

**Report on the Proposed Cold Spring Canyon Bridge Suicide Barrier**  
**February 5, 2008**

**Garrett Glasgow**  
**University of California, Santa Barbara**

As requested, here is my evaluation of the proposed suicide barrier on the Cold Spring Canyon Bridge. The administrative record in this matter shows that the basic objective and underlying purpose of the proposed barriers project is to save lives by preventing suicides (Caltrans 2006a, 2006b). My area of expertise is in research design and statistics in the social sciences. Thus, I will confine my report to a review of the evidence presented on the likelihood that this project will achieve its objective of saving lives by preventing suicides.

**The Effectiveness of Suicide Barriers: A Review of the Evidence**

As a suicide prevention strategy, suicide barriers fall in the category of “means restriction.” It is widely believed that some suicides are impulsive, and thus some suicidal individuals can be saved by restricting their access to lethal agents, allowing time for the suicidal crisis to pass (Clarke and Lester 1989). As one might expect, most of the evidence for the effectiveness of means restriction as a suicide prevention strategy comes from studies of lethal agents people keep in their homes and might use in an impulsive suicide, such as firearms (Caron 2004) and prescription medications (Lester 1989). In a review of a series of studies on suicide attempts, Hawton (2001) notes:

Perhaps the most important implication of a highly impulsive suicide attempt is that it is most likely to involve a method of suicidal behavior that is immediately to hand. This is the situation in which a policy of limiting availability of dangerous means for suicidal actions is most likely to be effective. It has clear relevance to limiting availability of means such as firearms, dangerous medicines, and toxic substances such as pesticides and insecticides. (p. 80).

Due to its distance from local population centers, suicide by jumping from the Cold Spring Bridge seems less likely to be the product of an impulsive suicidal moment than suicide by a lethal agent found in the home. Nevertheless, it is possible that the concept of means restriction might also extend to suicides by jumping from bridges.

While this idea seems plausible, at this point it is purely conjecture. To date every study on the effectiveness of suicide barriers has been inconclusive – nobody knows whether suicide barriers are an effective method of preventing suicide and saving lives.

***Preventing Suicides at a Particular Location versus Saving Lives***

How can we determine if suicide barriers on bridges save lives? It is not enough to simply point out that bridges that have installed barriers see fewer suicides, as there is a distinction between preventing suicides and preventing suicides at a particular location.

While we can be reasonably confident that a suicide prevention barrier on the Cold Spring Bridge will reduce suicides at that location, it does not follow from this that a barrier would save lives.

We must consider the possibility of *displacement* – that is, will placing a barrier on the Cold Spring Bridge simply lead those intending to commit suicide to jump at another location? For instance, there are preliminary reports by local officials in Toronto that suicides by jumping from freeway overpasses have increased since the installation of a suicide barrier (the “Luminous Veil”) on the Bloor Viaduct in 2003, although this has not yet been the topic of a formal study (Mandel 2007). We must also consider the possibility of *substitution* – that is, will placing a barrier on the Cold Spring Bridge lead those intending to commit suicide to substitute a different method of suicide, such as poison or a handgun? There is research that suggests that substitution does take place in some cases – for instance, Rich et al. (1990) found evidence that the implementation of stricter gun laws in Canada in 1978 led to more suicides by jumping among those most likely to use guns for suicide (young men).

If installing a suicide prevention barrier on the Cold Spring Bridge simply leads suicidal individuals to kill themselves in another place or in another way, we are not saving lives, and the proposed Caltrans project will not achieve its objective.

Several people have observed that the Cold Spring Bridge has the highest concentration of fatalities in any spot location owned by the state in Caltrans District 5. However, if the objective of the project is to save lives, this fact is irrelevant. Again, the stated objective of the project is to save lives, and this objective will not be achieved if the barrier on the Cold Spring Bridge simply disperses suicidal individuals to take their lives elsewhere.

### ***Existing Research on Suicide Barriers is Inconclusive***

What kind of evidence should we look for in order to know if suicide prevention barriers save lives? We cannot simply look at the numbers who jump from a bridge before and after the installation of a suicide barrier for the reasons discussed above. Instead, we must look for changes in the *suicide rate* in the communities surrounding the bridge. If suicide prevention barriers are saving lives, then this means that there will be some individuals who would have committed suicide if there had been no barrier, but instead choose to live – all else equal, this will lead to a reduction in the overall suicide rate. Conversely, if suicide prevention barriers do not save lives, individuals deterred from jumping from the bridge in question will simply commit suicide in another place (displacement) or in another way (substitution) – all else equal, this will leave the overall suicide rate unchanged. Finding a decrease in the *suicide rate by jumping* would suggest there is no *displacement*, while finding a decrease in the *overall suicide rate* would suggest there is neither *displacement* nor *substitution*.

