

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Did the Suicide Barrier Work After All?: Revisiting the Bloor Viaduct Natural Experiment and Its Impact on Suicide Rates in Toronto
<b>AUTHORS</b>	Sinyor, Mark; Schaffer, Ayal; Redelmeier, Donald; Kiss, Alex; Nishikawa, Yasunori; Cheung, Amy; Levitt, Anthony; Pirkis, Jane

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Garrett Glasgow NERA Economic Consulting USA
<b>REVIEW RETURNED</b>	15-Dec-2016

<b>GENERAL COMMENTS</b>	<p>Review of "Did the Suicide Barrier Work After All?: Revisiting the Bloor Viaduct Natural Experiment and Its Impact on Suicide Rates in Toronto"</p> <p>This study examines the suicide rate in Toronto before and after the installation of a suicide prevention barrier on the Bloor Street Viaduct, and finds that the suicide rate is reduced in the years following the installation of the barrier. Unfortunately, this research design does not allow us to answer the question of whether the barrier saved lives -- it is simply impossible with a single time series of 22 observations to rule out other, competing explanations for the decline in the suicide rate in Toronto.</p> <p>For example, Toronto has experienced significant demographic change during the time period of the study (1993-2014). In particular, the percentage of the population in Toronto that is foreign-born increased from about 35% to 50% during the study period. The suicide rate for immigrants is about half that of Canadian-born individuals, and is even less in Toronto (Malenfant 2004). How much of the decline in the suicide rate is due to this demographic change? It is impossible to tell with this study design. Simply pointing to a decline in the suicide rate after the installation of the barrier is not enough to demonstrate that the barrier was the cause of this decline.</p> <p>The mean number of suicides per year dropped by more than double the number of people who jumped from the Bloor Street Viaduct after the installation of the barrier. Clearly something beyond simple means restriction is happening here, but we can't determine what it is with this research design.</p> <p>The authors acknowledge that there could be other plausible explanations for the decline in the suicide rate that are not accounted for in their study (p. 14), but still go on to draw strong conclusions from their empirical results. These conclusions are unwarranted given the inability of this research design to rule out</p>
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	<p>these competing explanations.</p> <p>The observation that media coverage might obscure the true effect of a suicide barrier (at least in the short term) is an excellent point that I have not seen in the published literature to date. However, this simply reinforces the point that there are multiple plausible explanations for changes in the suicide rate that a single time series of 22 observations cannot hope to disentangle.</p> <p>This study shares this fundamental weakness with all previous examples of this "pre-post" design that tries to examine the effect of a suicide barrier on a bridge by comparing annual data on suicide rates before and after the installation of the barrier. It is impossible to effectively control for alternative explanations with this approach. New research designs are clearly needed if we are to determine if suicide prevention barriers are effective. For instance, comparing trends across communities with and without suicide barriers might help to eliminate some obvious confounding factors. Future research efforts in this area should focus much more effort on identifying and eliminating competing explanations for changes in the suicide rate.</p> <p>References:</p> <p>Malenfant, Éric Caron. 2004. "Suicide in Canada's Immigrant Population." Health Reports, Vol. 15, No. 2, Statistics Canada, Catalogue 82-003.</p>
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<b>REVIEWER</b>	Petr Winkler National Institute of Mental Health, Czech Republic
<b>REVIEW RETURNED</b>	27-Dec-2016

<b>GENERAL COMMENTS</b>	<p>This is a good paper which presents findings important for the international community. However, I have serious concerns about how the Werther effect is dealt with. It is very unusual for a study to apply a one-year lag between media reports and completed suicides. On the contrary, vast majority of studies focus on short-term effects and a period no longer than 4 weeks.* The one-year lag would profoundly change the way the Werther effect is traditionally understood.** This change might be possible, but would require meticulous reasoning, perhaps in stand-alone study. I would recommend either, to completely exclude the analysis on Werther's effect from this paper or to avoid the one-year lag. If authors choose the former, their findings on the long-term impact of the BSV suicide barrier are, in my humble opinion, ready for publication. If authors choose the latter, they might wish to re-code all the articles to make it sure that they appropriately addressed the articles which were results of specific suicides, rather than the cause of them.</p> <p>* Sisask M, Värnik A. Media roles in suicide prevention: a systematic review. International journal of environmental research and public health. 2012 Jan 4;9(1):123-38.</p> <p>** Phillips DP. The influence of suggestion on suicide: substantive and theoretical implications of the Werther effect. Am Sociol Rev 1974; 39: 340– 54.</p>
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## VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Comment 1: This study examines the suicide rate in Toronto before and after the installation of a suicide prevention barrier on the Bloor Street Viaduct, and finds that the suicide rate is reduced in the years following the installation of the barrier. Unfortunately, this research design does not allow us to answer the question of whether the barrier saved lives -- it is simply impossible with a single time series of 22 observations to rule out other, competing explanations for the decline in the suicide rate in Toronto. For example, Toronto has experienced significant demographic change during the time period of the study (1993-2014). In particular, the percentage of the population in Toronto that is foreign-born increased from about 35% to 50% during the study period. The suicide rate for immigrants is about half that of Canadian-born individuals, and is even less in Toronto (Malenfant 2004). How much of the decline in the suicide rate is due to this demographic change? It is impossible to tell with this study design. Simply pointing to a decline in the suicide rate after the installation of the barrier is not enough to demonstrate that the barrier was the cause of this decline. The mean number of suicides per year dropped by more than double the number of people who jumped from the Bloor Street Viaduct after the installation of the barrier. Clearly something beyond simple means restriction is happening here, but we can't determine what it is with this research design.

