National Institute for Health and Care Excellence

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Final

Preventing suicide in community and custodial settings

Evidence review 6 for reducing access to means

NICE guideline NG105

Evidence reviews

September 2018

Final

These evidence reviews were developed by Public Health – Internal Guideline Development team

Disclaimer

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Introduction

Restricting access to suicide means is an important component of suicide prevention and provides a basis for prevention strategies. The effectiveness of restricting access to means on suicide rates has been demonstrated within a number of studies examining the impact of regulations on the availability of pharmaceuticals, firearms and pesticides (Nordentoft et al 2007; Johnson and Coyne-Beasley 2009). In some countries, restriction of access to common methods of suicide has led to lower overall suicide rates. For instance, in Canada, national restrictions on access to firearms were implemented in 1977, with a resulting decrease of suicide by firearm and the total number of suicide rates. Legal restrictions to firearms also resulted in a reduction of firearm suicide in Australia in 1980 and in several US states (Mann et al 2005; Miller et al 2006).

In the UK, national legislation limiting the size of pack of medications was introduced in 1998 and suicide rates by poisoning with paracetamol have decreased significantly since (Hawton et al 2001). In Ireland, legislation was introduced in 2001 to control the sale of paracetamol, resulting in a significant fall in the rate of intentional paracetamol overdoses (Corcoran et al 2010; Donohoe E et al; 2006). To reduce the incidence of suicide within prisons, Safer Cells have been introduced to provide useful accommodation for some at-risk prisoners and to make the act of suicide or self-harm by ligaturing as difficult as possible (Minister of Justice, 2010).

Therefore, there is evidence supporting restrictions on access to means as an effective preventive strategy at a national level. This review focuses on local interventions to restrict or change access to the means of suicide and the aim is to determine whether these interventions are effective and cost effective at preventing suicide.

Review question

Are interventions to change or reduce access to the means of suicide (such as restricting access to medicines, providing safety fences, more lighting, and CCTV or suicide patrols) effective and cost effective at preventing suicide?

PICO table

The review focused on identifying studies that fulfilled the conditions specified in PICO table (Table 1). For full details of the review protocol, see Appendix A:

Table 1: PICO inclusion criteria for the review question of changing or reducing access to means.

Population	Whole population or subgroups. Interventions directed at individuals may be identified and the protocol will be adapted accordingly.
Interventions	Local interventions to change or reduce access to the means of suicide, for example: • providing safety fences, more lighting, CCTV or suicide patrols

	• Access to medicines (prescribed medication would be covered by existing guidelines and can be cross-referred to) Exclusions: • Assisted suicide • National strategies or national interventions.
Comparator	• Other intervention • Status quo/control • Time (before and after) or area (i.e. matched city a vs b) comparisons
Outcomes	• Suicide rates • Suicide attempts • Number of people hospitalised after suicide attempts • Reporting of suicide ideation The outcomes that will be considered when assessing help-seeking behaviour: • Service uptake (such as mental health services, helplines).

Public Health evidence

Evidence review

In total, 19,228 references were identified through the systematic searches. References were screened on their titles and abstracts and full text and 50 references that were potentially relevant to this question were requested. 19 quantitative studies were included (see Appendix D: for the evidence tables) and 31 studies were excluded. For the list of excluded studies with reasons for exclusion, see Appendix D:

Findings

Summary of included studies in the review

12 studies provided evidence on local approaches to the restrictions of access to means of suicide. Included studies were categorised by types of interventions as following:

Interventions delivered in isolation

Physical barriers at high frequency jump sites

A total of 6 studies examined the effectiveness of physical barriers for preventing suicides from jump sites. 5 individual experimental studies reported barriers such as glass barriers or fences installed on 5 separate bridges or viaducts including the Memorial Bridge, USA (Pelletier 2007), the Grafton Bridge, New Zealand (Beautrais 2009), the Bloor Street Viaduct, Canada (Sinyor and Levitt 2010/2017), Jacques-Cartier Bridge, Canada (Perron et al 2013) and the Gateway Bridge, Austria (Law et al 2014). 1 individual study examined the effectiveness of barriers such as fences on bridges and other high structures in Switzerland (Hemmer et al 2017).

Safety nets

2 studies (Reisch and Michel 2005; Hemmer et al 2017) reported a safety net installed on the terrace or bridge, to deter people from jumping from these sites.

Railway/subway platform screen door

2 studies (Ueda et al 2015 and Chung et al 2016) reported platform screen doors (PSDs) installed on subway or train platforms. PSDs open only when trains stop at stations, therefore limiting access to the platform by individuals who enter the train tracks in order to take their own lives.

Restrictions on road access to high frequency sites

2 naturalistic studies (Issa and Bennett 2005, Skegg and Herbison 2009) reported off road fencing for access to cliffs. Issa and Bennett (2005) compared the number of suicide events before and after restricting road access to high frequent suicide sites following outbreak of foot and mouth disease, and Skegg and Herbison (2015) examined the change in suicide rates before and after the road closure due to maintenance.

Blue light-emitting-diode lights

2 studies (Matsubayashi and Ueda 2013; Ichikawa and Inada 2014) reported the installation of blue lights on railway platforms. The blue lights were originally introduced to reduce crime, due to their possible calming effect on people.

Telephone hotline (Crisis telephones)

1 study (Stack 2015) examined suicide rates before and after telephone hotlines were installed on the Skyway Bridge in St. Petersburg, Florida. Phones were placed along the area of the bridge where it rises to 193 feet (59 m) and where there was a parking spot for emergency vehicles where people had been committing suicide. Suicide victims usually drive to the top of the rise in the bridge, park their car in the emergency lane and jump.

Signposts

1 study (King and Frost 2005) examined suicide rates after the installation of signposting of the Samaritans' national telephone number in 26 car parks in the New Forest in England. A simple white A4 sign displaying the national help-line number of Samaritans in black and the caption "The Samaritans: we'll go through it with you" which was positioned on an existing notice board at the entrance to each of the 26 car parks.

Firearm legislation

1 study (Anestis et al 2017) examined the impact of firearm legislation on suicide rates across USA states from 1999 to 2015, by comparing overall suicide rates and firearm suicide rates between states with and without specific legislation regulating handgun ownership including universal background checks and mandatory waiting periods.

Combinations of interventions

Physical barriers and surveillance

1 study (Bennewith et al 2007 and Bennewith et al 2011) examined suicide rates before and after the installation of a barrier (wire fencing) on a bridge (the Clifton Suspension Bridge)

with an expansion of role of bridge staff to ensure individuals' safety and the installation of CCTV cameras to monitor incidents on the bridge.

Physical barriers, encouraging help-seeking and surveillance

1 study (Lockley et al 2014) examined suicide rates after the installation of a fence installed along a clifftop, crisis telephones and CCTV cameras in the Gap Park (Sydney, Australia). The local council introduced 4 approaches to manage suicide high-frequency locations: restricting access to means by constructing fencing, encouraging help-seeking by installing crisis telephone and signs, installing CCTV cameras and improving site amenities.

Encouraging help-seeking and surveillance

1 study (Lester 2005,) examined suicide rates after the installation of telephone helpline and the presence of police patrols for preventing suicides.

Outcomes covered included suicide rates at the intervention site, displacement to other nearby sites and suicide attempts and other sites; however there was no data on other outcomes of interest as stated in the review protocol.

Economic evidence

No economic study met inclusion criteria of the review.

Evidence statements

Evidence statement 7.1 - physical barriers

Suicides

A meta-analysis of 11 studies found a statistically significant reduction in the number of suicides at sites where physical barriers were installed over a total of 161 years post-intervention follow-up (risk ratio = 0.24 [95% confidence interval, 0.14 to 0.39]). The average number of suicides per year decreased from 3.2 suicides to 0.7 suicides after the installation of physical barriers. There were no significant subgroup differences when analyses by type of barrier such as, fences, safety nets or platform screen doors. The level of certainty in the evidence was moderate to high.

Displacement to nearby sites

A meta-analysis of 7 studies found an increase in suicides at other sites but this was not statistically significant over a total of 45 years post-intervention follow-up (rate ratio = 1.46 (95% confidence interval, 0.84 to 2.54). The average number of suicides increased at other sites from 3.7per year to 6.3 suicides per year after the installation of physical barriers at nearby high frequency suicide sites. The level of certainty in the evidence was moderate.

Evidence statement 7.2 - restriction on road access to prevent suicide

Suicides

A meta-analysis of two studies found a statistically significant reduction in the number of suicides where restriction on road access was in place over a total of 2.4 years post-intervention follow-up (risk ratio at 0.12 [95% confidence interval 0.02 to 0.87]). The number

of suicides decreased from 9.8 per year to 0 per year following the road access restriction. The level of certainty in the evidence was moderate.

Evidence statement 7.3 - the effectiveness of blue lights to prevent suicides at railway stations

Suicides

A single study over a 11 years post-intervention follow-up found a statistically significant reduction in the number of suicides following the installation of blue lights at railway stations (risk ratio at 0.14 [95% confidence interval, 0.08 to 0.24]). The number of suicides on average decreased from 10.2 per year to 1.5 per year following the installation of blue lights. The level of certainty in the evidence was moderate.

Suicide attempts

Evidence from one study over a 10 year study period (7 years pre-intervention and 3 years post intervention) found a statistically significant increase in the number of people who attempted to suicide following the installation of blue lights at railway stations, (risk ratio at 1.55 [95% confidence interval, 1.11 to 2.22]). The number of attempted suicides on average increased from 11.3 per year to 17.7 per year following the installation of blue lights. The level of certainty in the evidence was moderate.

Evidence statement 7.4 - the effectiveness of interventions encouraging help-seeking to prevent suicides

Suicides

A meta-analysis of 4 studies found no statistically significant difference in the number of suicides following interventions to encourage help-seeking over a total of 21 years post-intervention follow-up (risk ratio at 0.91 [95% confidence interval, 0.43 to 1.93]). The number of suicides increased slightly from 5.4 per year to 6.8 per year following the implementation of the intervention. The level of certainty in the evidence was very low.

Evidence statement 7.5 - the effectiveness of surveillance to prevent suicides

Suicides

A meta-analysis of 3 studies found a statistically significant reduction in the number of suicides following surveillance interventions over a total of 10 years post-intervention follow-up (risk ratio at 0.568 [95% confidence interval, 0.50 to 0.94]). The average number of suicides per year decreased from 7.8 to 5.3 following the implementation of the intervention. The level of certainty in the evidence was low.

Displacement to nearby sites

Evidence from one study found no statistically significant difference in the number of suicides at nearby sites over a total of 5.0 years post-intervention follow-up (risk ratio 1.36 [95% confidence interval, 0.85 to 2.16]). The average number of suicides per year increased at nearby sites from 6.2 to 8.4 suicides per year. The level of certainty in the evidence was low.