Perhaps the most widely cited study in debates about suicide barriers on bridges is Seiden (1977). This study tracked 515 people who were restrained from committing suicide

from the Golden Gate Bridge between 1937 and 1971, and found that about 94% of these people did not go on to commit suicide in the following 7 years. Although this study is frequently interpreted as evidence of the likely effectiveness of suicide barriers, it actually does not speak to this question for two reasons.

First, and most obviously, the individuals in this study were restrained from suicide not by a physical barrier, but by human intervention. Thus, the results of this study are better interpreted as an examination of the long-term effectiveness of human intervention strategies such as call boxes and patrols rather than physical suicide barriers.

Second, if we are to interpret this study as evidence of the likely effectiveness of physical barriers, we must assume that installing suicide barriers does not result in displacement or substitution. The individuals in this study were prevented from committing suicide at their preferred location, and then chose to live – but if barriers made suicide at the Golden Gate Bridge impossible, would they still go to the Golden Gate Bridge, or would they simply go to another bridge or substitute another method? In order to regard this study as evidence that suicide barriers would save lives in the same way as the human intervention actually observed, then we must assume these individuals would have behaved in exactly the same way whether or not the Golden Gate Bridge had suicide barriers – in other words, we must assume away the possibility of displacement and substitution.

Also note that this study suffers from what is known as a *self-selection bias*. That is, there are many reasons to believe that the individuals tracked in this study are not representative of individuals that actually commit suicide by jumping from bridges. Simply put, were the people in this study serious about committing suicide, or did they go to a highly visible public place and threaten to commit suicide as a “cry for help”? If it is the latter, it would be a mistake to count them as examples of the lives suicide prevention barriers could save if they never intended to die in the first place.

Studies based on interviews with those who survived a jump from a bridge are similarly flawed (Rosen 1975). Survivors often report they only planned to jump from a specific bridge, but one factor that likely influenced this preference was the fact that it was actually possible to commit suicide at this location. If a suicide barrier had made suicide at their preferred location impossible, would these individuals have simply formed a suicide plan involving a different location or a different method? We have no way of knowing. Some survivors also claim that they would not have attempted suicide if a barrier had been in place, but the experience of the suicide attempt may be influencing their statements (Simon et al. 2001), and a barrier does nothing to solve the mental and emotional problems that led these individuals to attempt suicide in the first place.

Another well-known study of a suicide barrier on a bridge was a comparison of the number of suicides from the Ellington and Taft Bridges in Washington, D.C. (O’Carroll et al. 1994). After a suicide prevention barrier was installed on the Ellington Bridge, this study found there were no further suicides from that bridge, and the number of suicides per year from the Taft Bridge remained roughly constant. However, this is not proof that

the suicide prevention barrier on the Ellington Bridge is saving lives. In the words of O'Carroll:

Are the data provided sufficient to substantiate the effectiveness (or lack thereof) of bridge barriers as a means to prevent suicide? The answer is no, the data are not sufficient to answer that question, because they do not touch on the issue of whether persons who would have committed suicide by jumping from the Ellington Bridge went on to commit suicide by other means. ... [P]ersons frustrated in their efforts to commit suicide by jumping from the Ellington Bridge are in no sense restricted to committing suicide by jumping from the Taft Bridge. (p. 92)

Similarly, Silverman states there is a "... lack of clear evidence unequivocally proving that the construction of barriers on the Ellington Bridge has resulted causally in an absolute reduction in the *number* and *rate* of suicides in Washington D.C. ..." (p. 99). Thus, both authors in this study conclude that the effectiveness of suicide barriers has not been proven. Note further that no statistical tests for changes in the suicide rate were conducted.

Another commonly cited study examined a case where a suicide barrier was removed from a bridge (Beautrais 2001). This study found that when barrier were removed from the bridge, the number of people jumping from this bridge increased substantially (3 in the 4 years before the removal of the barrier versus 15 in the 4 years after the removal of the barrier). Note this bridge was adjacent to the region's largest inpatient psychiatric unit, which would seem to make it a more likely site for "impulsive" suicides than the Cold Spring Bridge.