Malenfant, Éric Caron. 2004. "Suicide in Canada's Immigrant Population." Health Reports, Vol. 15, No. 2, Statistics Canada, Catalogue 82-003.

Author response: We thank the reviewer and share his concerns (see below and response to comment 2 for instances in which we have introduced caution in interpreting the study's results).

While we agree with the reviewer that immigration may possibly be a significant driving force in the lower overall rates of suicide in Toronto over time, there are several issues to consider. First, the study highlighted by the reviewer (Malenfant, 2004) relies on vital statistics to arrive at suicide rates for native and immigrant Torontonians of 6 and 8 per 100,000 respectively. These are underestimates, whereas our coroner data (showing overall rates of 10 per 100,000 per year over the study period) are more reliable. Furthermore, even if overall rates are lower in immigrants, it is not clear that the same should apply to suicide by jumping specifically. The majority of immigrants to Toronto over the study period have been from Southeast Asia (Statistics Canada, 2013). Suicide by jumping is a major cause of death in urban regions of Asia and rates of suicide by jumping as a method approach 50% in Hong Kong (Wu et al., 2012), a major source of immigrants to Toronto. Therefore, it is also possible to speculate that immigration to Toronto might lead to overall decreases in suicide deaths but INCREASES in suicide by jumping over time, opposite to the reviewer's conjecture. Our study was not designed to test either hypothesis. We have modified the limitations accordingly:

"This study has several important limitations. The most important is a potential ecological fallacy. As an uncontrolled natural experiment, it is possible that factors we were unable to account for may have impacted suicide rates. For example, although we were able to control for population growth per capita, we could not control for other population-based factors such as knowledge of the Bloor Street Viaduct as a suicide hotspot or societal changes that might have impacted on chosen suicide methods. The changing immigrant and ethnic composition of the city, in particular, may account for a portion of the overall reduction in suicide rates (Malenfant, 2004). This study did not examine the impact of economic changes nor did it seek to identify all other suicide prevention interventions occurring in Toronto."

Additionally, the reviewer is correct in noting that a 22 observation time-series may be a sub-optimal strategy for determining the impact of a suicide barrier, however it is important to stress that this is a unique situation. There are very few bridges worldwide like the Bloor Street Viaduct that are in major urban centres and have had highly publicized barriers. The Golden Gate Bridge is one example.

Although all natural experiments are flawed, the data presented in this study is the best available and the finding that suicide deaths were all but eliminated at the Bloor Street Viaduct with no increase in deaths at other bridges or buildings in the city is a robust one. This study clearly and directly contradicts the hypothesis that people will jump from other bridges and buildings if a suicide hotspot is removed.

Statistics Canada. 2013. Toronto, C, Ontario (Code 3520005) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013.

Wu K., Chen, Y., & Yip, P. (2012). Suicide methods in Asia: Implications in suicide prevention. *International Journal of Environmental Research and Public Health*, 9(4), 1135-1158.

Comment 2: The authors acknowledge that there could be other plausible explanations for the decline in the suicide rate that are not accounted for in their study (p. 14), but still go on to draw strong conclusions from their empirical results. These conclusions are unwarranted given the inability of this research design to rule out these competing explanations.

Author response: We introduced caution into the interpretation of the results in the abstract: "the barrier appears to have had its intended impact at preventing suicide"

We have further softened the language in the discussion:

"Nevertheless, the results of this study suggest that a substantial proportion of those people who have been prevented by the barrier from dying at the Bloor Street Viaduct may not have gone on to end their lives in other locations and ways."

Please note the word "proportion". The manuscript does not suggest that all deaths that would have occurred at the Bloor Street Viaduct were prevented, merely that some of them may have been. We believe that this is a reasonable interpretation of the data.

Comment 3: The observation that media coverage might obscure the true effect of a suicide barrier (at least in the short term) is an excellent point that I have not seen in the published literature to date. However, this simply reinforces the point that there are multiple plausible explanations for changes in the suicide rate that a single time series of 22 observations cannot hope to disentangle.