Evidence statement 7.6 - the effectiveness of firearm legislation to prevent suicide

Suicides

Evidence from one study over a 15-years observation found states with laws requiring background check and/or mandatory waiting periods had lower overall suicide rates and firearm suicide rates than states without such laws (mean difference, background check=4.8 fewer suicide per 100,000 in states with background check; mean difference, mandatory waiting period=-4,5 per 100,000 in states with mandatory waiting periods) The reductions in firearm suicide rates were statistically significant. The level of certainty in the evidence was very low.

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

The committee agreed that the number of people who died from sucides or the number of people who had attempted suicides were the most important outcomes for this review question.

Some of included studies used "displacement to nearby site" as an outcome and this was included in the review as a post-hoc decision. This was considered important for decision making as there is a concern that if access to means of suicide are restricted in one site, for example, a train station, then the person may go to another site where the access to means are not restricted.

Other outcomes specified in the review protocol such as the number of people hospitalised after suicide attempts, the number of people reporting of suicidal ideation, and service uptake were not reported in the included studies.

The quality of the evidence

19 studies met the inclusion criteria for this review. All studies used a before-after study design to examine the effectiveness of the interventions. The committee noted that the overall certainty in the evidence on physical barriers or blue lights in this review was moderate to high, and evidence on encouraging help-seeking combined with surveillance was very low to low. There was also a paucity of evidence on restrictions to access to means in custodial settings such as removal of ligature points or timed surveillance.

Amongst the included studies, evidence was provided on the effectiveness of the following interventions:

- Physical barriers at jump sites
- Restrictions on road access to high frequency sites
- Safety nets
- Guard rails on windows
- Platform screen doors in railway or subway stations
- Crisis telephone (or telephone hotline)
- Signpost
- Blue light-emitting-diode lights
- Surveillance (CCTV camera or police patrol)

Most of these interventions were delivered in isolation, and 4 studies reported a combination of interventions for preventing suicide. Overall pooled results of the effectiveness of restriction on accessing to suicide means including physical barriers, road blockage, and platform screen doors were consistent across studies, reporting a statically significant reduction in suicide events after intervention. The certainty in results was moderate to high as the number of suicides observed/reported and the length of follow-up time before and after study interventions varied widely amongst included studies. There was also a possibility of in-complete suicide cases being reported but this had little impact on the estimated effect on preventing suicide.

2 included studies accessed the impact of restriction on road access to high frequency suicide sites. The committee agreed that such studies were natural experiments and present issues with repeatability.

Benefits and harms

Physical barriers

The committee noted that the evidence was primarily focused on the prevention of suicides by jumping from high-frequency locations such as bridges, cliffs and subway or railway platforms. Of interventions included, the committee agreed that an overall positive effect on suicide prevention after the introduction of physical barriers at sites where suicide frequently occurred was substantial, with a statistically significant reduction in the number of suicides at these sites. However further research may be needed to warrant the use of platform screen doors at railway or subway stations for preventing suicides, as evidence on the effectiveness of platform screen doors were largely based on data reported or collected from one railway or subway company. The committee noted there have been pilot schemes within the UK (network rail) to assess these interventions, but currently no published data is available to evaluate the effectiveness of such interventions. In addition, there is a lack of evidence on interventions to restrict access to means in prison settings.

Encouraging help-seeking

The committee noted 4 studies[1] that examined the effectiveness of interventions related to help-seeking, however pooled results did not show any benefit effect of this type of intervention in preventing suicide. The committee suggested that the encouragement of help seeking at high frequency sites such as the use of signposts and crisis telephones may be an area where further research is needed, given heterogeneity across included studies regarding types of help-seeking interventions and there delivery methods.

Blue lights

The committee found it difficult to evaluate the effectiveness of blue lights on preventing suicide as the evidence base was very uncertain due to only one study being included. The committee noted that blue lights are being introduced in the UK but only as a combined intervention of signposting, crisis telephones and gate-keeping training. Committee members also raised concerns over how blue lights would work as a calming measure and further noted that these lights would only be useful at night time.

[1] King and Forst (2005) was delivered alone; Lester (2005), Lockley et al (2014) and Wong et al (2009) were delivered in combination with other interventions such surveillance and gatekeeper training.

Surveillance (CCTV camera or police patrol)

It was agreed that interventions involving surveillance such as the installation of CCTV and the presence of staff at high frequency suicide sites, led to a reduction in the number of suicides. The committee suggested that such benefit was likely to be associated with increased vigilance at high-frequency locations and highlighted that an improvement in vigilance of particular suicidal methods and locations would be crucial when preventing suicides.

The committee noted that we should be mindful about unintended consequences when restricting access to means and that the impact of suicide prevention by restriction on access to means in difference settings may vary. The committee highlighted that the most common means of suicide is hanging and that up to 90% of suicides by hanging occur in a private residencies, which makes the restriction of access to means in these cases difficult.. Thus, the committee were keen to focus on suicidal prevention in public places where interventions to reduce access to means have been shown to be both cost-effective and effective.

Cost effectiveness and resource use

No health economic evidence was found and this review question was prioritised for health economic modelling. Possible resource use impacts were:

- Costs of setting up physical barrier (tie in with different barriers such as fence, safety net, railway platform screen doors)

To support implementation of the recommendation, an implementation tool has been developed for local authorities do determine the cost-efffctivess of prevention access to means based on their own local data.

Other factors the committee took into account

The committee noted that when interpreting the evidence from the included studies, it is essential to identify whether interventions were targeted at the population or individual level depending on the nature of an intervention. For example, medication management could prevent self-poisoning by reduced package size of paracetamol at a population level and/or monitoring repeat prescriptions at an individual level. The committee also discussed the importance of real-time surveillance to identify local locations where suicide is more likely, and agreed that information about such locations should be accessible and shared between agencies involved in suicide prevention.

The committee noted that Public Health England had produced a report (PHE 2015) on preventing suicides in public places. The committee considered the difference between suicide as an impulsive act and suicide as a planned act. The committee agreed that the evidence base on preventing access to the means of other suicide methods were limited in the review. There was a gap in the evidence on restriction of access to means in custodial settings and settings where specific occupational groups have access to means for suicide such as doctors, nurses, veterinary workers, and farmers. The committee based on their experience in practice, described several other common forms of suicide methods such as hanging, self-poisoning by prescription medications (in particular, medications prescribed to individuals with terminal conditions that are unused if the individual dies), fire-arms and GP access to information on fire-arm ownership and burning.

Appendices

Appendix A: Review protocol

Topic 1	**Interventions to change or reduce access to the means of suicide**
Component of protocol	**Description**
Review question	Are interventions to change or reduce access to the means of suicide (such as medicines, providing safety fences, more lighting, and CCTV or suicide patrols) effective and cost effective at preventing suicide?
Context and objectives	To determine whether interventions to change or reduce access to the means of suicide effective and cost effective at preventing suicide.
Participants/population	Whole population or subgroups.
Intervention(s)	Local interventions to change or reduce access to the means of suicide, for example: providing safety fences, more lighting, CCTV or suicide patrols Access to medicines Exclusions: Assisted suicide National strategies or national interventions. Prescribed medication would be covered by existing guidelines (for example, NG5 and NG46) and can be cross-referred to.
Comparator(s)/control	Comparators that will be considered are: Other intervention Status quo Time (before and after) or area (i.e. matched city a vs b) comparisons
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: Suicide rates (including at hot-spots) Suicide attempts Number of people hospitalised after suicide attempts Reporting of suicide ideation The outcomes that will be considered when assessing help-seeking behaviour: Service uptake (such as mental health services, helplines).
Types of studies to be included	Comparative studies including: Randomised or non-randomised controlled trials

Topic 1	Interventions to change or reduce access to the means of suicide
Component of protocol	**Description**
	Before and after studies Cohort studies Economic studies: Economic evaluations Cost-utility (cost per QALY) Cost benefit (i.e. Net benefit) Cost-effectiveness (Cost per unit of effect) Cost minimization Cost-consequence Systematic reviews will only be included if they have a high level of external validity to our research questions. They will also be used as a source for primary evidence. Only full economic analyses will be included – papers reporting costs only will be excluded. Qualitative studies will be excluded

For the full protocol see the attached version on the guideline consultation page

Appendix B: Literature search strategies

See separate document attached on the guideline consulatation page.

Appendix C: References

Anestis MD, Selby EA, and Butterworth SE (2017) Rising longitudinal trajectoires in suicide rates: The role of firearm suicide rates and firearm legislation. Preventive medicine 100, 159-166

Beautrais AL (2001). Effectiveness of barriers at suicide jumping sites: a case study. The Australian and New Zealand journal of psychiatry, 35(5), pp.557-62.

Beautrais AL, Gibb SJ, Fergusson DM, et al. (2009). Removing bridge barriers stimulates suicides: an unfortunate natural experiment. The Australian and New Zealand journal of psychiatry, 43(6), pp.495-7.

Bennewith O, Nowers M, and Gunnell D (2007). Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention. The British journal of psychiatry: the journal of mental science, 190, pp.266-7. Included in Pirkis's review

Bennewith O, Nowers M, and Gunnell D (2011). Suicidal behaviour and suicide from the Clifton Suspension Bridge, Bristol and surrounding area in the UK: 1994-2003. European journal of public health, 21(2), pp.204-8. Included in Pirkis' review

Chung YW, Kang SJ, Matsubayashi T et al. (2016) The effectiveness of platform screen doors for the prevention of subway suicides in South Korea Journal of affective disorders 194 80-83

Corcoran P, Reulbach U, Keeley HS et al. (2010) Use of analgesics in intentional drug overdose presentations to hospital before and after the withdrawal of distalgesic from the Irish market BMC clinical pharmacology 10 (1) 1-8

Donohoe E, Walsh N, Tracey JA (2006) Pack-size legislation reduces severity of paracetamol overdoses in Ireland Irish journal of medical science 175 (3) 40-42

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Mann JJ, Apter A, Bertolote J et al. (2005) Suicide prevention strategies: a systematic review Jama 294 (16) 2064-2074

Matsubayashi T, Sawada Y, Ueda M (2013) Does the installation of blue lights on train platforms prevent suicide? A before-and-after observational study from Japan Journal of affective disorders 147 (1) 385-388

Matsubayashi T, Sawada Y, Ueda M (2014) Does the installation of blue Lights on train platforms shift suicide to another station? Evidence from Japan Journal of affective disorders 169 57-60

Miller M, Azrael D, Hepburn L et al. (2006) The association between changes in household firearm ownership and rates of suicide in the United States, 19812002 Injury Prevention 12 (3) 178-182

Ministry of Justice. National offender management service. 2010. Quick-time learning Bulletin. Safter Cells.

Nordentoft M, Qin P, Helweg ÇÉLarsen K et al. (2007) Restrictions in means for suicide: an effective tool in preventing suicide: the Danish experience Suicide and life-threatening behavior 37 (6) 688-697

Pelletier A R. (2007). Preventing suicide by jumping: the effect of a bridge safety fence. Injury prevention: journal of the International Society for Child and Adolescent Injury Prevention, 13(1), pp.57-9.

