anhui</td>
<td>27.5</td>
<td>1974–1976</td>
<td>CPS</td>
<td>49%</td>
</tr>
<tr>
<td><strong>Delta</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jiangsu</td>
<td>24.1</td>
<td>1973–1975</td>
<td>CPS</td>
<td>31%</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>18.4</td>
<td>1976–1978</td>
<td>Zhou/Yang</td>
<td>0%</td>
</tr>
<tr>
<td>Shanghai</td>
<td>38</td>
<td>1982</td>
<td>Bu</td>
<td>107%</td>
</tr>
</tbody>
</table>

CPS: China Population Series.
Bu: Bu et al. (1987).
Yang: Yang et al. (1996).

Heat waves and cause-specific mortality in Catalonia, Spain in 1983-2006

Figure: Relative risk (RR) and 95% confidence intervals of mortality and extremely hot days by 66 causes of death.

Heatwaves in England and Wales

Figure: Suicide counts during two heatwaves:
(a) July and August 1995; (b) July and August 2003.

Drought (analysing rainfalls) in NSW (Australia)

Fig. 1 Time series of New South Wales (NSW) suicide rate (per 100,000; full lines, lefthand scale) and NSW annual precipitation (broken lines, righthand scale; note scale is reversed). Data from 1964 to 2001. Thick lines are distance weighted least squares smoothed time series.

Floods in QLD, January 2011

Suicide figures in the Ipswich region, 1st January-30th June of each year

De Leo et al, Report to the State Coroner, AISRAP, 2011
Floods in QLD, January 2011

Suicide figures in the Toowoomba region, 1st January-30th June of each year

De Leo et al, Report to the State Coroner, AISRAP, 2011
Floods in QLD, January 2011

In the first semester 2011, the Toowoomba region, with Grantham and the Lockyer Valley, had the lowest number of suicides of the entire study period (2000-2011). On the other hand, the Ipswich region had a peak in suicide numbers that equalled the one of 2004. A detailed location analysis was conducted in order to shed some light on this mortality peak. This revealed that the vast majority of deceased’ residences were not inundated by flood. Of course, this evidence does not exclude the possibility of a ‘shared’ psychological impact from the disaster also for those individuals not directly affected by the event. However, this consideration remains at the speculative level and is unsupported by the available documents.

De Leo et al, Report to the State Coroner, AISRAP, 2011
Methodological limitations

- Different types of natural disasters
- Extent of the natural disaster (people affected, amount of destructions)
- The length of the time period observed
- Different control or comparison groups
- Confounding factors (e.g. Economical changes)

(Rezaeian, 2008)
Conclusions

- The results of the different studies vary
- There seems to be a drop in suicidal behaviour in the initial post-disaster period, which has been referred to as the ‘honeymoon’ period (Madianos & Evi, 2010) or the ‘pulling together’ phenomenon (Gordon et al, 2011) in the literature.
- However, a delayed increase in suicide rates has been observed in some groups, e.g. middle-age males (Chuang et al, 2007; Nishio et al, 2009), females (Hyodo et al, 2010).
- Need for further studies using proper methodologies.
Thank you!