As with O'Carroll et al., the results of this study were inconclusive. Beautrais did not test the impact of the removal of the barrier on overall suicide rates, which is the test we would need to see in order to determine if the removal of the suicide barrier resulted in more suicides. In reviewing her own study and others, Beautrais concludes:

The weight of evidence from these studies clearly suggests reductions in the rate of suicide by jumping from the sites following the introduction of barriers. However, the extent to which such changes lead to (i) an overall reduction in suicide or, (ii) increased preferences for other sites or methods of suicide remains contentious. (p. 561)

One study specifically cited in the Caltrans memorandum of August 18, 2006 is a study by Pelletier (2007, cited by Caltrans as a 2006 unpublished working paper). This study examined the impact of a suicide barrier on the Memorial Bridge in Augusta, Maine. As with the studies examined above, Pelleiter found that while the barrier reduced suicides at the bridge, it did not have a statistically significant impact on the suicide rate (p. 58).

Other studies on suicide barriers produce equivalent results. Reisch and Michel (2005) examine the effect of a safety net designed to prevent suicides from the Bern Muenster Terrace, and found no statistically significant change in the suicide rate by jumping (they

did not test the effect of the net on the overall suicide rate). Bennewith et al. (2007) found that a suicide barrier on the Clifton Suspension Bridge in England reduced the suicide rate at the bridge, but did not have a statistically significant effect on either the suicide rate by jumping or the overall suicide rate. Reisch et al. (2007) test the relationship between suicide by jumping and the accessibility of bridges, and conclude “[b]arriers on bridges may prevent suicides but also may lead to a substitution of jumping site or method” (p.681).

In a review of the existing literature on suicide prevention on bridges Gunnell et al. (2005) conclude “[w]hilst there is no clear evidence that the installation of barriers results in a reduction in overall population suicide rates, extrapolation from other studies concerning the effect of changes in the availability of commonly used methods suggests this may be the case” (p. 17). That is, while researchers hypothesize that the concept of means restriction might be successfully extended to suicide prevention on bridges, there is currently no proof that barriers save lives.

Thus, while there is growing evidence that installing a suicide barrier will reduce the incidence of suicides on a bridge, there is no proof that this in turn results in lives saved. That is, no existing research has been able to rule out the possibility that suicide barriers simply lead people to commit suicide in another place or in another way.

### ***Changes in the Suicide Rate***

Although not the subject of a published study, it has been pointed out that there is evidence that suicide rates have dropped in communities that have installed suicide barriers on bridges. For instance, according to data from the Center for Disease Control (CDC 2008) the suicide rate in Washington D.C. declined by almost 49% from 1986 (the year of the installation of the suicide barrier on the Ellington Bridge) to 2004. However, this remarkable decline should give us pause for two reasons.

First, suicides by jumping comprise a small fraction of suicides overall – suicides by jumping from all bridges comprised less than 10% of all suicides in Washington D.C. from 1981 to 1986 (Forgey 1987), so it seems implausible that a barrier on a single bridge could produce such a dramatic drop in the suicide rate.

More importantly, the suicide rate has been dropping everywhere in the U.S. (Lubell et al. 2008, McKeown et al. 2006), both in communities that have installed suicide barriers and in communities that have not. For instance, over the same 1986-2004 time period suicides in San Francisco County (the site of the barrier-less Golden Gate Bridge) dropped by over 30%, and by a remarkable 56% from 1979-2004 (the numbers remain roughly the same if Marin County is included in these calculations). Given that there are clearly other forces at work reducing the suicide rate, attributing changes in local suicide rates to the installation of a suicide barrier is premature.

### ***A Possible Case of Barrier Ineffectiveness***

It should be noted that while barriers are generally effective at reducing suicides from bridges, this is not always the case. For instance, the Colorado Street Bridge in Pasadena has seen four suicides in the last year despite having suicide barriers in place (*Pasadena Star-News*, various dates). This is approximately three times the average rate of suicide from this bridge in the period before the barrier was installed (based on newspaper reports, approximately 1.25 per year). In the event a barrier is installed on the Cold Spring Bridge this case should be studied to determine if this increase in suicides is due to a design flaw or an unforeseen maintenance issue with the barriers. However, this case may simply be an indication that barriers are unable to prevent determined individuals from committing suicide.

### **Who Endorses Bridge Barriers as a Suicide Prevention Strategy?**

It is clear from the discussion above that suicide barriers are not proven to save lives. However, this raises another point of confusion. During the course of the debate about the barrier on the Cold Spring Bridge several statements were made that seemed to suggest that a number of public health agencies endorse the construction of barriers on bridges as an effective strategy for suicide prevention. How can this be, given the state of the evidence we have reviewed above?

A review of the policy statements put forth by these public health agencies quickly clears up the confusion – public health agencies do not explicitly endorse suicide barriers as an effective method of suicide prevention. I have reviewed the National Strategy for Suicide Prevention, which is a collaborative effort from the Substance Abuse and Mental Health Service Administration (SAMHSA), the Center for Disease Control (CDC), the National Institutes of Health (NIH), the Health Resources and Services Administration (HRSA), and the Indian Health Service (IHS). I have also studied reviews of suicide prevention strategies put forth by the American Medical Association and the World Health Organization (WHO). None of these organizations explicitly endorses the use of suicide barriers as a suicide prevention method.