Perron S, Burrows S, Fournier M, Perron PA, and Ouellet F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. American journal of public health, 103(7), pp.1235-9.

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Sinyor M, Schaffer A, Redelmeier DA, et al. (2017) Did the suicide barrier work after all? Revisiting the Bloor Viaduct natural experiment and its impact on suicide rates in Toronto. BMJ open 7(5), e015299

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(2009). Effect of restricting access to a suicide jumping site. The Australian and New Zealand journal of psychiatry, 43(6), pp.498-502.

Stack S (2015). Crisis phones-Suicide prevention versus suggestion/contagion effects: Skyway Bridge, 1954-2012. Crisis: The Journal of Crisis Intervention and Suicide Prevention, 36(3), pp.220-224.

Ueda M, Sawada Y, Matsubayashi T (2015) The effectiveness of installing physical barriers for preventing railway suicides and accidents: Evidence from Japan Journal of affective disorders 178 1-4

Appendix D: Excluded studies

No.	Study	Reason for exclusion
1.	Atkins Whitmer, D, and Woods DL (2013). Analysis of the cost effectiveness of a suicide barrier on the Golden Gate Bridge. Crisis, 34(2), pp.98-106.	No economic data reported in the result
2.	Barker E, Kolves Ki, De Leo D. (2016). Rail-suicide prevention: Systematic literature review of evidence-based activities. Asia-Pacific psychiatry: official journal of the Pacific Rim College of Psychiatrists.	The review was not in line with inclusion criteria for a systematic review defined in the protocol.
3.	Biddle L, Donovan J, Owen-Smith A et al. (2010). Factors influencing the decision to use hanging as a method of suicide: qualitative study. The British journal of psychiatry: the journal of mental science, 197(4), pp.320-5.	Qualitative study
4.	Cox GR, Owens C, Robinson J, et al. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. BMC public health, 13, pp.214.	No new evidence added to Pirkis' reviews
5.	Gunnell David, Knipe Duleeka, Chang Shu-Sen, Pearson Melissa, Konradsen Flemming, Lee Won Jin, and Eddleston Michael (2017) Prevention of suicide with regulations aimed at restricting access to highly hazardous pesticides: a systematic review of the international evidence. The Lancet. Global health 5(10), e1026-e1037	Interventions were implemented at a national level
6.	Hagihara A, and Abe T. (2012). Effects of media reports and the subsequent voluntary withdrawal from sale of suicide-related products on the suicide rate in Japan. European archives of psychiatry and clinical neuroscience, 262(3), pp.245-51.	Intervention (media reporting)
7.	Harris FM, Maxwell M, O'Connor R, et al. (2016). Exploring synergistic interactions and catalysts in complex interventions: longitudinal, mixed methods case studies of an optimised multi-level suicide prevention intervention in four European countries (Ospi-Europe). BMC public health, 16, pp.268.	Intervention (multi-component prevention)
8.	Havarneanu GM, Burkhardt J-M, and Paran F. (2015). A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents. Accident, and analysis and prevention, 81, pp.30-50.	The review was not in line with inclusion criteria for a systematic review defined in the protocol
9.	Havarneanu Grigore M, Burkhardt Jean-Marie, and Silla Anne (2016) Optimizing suicide and trespass prevention on railways: a problem-solving model from the RESTRAIL project. International journal of injury control and safety promotion , 1-18	Outcome of interest were not included
10.	Johnson RM, Frank EM, Ciocca M, et al. (2011). Training mental healthcare providers to reduce at-risk patients' access to lethal means of suicide: evaluation of the CALM Project. Archives of suicide research: official journal of the International Academy for Suicide Research, 15(3), pp.259-64.	Intervention (gatekeeper training)

No.	Study	Reason for exclusion
11.	Knapp M, McDaid D, Parsonage M (2011) Mental Health Promotion and Prevention: The economic case. Economic analyses of barriers on Clifton Suspension Bridge.	No detailed on economic data in the report
12.	Knipe Duleeka W, Chang Shu-Sen, Dawson Andrew, Eddleston Michael, Konradsen Flemming, Metcalfe Chris, and Gunnell David (2017) Suicide prevention through means restriction: Impact of the 2008-2011 pesticide restrictions on suicide in Sri Lanka. PloS one 12(3), e0172893	Study was conducted in non-OECD country
13.	Larsen ME, Cummins N, Boonstra TW, O'Dea B, Tighe J, Nicholas J, Shand F, Epps J, and Christensen H. (2015). The use of technology in Suicide Prevention. Conference proceedings: ... Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual Conference, 2015, pp.7316-9.	Study type (overview)
14.	Law C, Yip P S, Chan W S, Fu K-W, Wong P W Lw Y. (2009) Evaluating the effectiveness of barrier installation for preventing railway suicides in Hong King. J Affect Disord , 114 : 254-62.	Study was conducted in non-OECD country
15.	Law C, Yip P S. (2011) An evaluation of setting up physical barriers in railway stations for preventing railway injury : evidence from Hong Kong. J Epidemiol Community Health, 65 : 915-20.	Study was conducted in non-OECD country
16.	Mann J J, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, Hegerl U, Lonnqvist J, Malone K, Marusic A, Mehlum L, Patton G, Phillips M, Rutz W, Rihmer Z, Schmidtke A, Shaffer D, Silverman M, Takahashi Y, Varnik A, Wasserman D, Yip P, and Hendin H. (2005). Suicide prevention strategies - A systematic review. Jama-Journal of the American Medical Association, 294(16), pp.2064-2074.	Intervention (not targeting access to means)
17.	Mohl A, Stulz N, Martin A, Eigenmann F, Hepp U et al (2012) The “Suicide Guard Rail”: a minimal structural intervention in hospital reduces suicide jumps. BMC Res Notes 5: 408	Not in the community setting.
18.	Owens C, Lloyd-Tomlins S, Emmens T, and Aitken P. (2009). Suicides in public places: findings from one English county. European journal of public health, 19(6), pp.580-2.	No intervention
19.	Pearson Melissa, Metcalfe Chris, Jayamanne Shaluka, Gunnell David, Weerasinghe Manjula, Pieris Ravi, Priyadarshana Chamil, Knipe Duleeka W, Hawton Keith, Dawson Andrew H, Bandara Palitha, deSilva Dhammika, Gawarammana Indika, Eddleston Michael, and Konradsen Flemming (2017) Effectiveness of household lockable pesticide storage to reduce pesticide self-poisoning in rural Asia: a community-based, cluster-randomised controlled trial. Lancet (London, and England) ,	Study was conducted in non-OECD country

No.	Study	Reason for exclusion
20.	Pirkis J, Spittal MJ, Cox G et al. (2013) The effectiveness of structural interventions at suicide hotspots: a meta-analysis International journal of epidemiology	Individual studies identified and included if met inclusion criteria for the review
21.	Pirkis J, San Too L, Spittal MJ et al. (2015) Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis The Lancet Psychiatry 2 (11) 994-1001	Individual studies identified and included if met inclusion criteria for the review
22.	Pope N D, Slovak K L, and Giger J T. (2016). Evaluating a training intervention to prepare geriatric case managers to assess for suicide and firearm safety. Educational Gerontology, 42(10), pp.706-716.	Intervention (gatekeeper training)
23.	Shelef L, Tatsa-Laur L, Derazne E, Mann J J, and Fruchter E. (2016). An effective suicide prevention program in the Israeli Defence Forces: A cohort study. European psychiatry: the journal of the Association of European Psychiatrists, 31, pp.37-43.	Intervention (national intervention)
24.	Skilling G D, Sclare P D, Watt S J, and Fielding S. (2008). The effect of catalytic converter legislation on suicide rates in Grampian and Scotland 1980-2003. Scottish medical journal, 53(4), pp.3-6.	Intervention (national legislation)
25.	Slaven J and Kisely S. (2002). The Esperance primary prevention of suicide project. The Australian and New Zealand journal of psychiatry, 36(5), pp.617-21.	Intervention (national prevention)
26.	Walrath C, Garraza L G, Reid Hailey, Goldston D B, and McKeon R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. American journal of public health, 105(5), pp.986-93.	Intervention (multi-component intervention)
27.	Wong P W, Liu P M Chan W S et al (2009) In integrative suicide prevention program for visitor charcoal burning suicide and suicide pact. Suicide life threat Behav 39(1): 82-90.	Study was conducted in non-OECD country
28.	Yip P S. F, Caine E, Yousuf S, Chang S S, Wu K C. C, and Chen Y Y. (2012). Means restriction for suicide prevention. The Lancet, 379(9834), pp.2393-2399.	Study type (overview)
29.	Yip Paul S. F, Cheng Qijin, Chang Shu-Sen, Lee Esther Sze Tsai, Lai Chui-Shan Carmen, Chen Feng, Law Yik-Wa Frances, Cheng T M. Eric, Chiu Sau Mee, Tse Y L. Jeff, Cheung Ka-Wai Raymond, Tse Man-Li, Morgan Peter R, and Beh Philip (2017) A Public Health Approach in Responding to the Spread of Helium Suicide in Hong Kong. Crisis 38(4), 269-277	Study was conducted in non-OECD country
30.	Yurtseven Ayse, Uzun Ibrahim, and Arslan Murat Nihat (2017) Suicides by Jumping Off Istanbul Bridges Linking Asia and Europe. The American journal of forensic medicine and pathology 38(2), 139-144	Non-intervention study

No.	Study	Reason for exclusion
31.	Zalsman G, Hawton K, Wasserman D, van Heeringen K , Arensman E, Sarchiapone M, Carli V, Hoschl C, Barzilay R, Balazs J, Purebl G, Kahn J Pierre A S, Cendrine B L, Bobes J, Cozman D, Hegerl U, and Zohar J. (2016). Suicide prevention strategies revisited: 10-year systematic review. The lancet. Psychiatry, 3(7), pp.646-59.	Intervention (national intervention)

