

Removing bridge barriers stimulates suicides: an unfortunate natural experiment

Annette L. Beautrais, Sheree J. Gibb, David M. Fergusson,
L. John Horwood, Gregory Luke Larkin

Objectives: Safety barriers to prevent suicide by jumping were removed from Grafton Bridge in Auckland, New Zealand, in 1996 after having been in place for 60 years. This study compared the number of suicides due to jumping from the bridge after the reinstallation of safety barriers in 2003.

Methods: National mortality data for suicide deaths were compared for three time periods: 1991–1995 (old barrier in place); 1997–2002 (no barriers in place); 2003–2006 (after barriers were reinstated).

Results: Removal of barriers was followed by a fivefold increase in the number and rate of suicides from the bridge. These increases led to a decision to reinstall safety barriers. Since the reinstallation of barriers, of an improved design, in 2003, there have been no suicides from the bridge.

Conclusions: This natural experiment, using a powerful a-b-a (reversal) design, shows that safety barriers are effective in preventing suicide: their removal increases suicides; their reinstatement prevents suicides.

Key words: bridge barriers, jumping, suicide, suicide prevention.

Australian and New Zealand Journal of Psychiatry 2009; 43:495–497

Jumping is a violent, highly lethal method of suicide, and common in places with high-rise residences, accounting for up to 60% of suicides in countries such as Singapore [1]. Case fatality is estimated at >30% for jumping from all types of structures [2] and at >90% for higher bridges [3–5]. Although, worldwide, most suicides by jumping occur from high-rise residences, a small number of

sites, including bridges, develop iconic status as places for suicide. Grafton Bridge in Auckland, New Zealand, is one such site.

Grafton Bridge is a 97.5 m-long concrete arch bridge in central Auckland. The bridge links two major central city roads, rises approximately 80 m above a metropolitan motorway, and has pedestrian pathways on each side. At the recommendation of the then coroner, following suicides from the Bridge, safety barriers were erected in 1937. In 1996 the City Council acted upon community complaints that the barriers were unsightly, vandalized an historic structure, and impeded efforts to rescue people attempting to jump from the bridge. After consultation, the Council decided to remove the barriers with this decision supported by the Ministry of Health. In 2001 we showed that the removal of the safety barriers had resulted in a significant fivefold increase in the number and rate of suicide due to jumping from Grafton Bridge: prior to the removal of barriers only

Annette L. Beautrais, Associate Professor (Correspondence)

Canterbury Suicide Project, Department of Psychological Medicine,
University of Otago, Christchurch, PO Box 4345, Christchurch, New
Zealand. Email: annette.beautrais@yale.edu

Sheree J. Gibb, PhD Candidate; David M. Fergusson, Professor;
L. John Horwood, Senior Research Fellow

Department of Psychological Medicine, University of Otago, Christchurch,
New Zealand

Gregory Luke Larkin, MD

Department of Surgery, Division of Emergency Medicine, Yale
University School of Medicine, New Haven, Connecticut, USA

Received 18 January 2009; accepted 21 January 2009.

three suicides had occurred during the preceding 4 years, compared to 15 deaths in the 4 years following the removal of barriers [6]. This analysis convinced the City Council to reinstate barriers. New barriers, of an improved, curved glass design, and which extended the full length of the bridge, were installed in 2003. The aims of the present study were to gather data about suicide due to jumping from Grafton Bridge after reinstallation of safety barriers.

Methods

In New Zealand all suspected suicide deaths are investigated by a coroner, with coronial verdicts collated by the Department of Courts. We obtained data about suicide due to jumping from Grafton Bridge from the Department of Court's coronial records, and the mortality database of the New Zealand Health Information Service.

Results

Table 1 shows data for suicide due to jumping from Grafton Bridge for three time periods: (i) 1991–1995, when the original barriers were in place; (ii) 1997–2002, when the barriers were removed; and (iii) 2003–2006 when barriers were re-installed. Table 1 lists the number of suicides within each period; the per annum number of suicides; and the per annum rates of suicide per 100 000 of population. Numbers and rates of suicide clearly increased in the period when the barriers were removed, compared to the numbers and rates when the original and new barriers were in place. A χ^2 test of the rate of change in the rate of suicide over the three periods showed a highly significant difference between time periods ($\chi^2(2) = 16.9$, $p < 0.0001$). Pairwise comparisons showed that rates of suicide over the period when the barriers were removed were significantly higher than for the original barriers ($\chi^2(1) = 4.8$, $p < 0.05$) and the new barriers ($\chi^2(1) = 14.0$, $p < 0.0001$).

