

## Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention

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**Summary** We assessed the effect of the installation of barriers on the Clifton suspension bridge, Bristol, England, in 1998 on local suicides by jumping. Deaths from this bridge halved from 8.2 per year (1994–1998) to 4.0 per year (1999–2003;  $P=0.008$ ). Although 90% of the suicides from the bridge were by males, there was no evidence of an increase in male suicide by jumping from other sites in the Bristol area after the erection of the barriers. This study provides evidence for the effectiveness of barriers on bridges in preventing site-specific suicides and suicides by jumping overall in the surrounding area.

**Declaration of interest** None.

A number of sites around the world, particularly bridges, have gained notoriety as places from which suicide by jumping is popular (Gunnell & Nowers, 1997). As many acts of self-harm are impulsive in nature (Mann, 2003), restricting access to commonly used methods can result in reductions in both method-specific and overall suicide rates.

While two studies have found barriers to be effective in the prevention of suicide by jumping from particular bridges (O'Carroll *et al*, 1994; Beautrais, 2001) neither study investigated thoroughly the effects on suicide by jumping from other sites nearby and overall suicides. In December 1998, two metre-high wire barriers were installed on the main span of the Clifton suspension bridge in Bristol. For architectural reasons similar protective measures were not placed on the buttress walls at either end of the bridge (a photograph of the bridge is available as a data supplement to the online version of this paper). We used local and national suicide data to assess the effectiveness of these barriers in suicide prevention.

### METHOD

The Clifton suspension bridge is located at the centre of the geographic area served by the Bristol coroner (Nowers & Gunnell, 1996). The bridge is over 6 km from the nearest psychiatric hospital; it is 75 m above the river and the case fatality of jumps from the bridge is over 95%.

Coroners' inquest files were examined to obtain information on all suicides occurring in the Bristol area, 5 years before (1994–1998) and 5 years after (1999–2003) the installation of the barriers. All deaths with an inquest verdict of suicide were included in the study. Records of deaths given an open, accidental or misadventure verdict by the coroner were also examined, as previous research suggests that some deaths that are likely to be suicide are given such verdicts for legal reasons (O'Donnell & Farmer, 1995). For cases given these verdicts, vignettes describing the events leading up to the death were written (O.B.). The likelihood (high, medium, low or unclear) that these deaths were suicide was rated independently by D.G. and M.N., masked to the year of death. Only cases rated as medium or high likelihood were included in the study. Where the raters disagreed in their initial coding, consensus was reached through discussion. Of the 451 cases given a verdict other than suicide (open,  $n=189$ ; accident or misadventure,  $n=260$ ; no verdict,  $n=2$ ), independent ratings by D.G. and M.N. resulted in agreement on inclusion or exclusion in 383 (84.9%) cases. After discussion a consensus on inclusion or exclusion was reached in the remaining 68 cases. We did not examine the coroner's files for accidental acute alcohol poisonings or deaths from illegal drug use or methadone poisoning, as determining the possibility of suicide in such deaths is particularly problematic.

For all cases of suicide information was obtained on the person's date of death, age and gender. To compute local and national

rates of suicide, relevant population and mortality data were obtained from the Office for National Statistics on: (a) the number of suicides by jumping in England and Wales: ICD-10 codes X80 and Y30 (World Health Organization, 1992); (b) the overall number of suicides in England and Wales: ICD-10 codes X60–X84, Y10–Y34 excluding Y33.9 (where verdict pending); (c) population figures for the years 1994 to 2003.

Statistical analyses were carried out using Stata version 8.2 for Windows. Poisson regression was used to compare the number of deaths by jumping in the years before and after the construction of the barriers.

### RESULTS

There were 987 suicides in the Bristol area over the 10-year study period. Of these deaths, 134 (13.6%) were suicides by jumping, 61 from the Clifton suspension bridge. There were a further 4 deaths where both the location of the body or skeletal remains and indications of trauma suggested that the person might have fallen from the bridge ( $n=3$ ) or from nearby cliffs ( $n=1$ ). All these deaths occurred before the barriers were erected, were given open verdicts and the remains were never identified; none of these deaths was included in subsequent analyses.

The number of deaths by jumping from the Clifton suspension bridge halved (from 41 to 20;  $P=0.008$ ) in the 5 years after the construction of the barriers compared with the previous 5 years (Table 1). Ninety per cent (55 of 61) of the people who died in this way were male, and the decline in deaths was seen in men only.