Appendix E: Evidence tables

E.1.1 Anestis et al 2017

Anestis Michael D, Selby Edward A, and Butterworth Sarah E (2017) Rising longitudinal trajectories in suicide rates: The role of firearm suicide rates and firearm legislation. Preventive medicine 100, 159-166			
Study details	**Research Parameters**	**Population / Intervention**	**Results**
Author/year Anestis et al 2017 **Quality score** - **Study type** Observation **Aim of the study** To examine whether the rates of change in overall suicide rates and firearm suicide rates differed between states with and without specific legislation regulating handgun ownership demonstrated in prior studies to be associated cross-sectional with overall suicide rates (universal background checks and mandatory waiting periods; to examine	**Inclusion criteria** Firearm-related suicide and non-firearm related suicide between 1999 and 2015 **Exclusion criteria** Not reported **Method of analysis** The study examined the changes in annual overall and non-firearm suicide rates from one year to the next to determine if decreases in firearm suicide rates during one year predicted increases in non-firearm suicide rates during that same year. To examine this we used linear mixed models, which allowed us to examine suicide rates for each year during the data period	**Participant numbers** Firearm-related suicide and non-firearm related suicide between 1999 and 2015 **Participant characteristics** Not reported **Intervention** Gun-based prevention efforts in preventing death by suicide. Such research has presented evidence for the utility of legislation regulating access and exposure to handguns (e.g., universal background checks, mandatory waiting periods) in lowering overall – not simply firearm – suicide rates Universal background checks refer to a requirement that individuals selling a gun use a local, state, or federal system(variable by state) to search for records indicating that the individual attempting to buy the gun is barred from doing so (e.g. prior conviction for violent crime). Mandatory waiting periods refer to an amount of time required to pass between the purchase of a gun and	**Primary outcomes** Firearm related suicide The result shows that states with background checks demonstrated lower overall suicide rates over the data period than did states without such laws (Universal Background Check Required M=10.25; SD=2.87; Universal Background Check Not Required M=14.82; SD=3.37; b=4.57, SE = 0.84, t (49) = 4.33, p b 0.001, d = 1.22). Further examination of the model with covariates included indicated that background checks maintained significance for lower firearm suicide rates (p b 0.01), but not overall suicide rates (p b 0.001). States with mandatory waiting periods demonstrated significantly lower overall suicide rates (Wait Period Required M = 10.19; SD =2.60; No Wait Period M = 14.715; SD = 3.72; b = 3.16, SE = 1.10, t (49) = 2.89, p b 0.001, d =0.89). With the inclusion of covariates, mandatory waiting period remained a significant predictor of lower firearm suicide rates (p b0.05), but not overall suicide rates (p N 0.05). Further investigation indicated that states with universal background checks (including private sales of handguns or all firearms) and/or mandatory waiting periods demonstrated no significant differences in non-firearm suicide rates than states without those laws. Furthermore, although there were individual main effects for background check and waiting period laws and reduced overall suicide rates, there were no synergistic effects, as states with both laws (M = 9.27, SD =2.23) were not significantly different than states with one law (M =11.50, SD = 2.89; b = 0.28, 1.24, t (49) = 0.22, p = 0.83), however there may be low power to detect such effects.

whether firearm legislation is associated with sustained changes in the trajectory of state-wide suicide rates across time.

Location and setting

States, USA

Length of study

1999-2015

Source of funding

Not reported

(1999–2015) while simultaneously accounting for variability across states (and the District of Columbia) by specifying a random intercept for the model.

Next the study investigated state laws (universal background check and mandatory waiting period) in predicting annual overall suicide rates across states.

For these analyses we used linear mixed effects models to examine each law as a fixed effect, investigating each law in a separate model and including a random intercept to allow for variance between and within states.

the physical transfer of the weapon from the seller to the purchaser. The number of days involved in the waiting period varies by state.

Comparison

States with and without laws related gun ownership

Region, N (states)	N w/background	% w/background	N w/wait	% w/wait	Annual suicide rate (SD)
New England, 6	3	50%	1	17%	11.42 (3.37)
Mid Atlantic, 3	3	100%	1	33%	8.88 (2.56)
East North Central, 5	2	40%	2	40%	11.55 (1.77)
West North Central, 7	2	29%	3	43%	13.42 (2.45)
South Atlantic, 9	4	44%	3	33%	11.65 (2.90)
West South Central, 4	0	0%	0	0%	13.58 (1.52)
West South Central, 4	0	0%	0	0%	13.41 (2.57)
Mountain, 8	1	13%	0	0%	18.83 (2.97)
Pacific, 5	2	40%	2	40%	14.58 (4.45)

Author's conclusions

Our findings also highlight the potential impact of means safety efforts on the overall suicide rate. Specifically, our results indicated that the presence of specific laws was associated with a fundamentally different longitudinal trajectory of the overall suicide rate. In states without such laws, both the firearm-specific and overall suicide rates showed a sharp increase across years, whereas states with such laws exhibited a much more modest slope. Our results speak to the potential benefits of public health efforts aimed at reducing the national overall suicide rate through a concentrated effort to reduce the likelihood that a suicidal individual can readily access a gun.

Limitations identified by author Study data did not allow for an examination of the extent to which suicidal individuals were directly impacted by firearm legislation on the individual level. **Limitations identified by review team** Variation in the gun legislation in different states, and the effect could be confounded by any other suicide prevention programmes or initiatives during study period.

E.1.2 Beautrais 2001 and Beautrais et al 2009

Beautrais A L. (2001). Effectiveness of barriers at suicide jumping sites: a case study. The Australian and New Zealand journal of psychiatry, 35(5), pp.557-62.

Beautrais A L, Gibb SJ, Fergusson DM, et al. (2009). Removing bridge barriers stimulates suicides: an unfortunate natural experiment. The Australian and New Zealand journal of psychiatry, 43(6), pp.495-7.

Study details

Author/year
Beautrais 2001
Beautrais 2009 (linked studies)

Quality score
-

Study type
After- before- after reversal study

Aim of the study

Study 1: examined the impact of the removal of barriers from a central city bridge in 1996 on suicide rates

Study 2: compared the number of suicides due to jumping from the bridge after the reinstallation of safety barriers on the same bridge in 2003

Research Parameters

Number of participants
Not applicable

People who died by jumping characteristics

Location	Mean Age	Sex: male (n)
Grafton bridge (n=9)	26.3	8
Other bridges (n=19)	33.9	14

Inclusion criteria
Suicide events
Exclusion criteria
Study 1 Since the safety barriers were removed during 1996 data for 1996 were removed from all analyses.

Data Collection:
Study 1:
Data for suicide deaths by jumping from Grafton Bridge, from 1992 to 2000, were obtained from the regional City Police Inquest Office. It was not possible to obtain parallel data on all suicides by jumping from other sites in Auckland during the period

Population / Intervention

Intervention / Comparison
Study 1: Metal screens fixed above concrete parapets for purposes of suicide prevention, removed in 1996.

Intervention group: The number of deaths by suicide from jumping from the bridge in prior to the removal of the safety barriers (1992–1995) and the number of deaths from suicide by jumping in following the removal of the barriers (1997–2000).

Comparison group: The number of deaths by suicide from jumping from all other sites in Auckland , before (1993–1995) and after (1997–1998) removal of safety barriers from the bridge

Study 2: Reinstallation of a barrier in 2003 with an improved curved glass design

Intervention (no comparison/control group):

Number of deaths by suicide from jumping from the bridge from after reinstallation of the barriers (2002-2006)

Results

Primary outcomes
Number of suicides
Study 1:
Suicide by jumping from Grafton bridge before and after removal of safety barriers

Prior to the removal of barriers only three suicides occurred during the preceding 4 years, compared with 15 deaths in the 4 years following the removal of barriers. Chi-squared, one sample tests showed these differences to be highly significant (numbers, 3 *vs* 15: $\chi 2 = 8$, df = 1, $p < 0.01$; rates, 0.29 *vs* 1.29 per 100 000: $\chi 2 = 6.6$, df = 1, $p < 0.01$).

	Safety barriers in place (1992-1995)	Safety barriers removed (1997-2000)
Number	3	15
Rate per 100 000 of population at risk	0.29	1.29

Suicides (n) by jumping from GB, and all other sites in Auckland , before (1993–1995) and after (1997–1998) removal of safety barriers from the bridge

Location and setting
Grafton Bridge in Auckland, New Zealand

Length of study
Study 1: Number of deaths by suicide by jumping from
in the 4-year period (1992–1995) prior to the removal of
the safety barriers and the number of deaths in the 4-year period
(1997–2000) following the removal of the barriers.
Number of deaths by suicide from jumping for all other sites in the Auckland region was obtained from 1994-1998.

Study 2: Study assessed number and rates of suicides in three
periods:
_ 1991–1995 (5-year period in which original barriers were in place)
_ 1997–2002 (6-year period in which no barriers were in place)
_ 2002–2006 (5-year period in which new barriers were in place)

Source of funding
The Health Research Council of New Zealand.

1992–2000.

However data from 1994 to 1998 from suicides by jumping in the whole region were obtained from the national health statistics database. Case history data about each suicide death were abstracted from coronial files held by this database

Study 2:
National mortality data for suicide deaths due to jumping were compared for three time periods: 1991-1995 (old barrier in place); 1997-2002 (no barriers in place); 2003-2006 (after barriers were reinstated). Data obtained from the Department of Court's coronial records, and the mortality database of the New Zealand Health Information Service.

Number of deaths by suicide from jumping before the first barriers were removed at the site (1991-1995) and after the first barriers were removed (1997-2002)

Time	Grafton bridge (n)	All other sites (n)	Total
1994-1995	2	12	14
1997-1998	7	7	14

Note: missing data from other sites between 1992-1994, 1998-2000, so data for Grafton Bridge was merged to match

Overall numbers of suicides by jumping remained unchanged (14), prior to, and following, the removal of barriers from the Bridge. However, the distribution of deaths by jumping varied markedly: prior to the removal of barriers from the Bridge the majority (12/14) of suicides by jumping in Auckland occurred at sites other than the Bridge; following the removal of the barriers half (7/14) of all suicides by jumping in Auckland occurred at Grafton Bridge. A $\chi 2$ test showed a significant association between time period and site ($\chi 2 = 4.12$, $df = 1$, $p < 0.05$).

Study 2:
Rates of suicide due to jumping from Grafton Bridge 1991-2006

Period	Number of suicides	Suicides per year	Rate per 100,000
1991-1995 (before barriers)	5	1.0	0.10
1997-2002 (barriers removed)	19	3.17	0.28
2003-2006 (barriers reinstalled)	0	0.00	0.00

Numbers and rates of suicide increased in the period when the barriers were removed, compared when the original and new barriers were in place. An x2 test of the rate of change in the rate of suicide over the

			three periods showed a highly significant difference between time periods (x2(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 (x2(1) =4.8, p <0.05) and the new barriers (x2(1) =4.0, p <0.0001). **Authors conclusions** The present studies add to evidence that the most effective form of prevention at bridge jumping sites is installation of safety barriers. 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.
Limitations identified by author Cannot be concluded unequivocally that the removal of barriers from Grafton Bridge led to an overall increase in the rates of suicide by jumping in the Auckland region – could be that the removal of barriers had made the bridge more accessible and preferred site for suicide by jumping than was the case when barriers were in place. Study 1: Not possible to obtain full coronial data for suicides by jumping in the Auckland region after 1998, although data for suicides from Grafton bridge were available up to 2000. These restrictions on data availability reduce the statistical precision of the before and after comparisons reported in this paper. All data are based upon official records and are subject to the liabilities and potential imprecisions of official record data **Limitations identified by review team** Study 1: Missing suicide rate data from other sites in the Auckland region between 1992- 1994 (pre barrier removal) and between 1998- 2000 (post barrier removal) – therefore this is compared with data from Grafton bridge from the same time. However it is a relatively short duration for comparison - only data from 2 years pre/post removal of the barrier. Longer follow-up period may be needed to measure the true effect of the barrier on suicide rates after re- installation. Only explores 'other sites' for suicide by jumping in the Auckland region as a whole group comparison – data for suicide numbers before and after not specific to a particular site. Motives and epidemiological profiles of those who jump from locations that have acquired notoriety, may not be comparable with those who jump from other locations (e.g. residential buildings).			