All these findings are consistent with a process in which the presence of barriers was associated with a reduction in rates of suicide and the removal of barriers was associated with increased rates of suicide. It can be estimated that had the rate of mortality

associated with the original barriers prevailed over the period 1997–2002, this would have led to a reduction in the number of deaths from the bridge during this period from 19 to 6.4. Had the rate of mortality for the new barriers prevailed then all deaths over the period from 1997 to 2002 would have been prevented. These results make it clear that the loss of life due to the removal of barriers from Grafton Bridge was not inconsequential.

Discussion

To our knowledge, nowhere else in the world have safety barriers been removed and reinstated at a known suicide jumping site, providing an opportunity to study the way in which barriers influence suicide rates. Indeed, it has been argued that the ideal epidemiological method for evaluating the effectiveness of safety barriers in reducing suicide by jumping from bridges would be to conduct exactly this experiment, but that, ethically, it could never be done: "Needless to say, this controlled study can never be done, in part because it would be intolerable to wait for a 5- to 7-year period of time to elapse if it was observed early on that there was even a slight increase in the number (let alone rate) of suicides occurring on the bridge once the barriers came down" [7]. In a naturalistic study, the Grafton Bridge 'experiment' has used, in effect, a powerful a-b-a (reversal) design: barriers were in place, removed, and then reinstated. The original barriers were old, did not extend across the full length of the Bridge and failed to prevent all suicides. The well-designed replacements extend the entire length of the Bridge and have eliminated suicides.

Few studies have formally evaluated the impact of installing safety barriers at sites that have become popular for suicide by jumping. Placement of barriers on the main span of the Clifton Suspension Bridge in Bristol halved suicides from eight to four per year [3], but barriers did not extend the full length of the bridge, so while suicides from the fenced main span

Table 1. Rates of suicide due to jumping from Grafton Bridge 1991–2006

Period†‡	No. suicides	No. suicides per annum	Per annum rate of suicide per 100 000 population
Barriers in place (1991–1995)	5	1.00	0.10
Barriers removed (1997–2002)	19	3.17	0.28
Barriers reinstalled (2003–2006)	0	0.00	0.00

†Barriers were removed during 1996 and reinstalled at the start of 2003. ‡Data for 1996, the year in which barriers were removed, were excluded from the analysis.

decreased, suicides from the unfenced buttresses at either side of the bridge increased. In Washington DC the installation of barriers at the Ellington Bridge reduced suicides on that bridge (from four per year to one in 5 years), while the number of suicides at the neighbouring Taft Bridge, which remained unfenced, did not change [7].

The present study adds to evidence that the most effective form of prevention at bridge jumping sites is installation of safety barriers. This evidence justifies preventive interventions at sites that become identified for suicide, and suggests that these approaches are now moving towards becoming best practice in suicide prevention. In turn, the development of best practice guidelines for preventing suicide due to jumping raises important issues about the accountability and liability, both of authorities with responsibility for bridges, structures, buildings and other sites from which people jump, and of government agencies accountable for suicide prevention.

Acknowledgement

This study was funded by the Health Research Council of New Zealand.

References

1. Ung EK. Youth suicide and parasuicide in Singapore. *Ann Acad Med* 2003; 32:12–18.
2. Spicer RS, Miller TR. Suicide acts in 8 states: incidence and case fatality rates by demographics and method. *Am J Public Health* 2000; 90:1885–1891.
3. Bennewith O, Nowers M, Gunnell D. Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention. *Br J Psychiatry* 2007; 190:266–267.
4. Coman M, McR Meyer AD, Cameron PA. Jumping from the Westgate Bridge, Melbourne. *Med J Aust* 2000; 172:67–69.
5. Prevost C, Julien M, Brown BP. Suicides associated with the Jacques Cartier Bridge, Montreal, Quebec 1988–1993: descriptive analysis and intervention proposal. *Can J Public Health* 1996; 87:377–380.
6. Beautrais AL. Effectiveness of barriers at suicide jumping sites: a case study. *Aust N Z J Psychiatry* 2001; 35:557–562.
7. O'Carroll PW, Silverman MM. Community suicide prevention: the effectiveness of bridge barriers. *Suicide Life Threat Behav* 1994; 24:89–99.

Copyright of Australian & New Zealand Journal of Psychiatry is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.