Before the barriers were erected (1994–1998) 30 of the 31 suicides (97%) for which the site of the jump was recorded were from the span of the bridge and only one (3%) from the buttresses. In the subsequent 5 years nearly half (8/17) of the jumps for which the site was recorded were from the buttresses where no fencing was in place. In the 5 years after the construction of the barriers there was a non-significant increase compared with the previous 5 years in the number of deaths by jumping from sites other than the suspension bridge: from 6.2 deaths per year to 8.4 deaths per year ( $P=0.2$ ). This increase was entirely due to a rise in female deaths by jumping – in keeping with national trends in female suicide by jumping (see Table 1).

There was a non-significant fall in the mean number of deaths per year (14.4 to 12.4;  $P=0.4$ ) by jumping from all sites in the area across the two study periods. This fall was due to a reduction in male ( $P=0.017$ ) suicides by jumping. There was an increase in suicides by jumping among women ( $P=0.001$ ). There was no change in the overall rate of suicide among those resident in the area during the periods before and after the placement of the barriers on the bridge: mean annual rate 11.2 per 100 000 *v.* 10.5 per 100 000, difference  $-0.7$  (95% CI  $-1.9$  to  $0.9$ ),  $P=0.39$ . This was the case for both men (difference  $-1.8$  per 100 000, 95% CI  $-1.7$  to  $0.9$ ) and women (difference  $0.4$  per 100 000, 95% CI  $-0.9$  to  $2.1$ ).

## DISCUSSION

The number of deaths by jumping from the Clifton suspension bridge halved following the installation of the preventive barriers.

**Table 1** Suicides by jumping before (1994–98) and after (1999–2003) the installation of preventive barriers on the Clifton suspension bridge

Site of suicide by jumping	1994–1998	1999–2003	Difference in means (95% CI) <sup>1</sup>	P
<b>Clifton suspension bridge</b>				
<b>All suicides</b>				
Deaths/year, mean	8.2	4.0	$-4.2$ ( $-5.9$ to $-1.4$ )	0.008
Total deaths	41	20		
<b>Male</b>				
Deaths/year, mean	8.0	3.0	$-5.0$ ( $-2.6$ to $-6.3$ )	0.001
Total deaths	40	15		
<b>Female</b>				
Deaths/year, mean	0.2	1.0	$0.8$ ( $-0.08$ to $0.4$ )	0.1
Total deaths	1	5		
<b>Sites in Bristol other than the suspension bridge</b>				
<b>All suicides</b>				
Deaths/year, mean	6.2	8.4	$2.2$ ( $-0.9$ to $7.2$ )	0.2
Total deaths	31	42		
<b>Male</b>				
Deaths/year, mean	5.2	5.2	$0$ ( $2.2$ to $-3.8$ )	1.0
Total deaths	26	26		
<b>Female</b>				
Deaths/year, mean	1.0	3.2	$2.2$ ( $0.2$ to $7.7$ )	0.023
Total deaths	5	16		
<b>All sites in England and Wales (rates per 100 000)</b>				
All suicides	0.34	0.36	$0.02$ ( $0.01$ to $0.06$ )	0.2
Male	0.54	0.53	$-0.01$ ( $-0.07$ to $0.06$ )	0.8
Female	0.15	0.20	$0.05$ ( $0.01$ to $0.10$ )	0.005

1. Poisson regression analyses.

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Although there was a decrease overall in the number of deaths by jumping in the area among men, this was not the case for women. However, any impact on female suicide rates would be expected to be minimal, as only one woman jumped from the bridge in the 5 years prior to the installation of the barriers and national data suggest that suicide by jumping among females is increasing, although the proportional increase across the two study periods was higher in the Bristol area.

This study provides evidence for the preventive role of barriers on bridges. There

was some evidence that the presence of the barriers did not lead to an increase in deaths by jumping from other sites. The case-fatality rate among those jumping from the Clifton bridge is greater than 95%. Therefore, any displacement of people deterred from jumping to other methods of suicidal behaviour is likely to have a beneficial effect on levels of suicide, because no other method is associated with such a high case fatality. In view of continued suicides from some parts of the Clifton suspension bridge structure, further work to improve the safety of the site is warranted.

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