E.1.3 Bennewith 2007 and Bennewith et al 2011

Bennewith O, Nowers M, and Gunnell D. (2007). Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention. The British journal of psychiatry: the journal of mental science, 190, pp.266-7. **Bennewith O, Nowers M, and Gunnell D (2011). Suicidal behaviour and suicide from the Clifton Suspension Bridge, Bristol and surrounding area in the UK: 1994-2003. European journal of public health, 21(2), pp.204-8.**			
Study details	**Research Parameters**	**Population / Intervention**	**Results**

Author/year
Bennewith et al 2007
Bennewith et al 2011 (linked studies)

Quality score
-

Study type
Before and after

Aim of the study
Study 1)
To assess the effect of the installation of barriers on the Clifton suspension bridge, Bristol, England on local patterns of suicide

Study 2) The study additionally compared the characteristics of people jumping from different sites in Bristol, UK and its surrounding area, described the characteristics of those who jumped from the bridge before and after the installation of the preventive barriers, the non-fatal and fatal suicidal incidents on the bridge and Bridge staffs' views of the role the barriers have played in the prevention of suicides from the bridge

Location and setting

Number of participants

987 suicides in the Bristol area over the 10-year study period. Of these deaths, 134 (13.6%) were suicides by jumping and 61 from the Clifton suspension bridge. The other main sites for jumping were car parks (n = 12), other bridges (n = 10), cliffs (n = 20) and places of residence (n = 20)

Bridge staff: Interviews were conducted with 10 of the 13 staff employed as attendants on the Clifton Suspension Bridge.

Participant characteristics

Characteristics of individuals who died by jumping from the CB and other sites within Bristol 1994–2003:

Location	Mean Age (SD)	Sex: male (%)
Clifton bridge (n=61)	31.5 (9.0)	5 (90.2)
Other bridges (n=10)	33.9 (11.8)	7 (70.0)
Car parks (n=10)	32.7 (8.6)	10 (83.3)
Place of residence (n=20)	59.2 (20.2)	14 (70.0)
Cliffs (n=20)	40.3 (12.4)	12 (60.0)
Other sites	37.4 (17.6)	7 (77.8)
P value	P<0.001	P = 0.09

Characteristics of bridge staff interviewed:

Intervention / Comparison

The effectiveness of restricting access to lethal means by installing a two metre high wire fencing on the main span of the bridge in 1998 was assessed. The fencing was accompanied by an expansion of the role of bridge staff to include monitoring of incidents, and the installation of CCTV cameras.

Two staff work on the Clifton Suspension Bridge at night and three during the day. Part of their role is to ensure the safety of people on the bridge and to deal with any incidents. They are based in the Bridge-master's offices at either end of the bridge and their observation of incidents on the bridge is enhanced by CCTV cameras, installed at several points on the bridge, and by their regular patrols.

Interviews with 10 of 13 bridge staff were also conducted

Intervention group: data examined on changes in the number or rate of suicides before and after barrier installation at the high-frequency location

Comparison group: data examined on changes in the number or rate of suicides before and after barrier installation at other sites in Bristol, UK

Primary outcomes

Suicide rates (Study 1&2):

Substantial decreases in the number of suicides by jumping (though not a complete elimination of them) following the installation of fencing on the Clifton Suspension Bridge.

Deaths from the 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

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).

No significant 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 70.7 (95% CI 71.9 to 0.9), P=0.39. This was the case for both men (difference 71.8 per 100 000, 95% CI 71.7 to 0.9) and women (difference 0.4 per 100 000, 95% CI 70.9 to 2.1).

Suicide by jumping

Clifton suspension bridge:

	1994-1998 (before)	1999-2003 (after)	Diff in means (95% CI)	P value
Mean deaths/year	8.2	4.0	-4.2 (-5.9 to -1.4)	0.008
Total deaths	41	20		
Male mean deaths/year	8.0	3.0	-5.0 (-2.6 to -6.3)	0.001
Male total deaths	40	15		

Clifton suspension bridge, Bristol, England. The bridge is located at the centre of the geographic area served by the Bristol coroner. 75m above the river and has a fatality of over 95%.

Information gained on all suicided occurring in the Bristol area

Length of study

Barriers installed in 2008

Study 1

1994–1998 (5-year pre intervention period);

1999–2003 (5-year post intervention period).

Study 2

Same study period used above for suicide rates before and after the installation of barriers

1996–2005 (2-year pre intervention period and 7 year post) - interviews with bridge staff and further records of fatal and non-fatal incidents on the bridge

Source of funding

The American Foundation for Suicide Prevention

All male who had worked on the bridge for a range of 6 months to 24 years. They had witnessed a range of 0 to '≥15' cases of jumping from the bridge, dependant in part on their period of employment

Inclusion criteria

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

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.

Exclusion criteria

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

Data collection

Study 1

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

Female mean/deaths per year	0.2	1.0	0.8 (-0.8 to 8.4	0.1
Female total deaths	1	5		

Sites in Bristol other than the suspension bridge:

	1994-1998 (before)	**1999-2003 (after)**	**Diff in means (95% CI)**	**P value**
Mean deaths/year	6.2	8.4	2.2 (-0.9 to 7.2)	0.2
Total deaths	31	42		
Male mean deaths/year	5.2	5.2	0 (2.2 to -3.8)	1.0
Male total deaths	26	26		
Female mean/deaths per year	1.0	3.2	2.2 (0.2 to 7.7)	0.023
Female total deaths	1	5		

Characteristics of suicides by jumping in the Bristol area (study 2):

Statistical evidence (P < 0.01) that age was associated with the choice of site from which to jump. Those who died by jumping from their place of residence were older (mean age of 59.2 years) than those jumping from other sites. 80% of all the jumping suicides were male. The number of male suicides from the Suspension Bridge (90.2%) was higher than for all other sites, however only a weak statistical difference between sites (P = 0.09)

Characteristics of those who died by jumping from the Clifton Suspension Bridge before and after the installation of the barriers (study 2):

	Study 2 Same data from coroner's inquest files above used The following information, for the years 1996–2005 was also gained from incident forms completed by bridge staff: (i) approximate age (data based on Bridge staff's subjective impression) and sex of the individual; (ii) any previous history of incidents on the bridge for that individual; (iii) how the incident was noticed; (iv) a brief description of the incident; (v) action taken; (vi) whether local health or police services were informed and (vii) outcome of the incident		Mean age of suicides from the bridge was similar before (1994–1998) compared with after (1999–2003) the installation of the barriers (30.3 years vs. 34.1 years, difference 3.8 years, 95% CI 1.10–8.57). *Incidents on the bridge gained from staff incident forms (study 2):* 421 fatal and non-fatal incidents where someone jumped or appeared to be at risk of jumping from the bridge were recorded. 113 (39 per year) recorded 3 years (1996–1998) before the installation of the barriers and 304 (43 per year) in the 7 years (1999–2005) afterwards. 368 of these incidents were not fatal - potential suicides can more easily be reached by Bridge staff because of the time taken to scale the barrier and cameras on the bridge assist by alerting them to such incidents. Data on sex were recorded for 406 (406/421) incidents. 71.4% involved men. The number of incidents each year for males was similar before and after the installation of the barriers (29 vs. 29). Though there was an increase in the number of incidents involving females (8 vs. 13), statistical evidence for a sex-difference across the two time points was weak ($x2 = 2.74$, df = 1, $P = 0.10$). Information on age group was available for 330 (78.4%) incidents. 72.7%) involved were people aged 25–49 years, 20.6% were aged <25 years and only 6.7% were aged ≥50 years. The proportion of individuals in each age group was similar before and after the installation of the barriers ($x2 = 0.62$, df = 2, $P = 0.73$). *Staff involvement* Whether Bridge staffs were involved in incidents or not was recorded for 379 episodes. Of these, they were involved in 71.3% (67/94) before the installation of the barriers and 83.5% (238/285) after ($X2 = 6.73$, df = 1, $P < 0.01$). *Interviews with Bridge staff (study 2):* 8 interviewees believed that the barriers had been effective in preventing deaths by jumping from the bridge. 3 stated that the barriers meant that there was more opportunity for staff to intercede, and members of the public had also been able to 'get involved with the person or call for help.'

			One interviewee mentioned that the distance from the toll house to the centre of the bridge had meant that previously it was more difficult for staff to get to people before they had the opportunity to jump. Another stated that 'the cameras [on the Bridge] are very important in combination with the barrier.' They mean that 'you can see them . . . testing the wires and get onto the Bridge.'

Limitations identified by author
Possible that some incidents on the bridge involving a potential suicide were not recorded on an incident form.
While complete data bon age, sex, site of suicide and the place of residence of the deceased were available from the coroner's records, other data were incomplete.

Limitations identified by review team
Studies identified only small decreases in the *overall* suicide rate in the given city – other methods of suicide may be more common
Did not explore whether individuals who were prevented from jumping by barriers adopted other methods of suicide
Only explores 'other sites' for suicide by jumping in the Bristol region as a whole group comparison – data for suicide numbers before and after not specific to a particular site.
Longer follow-up period may be needed to measure the true effect of a barrier at the high-frequency location

E.1.4 Chung et al 2016

Chung YW, Kang SJ, Matsubayashi T et al. (2016) The effectiveness of platform screen doors for the prevention of subway suicides in South Korea Journal of affective disorders 194 80-83

Study details	Research Parameters	Population / Intervention	Results
Author/year Chung et al 2016 **Quality score** + **Study type** before and after study **Aim of the study** To assess the effectiveness of installing half- and full-height platform screen doors (PSD's) in reducing subway suicides **Location and setting**	**Number of participants** Not applicable Characteristics of PSD's at stations In 2005, Seoul Metro commenced installation of PSDs across all its subway stations and completed the installation in 2009. Thus, none of the 121 stations had PSDs at the beginning of the study period in 2003, and subsequently, the stations were retro fitted with PSDs at various time intervals. Among these, two stations that are located above the ground had half-height PSDs, measured at	**Intervention / Comparison** **No control group** Intervention: The number of suicides before the installation of half and full height PSD's across the single subway system and the number of suicides after the installation of half and full heights PDS's across the single subway system The dependent variable is the total number of suicides at each station per month, and independent variables are indicator variables of having all PSDs, full-height PSDs, or Half-height PSDs.	**Primary outcomes** The average number of suicides per station-month was 0.01 (SD= 0.10).The minimum number was 0, while the maximum was 2.The total number of suicides during the 10 year study period was 135 The table below shows the total number of suicides per year at stations with and without PSDs that include both the full –and half-height doors. The number of suicides is significantly higher when the stations were not equipped with PSDs. However, the table also shows cases of suicides after the PSD installation. In total, 3 suicides were observed at two stations with PSDs (Gangbyeon and Konkuk University stations) both of which were equipped with half-height PSDs.