For instance, consider the National Strategy for Suicide Prevention (NSSP 2001). All of the suicide prevention strategies based on means restriction in the NSSP are focused on reducing access to lethal agents in the home. Suicide barriers are simply mentioned in passing as a subject of interest (p. 72), and the NSSP recommends further research on the topic (p. 77).

SAMHSA also maintains the National Registry of Evidence-based Programs and Practices (NREPP), a searchable online registry of scientifically tested mental health and substance abuse interventions that have been reviewed and rated by independent reviewers (SAMHSA 2008). Bridge barriers are not included in the NREPP registry.

The AMA review (Mann et al. 2005) simply notes that “suicides by such methods have decreased following ... construction of barriers at jumping sites (p. 2070)” – in other

words, this review points out that barriers on bridges reduce the number of suicides by jumping from bridges, which as we have already seen is not proof that suicide barriers save lives. More importantly, the AMA makes no specific recommendation regarding suicide barriers. The AMA's policy recommendation for means prevention reads:

Restricting access to lethal methods decreases suicides by those methods. Priority should be given to the most commonly used methods used in each country. The possibility of substitution of methods requires ongoing monitoring, as does compliance with restrictions such as firearm access. (p. 2071)

This policy recommendation in fact seems to suggest that we should focus our means restriction efforts on projects other than suicide barriers, as suicide by jumping is comparatively rare in California – for instance, in 2005 (the last year for which data is available from the CDC) suicide by firearm (41.5%), suffocation (26.4%) and poisoning (19.2%) were all far more common than suicide by jumping from a high place (4.1%).

Finally, after endorsing means restriction for firearms, domestic gas, and toxic substances, on the topic of suicide barriers the WHO (WHO 1998) states:

In addition to the measures described, whose efficacy is attested to by the scientific literature, it is thought that other measures, such as the use of fencing on high buildings and bridges, could also contribute to a reduction in suicide rates, although there is no definitive evidence to support this idea. (p. 87)

Thus, while regarding suicide barriers as a promising area of research (in part though the hope that restricting access to very lethal means will lead suicidal individuals to substitute less lethal means), these agencies acknowledge that this is an unproven suicide prevention strategy, and the specific means restriction policies these organizations endorse are focused on lethal agents in the household.

To the best of my knowledge, the only organizations that explicitly endorse suicide barriers as a suicide prevention strategy are suicide prevention advocacy groups such as the American Foundation for Suicide Prevention (AFSP 2008) and the Glendon Association (Glendon Association 2007).

### **Implications for the Caltrans Project**

It appears that the existing Caltrans analysis (Caltrans 2006a, 2006b) is overly optimistic in estimating the likelihood a suicide barrier on the Cold Spring Bridge will achieve the stated objective of saving lives.

The benefit:cost ratio presented in the Caltrans memorandum on this project assumes that the barrier would save 1.6 lives per year (Caltrans 2006b). This assumption is flawed for two reasons.

First, this benefit:cost ratio makes the assumption that the Cold Spring Bridge averages two suicides per year. However, information released by the Santa Barbara County Sheriff-Coroner reveals that the average number of suicides from the bridge in a year is actually 0.98, or 43 suicides in 44 years (Santa Barbara County Sheriff-Coroner, 2007). That is, the benefit:cost ratio calculation is based on assuming that the suicide rate from the Cold Spring Bridge is twice as high as the rate we have actually observed.

Second, and more importantly, the benefit:cost ratio assumes that 80% of individuals who would have committed suicide from the Cold Spring Bridge would be saved by the proposed suicide barrier. As we have seen, this assumption is not supported by the data, the academic literature, or public health agencies. In short, there is no proof that the proposed suicide barrier will save lives, and thus no basis for the assumption that the project will save 1.6 lives per year. Given the state of the evidence, the conservative estimate for lives saved by this project would be 0, which in turn would yield a benefit:cost ratio of 0.

Thus, the prospects for the success of this project are very uncertain, and there is a significant chance that this project will not achieve its objective.

Nevertheless, some may feel the project should go forward regardless of proven effectiveness, arguing that if it saves even one life, it will be worth it. This is flawed logic, as the same argument could be used to justify any project without evidence of effectiveness. Given that the Caltrans highway safety budget is not infinite, all proposed safety projects must be evaluated based on existing evidence in order to determine the most cost effective way to improve highway safety. The proposed suicide barrier on the Cold Spring Bridge should not be an exception.

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