Author response: We thank the reviewer for pointing out the unique media aspect of the study. See response to comment 1 regarding multiple possible explanations.

Comment 4: This study shares this fundamental weakness with all previous examples of this "pre-post" design that tries to examine the effect of a suicide barrier on a bridge by comparing annual data on suicide rates before and after the installation of the barrier. It is impossible to effectively control for alternative explanations with this approach. New research designs are clearly needed if we are to determine if suicide prevention barriers are effective. For instance, comparing trends across communities with and without suicide barriers might help to eliminate some obvious confounding factors. Future research efforts in this area should focus much more effort on identifying and eliminating competing explanations for changes in the suicide rate.

Author response: We agree with the reviewer that this is a limitation. However, it is important to note that other research designs eliminate some of the confounds of the pre-post design while introducing new ones. Take this study as a specific example. Ideally, post-barrier Toronto would be compared to a city/region with identical changing demographic and economic circumstances, a suicide hotspot bridge and a very public and acrimonious debate about the cost and necessity of a barrier. That comparison is impossible. One advantage of the pre-post design is that there is some level of

“control” for many factors (the culture of the city, the media environment, availability of other suicide locations/methods) that cannot be controlled in comparison to other places. Our study establishes a baseline to which the innovative methodologies described by the reviewer can add in the future.

Reviewer 2

Comment 1: This is a good paper which presents findings important for the international community.

Author response 1: We thank the reviewer for this assessment.

Comment 2: However, I have serious concerns about how the Werther effect is dealt with. It is very unusual for a study to apply a one-year lag between media reports and completed suicides. On the contrary, vast majority of studies focus on short-term effects and a period no longer than 4 weeks.\* The one-year lag would profoundly change the way the Werther effect is traditionally understood.\*\* This change might be possible, but would require meticulous reasoning, perhaps in stand-alone study. I would recommend either, to completely exclude the analysis on Werther's effect from this paper or to avoid the one-year lag. If authors choose the former, their findings on the long-term impact of the BSV suicide barrier are, in my humble opinion, ready for publication. If authors choose the latter, they might wish to re-code all the articles to make it sure that they appropriately addressed the articles which were results of specific suicides, rather than the cause of them.

\* Sisask M, Värnik A. Media roles in suicide prevention: a systematic review. *International journal of environmental research and public health*. 2012 Jan 4;9(1):123-38.

\*\* Phillips DP. The influence of suggestion on suicide: substantive and theoretical implications of the Werther effect. *Am Sociol Rev* 1974; 39:340–54.

Author response 2: We thank the reviewer for this comment and for highlighting that we could have done a better job of explaining the rationale for the use of the one-year lag. It is true that the majority of studies of the Werther effect use short time scales but this is for practical reasons rather than for scientific rigor. If a celebrity dies, it is very difficult to measure the impact one or two years later. It is easiest to measure the transient impact in the first few weeks. This is explained on p. 132 of the reviewer's reference (Sisask & Värnik, 2012):

“Most of the studies have focused on short-term effect (e.g., from 1–2 days to 3–4 weeks) of media reporting, which is highly relevant period for provoking fatal and non-fatal suicidal acts. However, suicidal ideation (suicidal thoughts in the community) have found to be influenced by a publicized celebrity suicide for a longer, approximately 1-year period [62]. The long-term effect becomes probably even more important in the contemporary world, where majority of the newspapers are electronic and easily accessible in the Internet for an undetermined period of time.”

The Werther Effect is based on social learning and there is no reason to imagine that social learning ends several weeks after an exposure. We agree with Sisask & Värnik and the Bloor Street Viaduct provides a unique opportunity to study longer timescales because it is not a single media event arising from a particular death but rather an ongoing story that has waxed and waned. We have called attention to this in the strengths section (see response to Editor Comment 1 above) and in the Strengths and Limitations section as follows:

“The barrier also provided a unique opportunity to examine the Werther Effect. Most of the literature concerning suicide contagion examines suicide rates in the immediate weeks following specific suicide deaths (Sisask & Värnik, 2012). The media “event” of the Bloor Street Viaduct as a suicide hotspot has been ongoing but variable in intensity over the years of the study. Rather than examining a transient impact of articles in the weeks immediately following them, this circumstance allowed for the use of a one-year lag to determine the longer-term impact of media reports. And indeed, even over years, a Werther Effect was observed.”

We respectfully request to be able to keep the media aspect of the study within the manuscript and with the one-year lag because it is unique and, in our view, an important contribution to the Werther Effect literature.

#### VERSION 2 – REVIEW

<b>REVIEWER</b>	Garrett Glasgow NERA Economic Consulting United States of America
<b>REVIEW RETURNED</b>	23-Jan-2017

<b>GENERAL COMMENTS</b>	This new version of the manuscript strikes the appropriate note of caution in interpreting the results, addressing my major concern.
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