	Before PSD's		After PSD's	
Year	N (station-months)	Suicides	N (station-months)	Suicides
2003	1452	21	0	-
2004	1452	20	0	-

Ten-year monthly panel data for 121 subway stations between 2003 and 2012 in the Seoul metropolitan, South Korea

Length of study

10 years (2003-2012)

Source of funding

Financially supported by the Health Science Research Grants of Japanese Ministry of Health ,Labour, Welfare, JSPS Grants-in-Aid for Scientific Research, the National Research Foundation of Korea, and the Korean government

1.65m (65in.), and the remaining 119 stations had full-height PSDs that completely or almost extend to the ceiling of the platforms.

Inclusion criteria

Data on individual suicide cases that occurred between 2003 and 2012 at subway stations operated by Seoul Metro, which operates 50% of the subway stations in Seoul.

Exclusion criteria

Did not account for suicide attempts (only fatal cases)

Data collection

Seoul Metro runs 121 subway stations: 10 on Line 1 (from Cheongnyangni to Seoul Station), 51 on Line 2 (entire section), 34 on Line 3 (from Jichuk to Ogeum), and 26 on Line 4 (from Danggogae to Namtaeryeong). Monthly data of suicide counts at all 121 stations was used for analysis. Thus, the unit of observation was station-month: the total number of station-month observations was 14,520 (121 stations*120 months).

2005	1450	18	2	0
2006	1300	18	152	0
2007	1216	24	236	0
2008	1053	18	399	1
2009	846	13	606	1
2010	0	-	1452	0
2011	0	-	1452	1
2012	0	-	1452	0
Total	-	132	-	3

Regression analysis

The table provides estimates for the Poisson regression with 95% confidence intervals. The dependent variable Is the total number of suicides at each station per month, and independent variables are indicator variables of having all PSDs, full-height PSDs, or Half-height PSDs. The station, year and month fixed effects were included in the estimation.

	Model 1	Model 2
All PSDs	-2.181 [-3.521, -0.842]	
Full height PSDs		-17.146 [-18.334, -15.960]
Half height PSDs		0.746 [-1.129,2.622]
N	14,520	14,250

Model 1

The regression coefficient was negative indicating that the number of suicides was lower post PSD installation. To interpret the magnitude of the PSDs' overall effect, the incident relative ratio (IRR) was computed at 0.113 with a 95% confidence interval of 0.030 -0.431, suggesting that the introduction of PSDs decreased the number of suicides by 89% (CI: 57–97%).

Model 2

Results suggest that the stations equipped with full-height PSDs experienced a drop in the suicide rate since the installation. The corresponding IRR was approximately zero, suggesting that the full-height PSDs were effective in completely preventing suicides. By contrast, half-height PSDs did not seem to reduce the number of suicides, as the estimated coefficient was statistically indistinguishable from zero.

			Author Conclusions The present study provided further evidence that installing physical barriers at subway stations can be an effective strategy to reduce the number of suicides at stations. However, it also found that half-height PSDs are not as effective as full-height ones, even when these doors are as high as the height of an adult. In fact, it has been reported that those attempting suicide climbed over the PSDs at the Gangbyeon and Konkuk University stations, where half-height PSDs are of the same height as adults
Limitations identified by author The findings were based on the data from a single subway operator for a limited period of time. Accordingly, they did not consider the possibility that some passengers choose to die at a station run by other operators. The study did not examine the potential substitution effects of other suicide methods **Limitations identified by review team** No indication of numbers of overall suicide rates in the area before and after PSD's – this would have given more information about shifts in suicides locations after the installation of PSD's or the possible substitution of other methods All stations had PSD's fitted after 2003- described that 2 of these had half height PSD's fitted and the rest had full height PSD's fitted. However it is not clear in which years these PSD's were fitted. As there were only 2 suicides with half-height PSD's the estimation result may not be fully accurate.			

E.1.5 Hemmer et al 2017

Hemmer Alexander, Meier Philipp, and Reisch Thomas (2017) Comparing Different Suicide Prevention Measures at Bridges and Buildings: Lessons We Have Learned from a National Survey in Switzerland. PloS one 12(1), e0169625			
Study details	**Research Parameters**	**Population / Intervention**	**Results**

Author/year Hemmer et al 2017 **Quality score** - **Study type** Before and after **Aim of the study** The study aims to assess: 1) how high a barrier should be and how deep a safety net should be installed below the pedestrian level to prevent a significant number of all suicides by jumping? 2) 2) What more information t can be derived from this Swiss national survey on bridges and buildings? **Location and setting** Bridges and other high structures in Switzerland. **Length of study** The final analyses were carried out including data of the years 1990 - 2013. **Source of funding**	**Inclusion criteria** All available data of suicides throughout Switzerland at sites that have been secured by structural interventions. Only sites at which at least 0.5 suicides occurred on average per year during any period of 10 years within the whole study period. **Exclusion criteria** high-frequency locations not secured by structural interventions. **Method of analysis** Pre-post analyses comparing data before and after the installation of the measure for all structures and each individual structure were conducted. To test the overall effect of the prevention measures across jump sites, both the Mantel-Haenszel Test and maximum-likelihood methods (negative binominal regression) were calculated. To review the effects of suicide prevention measures at individual bridges, rate ratios with confidence intervals based on the standard error and p-values, were conducted. Comparison of suicide reduction rates of safety nets and barriers	**Participant numbers** Data on ADD suicides from 15 jump sites that met the inclusion criteria were analysed **Participant characteristics** The jump sites included 13 bridges, 1 terrace, and 1 multi-story car park. The jump sites were on average 62.94 m high (range 33.80 m to 150.00 m; SD = 23.00 m). The average barrier height before the suicide prevention intervention measures were installed was 1.13 m (SD = 0.14 m); the highest barrier was 1.30 m high, and the lowest was 0.80 m. On three bridges, the original barrier height could not be determined. On average, the jump sites were 2.75 km (SD = 3.71 km) away from a town centre. **Intervention** Of the 15 jump sites: N=11 (73.3%) were **secured by barriers (fences).** Five of these (45.5%) had complete fences, and 6 (54.5%) incomplete fences. On average, the security barriers had height of 2.30 m (SD = 0.61 m). After the construction of the security barrier, the minimum railing height was 1.50 m, and the maximum height 3.30 m. With one exception vertical barriers were raised to at least 1.70 m. Two of the fences had additional inward angles (bridges D, M). One bridge was additionally secured with side barriers on the bridgeheads in order to prevent climbing around the fences (bridge A). Six of the areas secured by fences were equipped with aid signs displaying emergency helpline numbers. N=4 (26.7%) jump sites were **secured by safety nets**.	**Primary outcomes** Suicide rates before and after structural interventions. **Author's conclusions** Aggregated data from all 15 sites **(barriers and safety nets)** showed structural interventions had a preventive effect on suicide incidence. Pre- intervention the suicide Rate Ratio (RR) was 0.32 (CI 95% = 0.23, 0.44). Post-intervention RR = 0.3 (CI 95% = 0.17, 0.44). This corresponds to a reduction of the occurrence of suicides by 71.7%. In the pre-intervention phase, 327 suicides were carried out during 2679 months (a rate of 0.12 suicides per month or 1.47 per year). In the post- intervention phase, 38 suicides occurred during 1101 months (a rate of 0.035 suicides per month or 0.41 per year). **Safety nets (n=4 sites).** Safety nets led to a 77.1% reduction of suicides. The rate ratio from before to after the installation of safety nets is 0.21, (CI 95% = 0.07, 0.62). During 656 months, 55 suicides occurred in the pre-intervention phase (0.084 suicides per month, or 1.00 per year). In the post-intervention phase, during 364 months, 7 suicides occurred (0.019 suicides per month or 0.23 per year). **Barriers – fences (n=11 sites).** This intervention led to reduction of suicides by 68.7%. The rate ratio from before to after installing the barriers was 0.34, (95% CI = 0.18, 0.64). In the pre-intervention phase, 272 suicides occurred during 2023 months (a rate of 0.13 suicides per month or 1.61 per year). In the post-intervention phase 31 suicides occurred during 737 months (0.042 suicides per month or 0.51 per year). **Extent of structural interventions.** Complete safety measures (n=5 sites with barriers, n=2 sites with nets) led to reduction of suicide by 82.0%. The rate ratio from before and after installing was 0.18, (CI 95% = 0.10, 0.44). In the pre-intervention phase, 184 suicides occurred during 1360 months (a rate of 0.14 suicides per month or 1.62 per year). In the post-

The SWISS FEDERAL ROADS OFFICE. Additional logistic support (workplace, PC, print copies computer hardware etc) was given by the PsychiatricHospital of Muensingen, Switzerland. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.	as well as complete and incomplete interventions were conducted by using Mann Whitney-U tests.	At 2 (50.0%) sites, the nets secure the complete jump area.2 nets (50.0%) were incomplete. On average, the safety nets had a depth of 3.88 m (SD = 2.66 m) below street level. The minimum depth was a bridge net with 0.50 m, and the maximum depth was 7.00 m on terrace. Three of the areas were equipped with signs displaying emergency helpline numbers.	intervention phase, 23 suicides occurred during 488 months (0.047 suicides per month or 0.57 per year). Incomplete safety measures (n=6 sites with barriers, n=2 sites with nest) led to a reduction of suicide by 44.8%. The rate ratio from before and after installing was 0.55, (CI 95% = 0.45, 0.86st). In the pre-intervention phase, 143 suicides occurred during 1319 months (a rate of 0.11 suicides per month or 1.30 suicides per year. In the post-interventions phase, 15 suicides occurred during 613 months (0.02 suicides per month or 0.29 per year). Complete interventions were significantly more effective than incomplete safety measures (Mann-Whittney U test; p = .029). No significant difference was found between safety nets and barriers. The suicide rate ratios of the individual structures showed that the efficacy of the safety measures ranged from 2.1% to 100%. **Author's conclusions** Structural interventions such as barriers or safety nets show a preventive effect. Altogether, the reduction in suicides across all jump sites represents 71.7%. The suicide rate could be reduced from 1.47 suicides per year to 0.41 suicides per year. Safety nets were not statistically significant more preventive than safety barriers. Incomplete structural interventions led to an insufficient prevention of suicides. It seems to be more important that a structural measure secures all parts of a bridge that allow lethal jumps, and it seems less important which kind of structural measure (safety net versus barrier) is chosen. More data is needed to determine whether there is in fact a difference between safety nets and barriers.
Limitations identified by author Along with physical availability, psychological availability by media reports is a decisive factor in the development and maintenance of a high-frequency location. Effects by media were not included in the present study. The study has not reviewed whether there has been a shift to nearby jump sites as a result of safeguarding a specific jump site. A further limitation of this study is that in part, calculations had to be carried out with a very small number of cases. Due to the small power of the analyses, the likelihood of finding significant effects is rather small. It is possible that some rare cases of suicide by jumping were missed (e.g., the body of a person floated away in the river below the bridge). The date of intervention was not controllable. We had to compare different pre-post periods. Bias cannot be excluded completely. Moreover, the current study does not mention attempted suicides. It is important that additional studies confirm our findings and provide a more complete picture by including suicide attempts.			

Limitations identified by review team
Agree with the limitations identified by the authors. No indication of numbers of overall suicide rates in the areas before and after the installation of structural interventions– this would have given more information about shifts in suicides locations or the possible substitution of other methods.

E.1.6 Ichikawai et al 2013

Ichikawa M, Inada H, Kumeji M (2014) Reconsidering the effects of blue-light installation for prevention of railway suicides Journal of affective disorders 152 183-185

Study details	**Research Parameters**	**Population / Intervention**	**Results**
Author/year Ichikawa et al 2013 **Quality score** - **Study type** Prospective Cohort study **Aim of the study** To reconsider the proportion of suicide attempts within station premises, where blue lights are potentially installed, and at night, when they would be lit. The proportion of suicide attempts that occurred at the end of the platforms (location for blue lights) at night was also estimated. **Location and setting** Japan **Length of study** Data obtained over a 10 year period (2002-2011)	**Population** Number of participants N/A Participant characteristics Unknown **Inclusion criteria** All railway cases categorised as "suicide attempt" **Exclusion criteria** Suicide attempts within the train or by jumping out of the train were excluded from the analysis **Data collection** Data on railway suicide attempts was compiled by the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT), which were made public pursuant to the Information Disclosure Act. Railway companies	**Intervention / Comparison** Intervention: Railway suicide attempts at stations by time and location. Blue lights were installed in 2008 across stations in the Tokyo metropolitan area – Matsubayashi 2015. Comparison: Data on no of suicide attempts by time and location after 2008. However does not state in the paper what percentage of stations reported here had blue lights and if the blue lights were still in place.	**Primary outcome** Descriptive analysis Table 1 shows the 5841 reported suicide attempts from April 2002 to March 2012 by time and location. Of these, 43% occurred within station premises (platforms), 43% were at night, and 14% fell into both categories. The proportion of night time suicide attempts was higher between stations (52%) than within station premises (platforms) (32%). Railway suicide attempts within station premises by time and location Time / All locations / Middle platform / End platform / Unidentified 0600-1159 / 755 / 158 / 96 / 501 1200-1759 / 957 / 182 / 151 / 624 1800-2359 / 673 / 103 / 107 / 463 0000-0559 / 150 / 22 / 25 / 103 Total / 2535 / 465 / 379 / 1691 Railway suicide attempts within station premises (platforms) at night (n=823) by year and location. Year / Total day/night / Middle platform / End Platform / Unidentified / Unidentified + end* 2002 / 181 / 4 / 8 / 61 / 69 2003 / 246 / 5 / 8 / 83 / 91 2004 / 204 / 4 / 5 / 55 / 60 2005 / 247 / 15 / 9 / 57 / 66 2006 / 226 / 9 / 12 / 45 / 57

Source of funding No funding	are obligated to report all accidents to the MLIT, including suicide attempts. All cases classified as 'suicide attempt' were extracted. Entries included the data and time of each attempt. The location of as suicide attempt was recorded under two broad classifications: "station premises" and "between stations." Platforms and adjacent areas are classified as being within the station premises. Because blue lights are typically installed at the ends of platforms and would have an effect only when lit, the proportion of suicide attempts stratified by time (06:00–11:59, 12:00–17:59, 18:00–23:59, or00:00–05:59) and place ("station premises" or "between stations") was first calculated. From the descriptions of the events, it was estimated whether each one occurred at the end of the platform, where blue lights would potentially be installed. This region was defined as being within 20 m of either end of the platform, assuming the illumination from the blue lights would reach that distance at most.		

2007	293	13	18	47	65
2008	310	14	19	63	82
2009	284	22	17	54	71
2010	254	16	19	50	69
2011	294	23	17	51	68
Total	2535	125 (5%)	132 (5%)	566 (22%)	698 (28%)

* for the most conservative estimate, it is assumed that all the "unidentified" attempts occurred at end sections

Unidentified – those which could not be identified as occurring at the middle of end of a platform.

Author Conclusions

More than half of railway suicide attempts occurred during the day, with many occurring away from station premises. Night time suicide attempts within station premises accounts for only 14% of all railway suicide attempts. Those who entered the track from the platform did not necessarily do so from one of the ends, where the blue lights would potentially have been installed. According to our most conservative estimate, only 28% of suicide attempts within station premises occurred at the end of a platform at night. Therefore, the installation of blue lights on platforms, to the extent they have some effect in preventing night time suicides, would have a small effect on the overall prevention of railway suicides.

Limitations identified by author

Study is limited by the fact that the exact proportion of railway suicide attempts that occurred at the ends of platforms was not calculable because of the sometimes incomplete descriptions of location in the free-form portion of the event data. We therefore instead calculated the maximum number of suicide attempts that could have occurred at the end sections of platforms, using a pre-determined classification of place. This is a conservative estimate, and the proportion of suicide attempts that are potentially preventable by the blue lights should be less than that we obtained

Limitations identified by review team

This paper refers to the Matsubyashi 2013 paper and attempts to reconsider the proportion of suicide attempts by further providing information on location and time of the attempts, however data retrieved here is from the whole of Japan as opposed to the one railway company in Tokyo used in the Matsubayashi study. Therefore we do not know what percentage or number of the stations reported here had blue lights installed.

Blue lights installed by other railway companies may also be less effective due to differences in numbers, locations, and types of blue lights

For this reason we cannot accurately determine pre and post intervention suicide attempt numbers.

A large number of suicide attempts had unidentified locations. It was assumed that

Although this study reports suicide attempts not decreasing from the ends of the platforms at night since the installations began, and only a small percentage occurring at the ends of platforms at night, results should be treated with caution for the above reasons

E.1.7 Isaac and Bennett 2005

Isaac M, Bennett J (2005) Prevention of suicide by jumping: the impact of restriction of access at Beachy Head, Sussex during the foot and mouth crisis 2001. Public Health Medic 6: 19-22.

Study details	Research Parameters	Population / Intervention	Results
Author/year Isaac and Bennett (2005) **Quality score** - **Study type** Retrospective observational study of coroners reports **Aim of the study** To explore the impact of restriction of accessibility of the site during the Foot and Mouth crisis in England. **Location and setting**	**Number of participants** Not applicable Characteristics of Beachy Head Beachy Head is one of locations which gained notoriety as a popular site where people had died from suicide. Between 1965 and 1979, 124 deaths occurred at Beachy Head cliffs. More than 50% of those who jumped from Beachy Head came from outside East Sussex. Although Beachy Head still has its reputation as a well-known location for suicide by jumping, there have	**Intervention / Comparison** No control group Intervention: In the year 2001 (foot and mouth crisis), Beachy Head was not accessible by car, and it was reopened in June 2001. .	**Primary outcomes** Suicide and accidental death by calendar month at Beachy Head 1987 -2001. 124 deaths occurred at Beachy Head (1965-1979) compared with 230 deaths during the period of 1987-2001 which was increase in 85%. This increase does not correlate with the national trends in suicide in England and Wales which showed a decrease in suicide rate between 1960 and 1997. The table below shows the total number of suicides and accidental deaths by gender and calendar month at Beachy Head 2001.

	Suicide and accidental deaths		Total
Month	Male	Female	
Jan	0	0	0
Feb	0	0	0
Marc	0	0	0
April	0	0	0
May	0	0	0

Suicide by jumping and accidental death at Beachy Head, east Sussex. **Length of study** The data was abstracted from the coroners' reported of all people who died at Beachy Head during 1987-2001. **Source of funding** Not reported	been no review of the rates of suicide at Beachy Head since that published in 1982. Inclusion criteria All deaths at Beachy Head were reviewed during 1987-2001. **Exclusion criteria** Not reported **Data collection** Coroners' reports of deaths at Beachy Head during 1987-2001.		<table><tr><td>June</td><td>1</td><td>0</td><td>1</td></tr><tr><td>July</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Aug</td><td>2</td><td>0</td><td>2</td></tr><tr><td>Sep</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Oct</td><td>0</td><td>0</td><td></td></tr><tr><td>Nov</td><td>2</td><td>1</td><td>3</td></tr><tr><td>Dec</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Total</td><td>6</td><td>3</td><td>9</td></tr><tr><td></td><td></td><td></td><td></td></tr></table> **Author Conclusions** The present study provided evidence that changes in accessibility had a profound effect on suicide by jumping than other method of suicide. Restricting access to Beachy Head is not feasible as it is a tourist attraction. However, there might a possibility of working with local agencies as well as suicide prevention groups to make it more difficult to access for suicide while still being freely accessible for tourism.
Limitations identified by author The rates of suicide in the area were available but it was difficult to clarify if availability of Beachy Head increases suicide in East Sussex residents. Although there was past history of psychiatric difficulties in more than 60%, and it might be logical to assume that better management psychiatric illness could reduce the suicides but this cannot be concluded from this study. **Limitations identified by review team** The study reported the number of suicide and accidental death at Beachy Head but no separate figures on the number of death due to suicide. The study is retrospective design reviewing suicide and accidental death based on coroner's reported during 1987-2001. The intervention of interest in the review (restriction on road) was in place for 5 months in 2001, and the comparison only made based on short follow-up time.			

E.1.8 King and Frost 2005

King E and Frost N. (2005). The New Forest Suicide Prevention Initiative (NFSPI). Crisis, 26(1), pp.25-33.			
Study details	**Research Parameters**	**Population / Intervention**	**Results**
Author/year King and Frost 2005 **Quality score** -	**Number of participants/ participant characteristics** Not applicable **Number of car parks receiving intervention:**	**Intervention / Comparison** Intervention: A simple white A4 sign displaying the national help-line number of the Samaritans in Black and the caption "The Samaritans: We'll go through this with you", was positioned on an existing notice board at	**Primary outcomes** *Number of suicides* N of signed car parks- 26 N of unsigned car parks- 114

Study type
Retrospective cohort study

Aim of the study
A multiagency initiative aimed to reduce the number of suicides by car exhaust (carbon monoxide) poisoning in the 140 New Forest car parks, UK, by displaying signs with telephone numbers of the Samaritans.

Location and setting
The New Forest includes 145 square miles of woodland, open heath land and pasture in Hampshire on the south coast of England.

Length of study
Numbers, location and residence of all car park deaths were monitored for 3 years during the implementation of signs in 1998 at the high-frequency location s.

Source of funding

The New Forest District Council, Forestry Commission, and the Southampton & SW Hants Health Authority

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Characteristics of suicides at the New Forest
During the years 1993-1997 (before intervention), 102 suicides occurred in the New Forest Registration District, of whom 47 were visitors. The proportion of suicides dying from car exhaust as in the whole region was 63%. 41 (40%) of these suicides were found in the Forestry Commission car parks of whom 39 (81%) were visitors. Coroners records showed that visitors from as far away as Nottinghamshire, Kent and Cornwall had driven to the New Forest to die.

Inclusion criteria
The intervention was targeted at car parks in the New Forest associated with the highest suicide risk. Each of which was either the site of more than one suicide, or in close proximity to other car parks in which multiple suicides had occurred.

All persons who initiated a suicidal act in the New Forest Registration District, and on whom a verdict of suicide, or an open verdict, was recorded

Exclusion criteria
Not reported

Data collection
Details on suicides: Inquest files of suicides in the New Forest

the entrance to each of the 26 car parks in 1998. Each sign also described the location of the nearest public telephone box.

The Samaritans offered suicide awareness training to all Local Authority and Forest Commission workers who might be expected to find a body in a parked car, and the Hampshire ambulance Service provided practical advice.

Comparison group: The significance of changes in the patterns of suicides occurring in the National Forest Registration District was evaluated in the light of a national observed decrease in the proportion of car exhaust suicides in England & Wales since 1992.

The numbers, location, residence, and cause of suicide in the NFRD for the proceeding 10 year period (1988-1998) and during the 3 year period (1998-2001) of signage were compared. Comparisons were also made between the average annual numbers of suicides who had parked in one of the 140 NFRD car parks, and suicides occurring elsewhere in the NFRD. This included District Council and parish council car parks, homes, open ground and lay-bys.

Method	NFRD	Signed car parks	Unsigned car parks	Any car park	Elsewhere in District
1988-1998 (10 years before intervention)					
Exhaust	139	45	51	96	43
Hanging	29	1	1	2	27
Other	67	1	1	2	65
1998-2001 (3 year intervention period)					
Exhaust	14	3	2	5	9
Hanging	19	1	2	2	17
Other	23	1	1	3	20

	Registration District obtained from the years 1984-1997. Official statistics on all suicides and corresponding open verdict deaths, registered in Hampshire, and in four counties (East Sussex, Essex, Gloucestershire and Nottinghamshire) in which well-known forests (Ashdown Forest, Epping Forest, Forest of Dean, and Sherwood Forest) are situated were obtained from the Office of national Statistics for the years 1993-2001. The exact location of death was ascertained by inspecting the inquest files. Car park sites for intervention: The 140 Forest Commission car parks were mapped and those in which at least 1 suicide had been found din the years 1984-1997 identified from detailed information contained in the inquest files from all the suicides.		
Limitations identified by author Not possible to ascertain the number of telephone calls to the Samaritans helpline during the intervention period **Limitations identified by review team** Causal association between caller and the intervention.			

E.1.9 Law et al 2014

Law CK, Sveticic J, De Leo, and Diego. (2014). Restricting access to a suicide hotspot does not shift the problem to another location. An experiment of two river bridges in Brisbane, Australia. Australian and New Zealand journal of public health, 38(2), pp.134-8.			
Study details	**Research Parameters**	**Population / Intervention**	**Results**

Author/year
Law et al 2014

Quality score
+

Study type
Before and after

Aim of the study
To evaluate the short- and long-term effect of safety barriers on Brisbane's Gateway Bridge and to examine whether there was substitution of suicide location.

Location and setting
Data on suicide by jumping in Brisbane, Australia were obtained from the Queensland Suicide Register. The effects of barrier installation at the Gateway Bridge were assessed through a natural experiment setting

Length of study
Data obtained between 1990 and 2012 – 23 years

Source of funding

Australian Commonwealth Government, Department of Health

Number of participants
Not applicable
Participant characteristics
Not applicable

Inclusion criteria
The location of suicide (Greater Brisbane Region or Statistical Area Level 4: 301-305, as specified by the 2011 Australian Statistical Geography Standard) and cause of death being either jumping from a high place or drowning.

Since Queensland is the second-largest state in Australia, with an area of 1.85 million km2, it is unlikely that the installation of barriers on a bridge in Brisbane would influence the epidemiology of jumping suicides across the whole state
Exclusion criteria
Suicide cases by other methods (e.g. hanging) that occurred at the bridges in Brisbane were excluded from the study.

Data collection
Suicide data were retrieved from the Queensland Suicide Register (QSR), an independent and comprehensive mortality database that includes information on all identified suicides by Queensland

Intervention / Comparison
Two bridges and their surroundings were investigated.

Intervention group: The Gateway Bridge is a pair of 65-metre-high bridges over the Brisbane River. A pair of fencing barriers about 3.3 metres high was retrofitted along the sidewalk of the bridge in 1993. After the new duplication bridge was built in May 2010, the barrier was replaced with a similar one with a height of 3.6 metres on the original bridge at the end of November 2010.

Comparison group: The Story Bridge, opened in 1935, is a 74-metre-high cantilever bridge that crosses the Brisbane River from Fortitude Valley on the north to Kangaroo Point on the south. To date no physical barriers have been installed on the Story Bridge and it could therefore be used as the control comparison site in the present analysis.

Primary outcomes
Number of suicides

A total of 277 suicides by jumping from a high place were identified for the period 1990 to 2012 in Brisbane. The method of jumping from a height accounted for 5.2% of all suicides by residents of Brisbane (n=5,232). Of those, 146 (45.5%) occurred from bridges in Brisbane, most commonly from the Gateway Bridge (n=38) and the Story Bridge (n=88)

Table 1 and 2: Number of suicides (rate per 100,000 of population). 1990-1993 before barriers, 1994-2012 after barriers. % change in rate refers to the average relative change of suicide risk between the pre installation and post-installation period estimated by from the Poisson regression model

	Gateway Bridge	Story Bridge	Other Bridges in Brisbane
1990-1993	22 (0.673)	15 (0.459)	6 (0.183)
1994-2012	16 (0.084)	73 (0.382)	14 (0.073)
Total 1990-2012	38 (0.170)	88 (0.392)	20 (0.089)
% Change in rate	-87.5 (p=<0.001)	-16.73 (p=0.520)	-60.0 (p=0.060)

	Other jumping sites in Brisbane (not bridges)	All suicides by jumping in Brisbane	All suicides by residents of Brisbane
1990-1993	13 (0.398)	56 (1.713)	757
1994-2012	27 (0.618)	221 (1.157)	4475
Total 1990-2012	118 (0.586)	277 (1.238)	5232

	residents from 1990 onwards. Suicide rates at each jumping location were calculated using the population of Brisbane, which was retrieved from the Australian Bureau of Statistics. To examine the effect of barrier installation for preventing suicide by jumping at the Gateway Bridge, descriptive analyses and Poisson regression analyses were applied. The latter examined the statistical significance of any change in numbers of suicides by jumping stratified from each jumping location (i.e. the Gateway Bridge, the Story Bridge, other bridges and other jumping sites in the Brisbane area) before (1990–1993) and after (1994–2012) the installation of the barriers on the Gateway Bridge		<table><tr><td>% Change in rate</td><td>55.4 (p=0.131)</td><td>-32.4 (p=0.009)</td><td>1.2 (p=0.758)</td></tr></table> The overall incidence of suicide reduced by 87.5% (p<0.001) following the fencing and the change did not appear to cause displacement to other locations of suicide by jumping across Brisbane during the same period at the Story Bridge (percentage change=-16.7%, p=0.520), other bridges (percentage change=-60.0%, p=0.060), or other jumping sites (percentage change=+55.4%, p=0.131). Overall, a 32.4% reduction of suicides by jumping was detected in Brisbane (p=0.009). However, this did not pose a significant impact on all suicides for residents in Brisbane (percentage change=+1.2%, p=0.758). **Author conclusions** This study provides empirical support that the barriers constructed at the Gateway Bridge were effective in preventing suicides by jumping with no immediate signs of displacement to another neighbouring suicide high-frequency location t (e.g. the Story Bridge) or other locations. This indicated that suicidal individuals generally did not seek alternative sites during the follow-up period of 19 years (from 1994 to 2012). Furthermore, the installation of higher barriers after renovation of the bridge in 2010 may have completely dissuaded people from considering suicide at that location. This study also demonstrated the importance of examining the long-term effects of barrier installation at the high-frequency location. As referred to the findings, the suicide rate at the Gateway Bridge only reduced by 53.0% during the first four-year period after the barrier installation (refer to study – not reported in table), which was considerably lower than the overall reduction of 87.5%. This indicated that the immediate effect of barrier installation is not sufficient to reflect its true impact at a high-frequency location and a longer follow-up period is needed for reporting in future.

Limitations identified by author

As suicide by jumping only constituted a small proportion of cases in Brisbane, it is difficult (if not impossible) to estimate how the physical barriers at the Gateway Bridge have affected the total number of suicides in the area, i.e., whether being prevented from jumping from the chosen bridge would lead not only to a substitution of location, but also of suicide method.

Reliable data for non-fatal suicidal acts incidence were not available, which could underestimate the actual effect of barriers on preventing suicide

Data did not contain any information about the structural weak points of the original Gateway Bridge in 1986 for people to commit suicide.

It would have been ideal to have an analysis that starts from the establishment of the bridge in 1986.

Not considered whether the installation of suicide barriers would bring a net gain to society from an economic perspective

Limitations identified by review team

Information on subject characteristics not reported (other studies report higher suicide by jumping rates in males)

Motives and epidemiological profiles of those who jump from locations that have acquired notoriety, may not be comparable with those who jump from other locations (e.g. residential buildings).

E.1.10 Lester 2005

Lester D (2005) Suicide by jumping from bridges. Percept Mot Skills 100: 628.

Study details	Research Parameters	Population / Intervention	Results
Author/year Lester 2005 **Quality score** - **Study type** before and after **Aim of the study** A descriptive study to describe the number of suicides jumping from Skyway Bridge Location and setting Sunshine Skyway Bridge, St. Petersburg, Florida **Length of study** 1996-1998, 2000-2002 Source of funding Not reported	**Number of participants** Not applicable Characteristics of Skyway Bridge The Skyway Bridge opened in 1954, and the first suicide occurred in November 1957. To date, 127 people have died. In 2000, the Florida state police began staffing the bridge full-time and 6 emergency call boxes stationed in the bridge since July 1999. Inclusion criteria Observed suicide cases on Skyway Bridge Exclusion criteria Not reported Data collection Suicide cases reported jumping from Skyway Bridge.	**Intervention / Comparison** No control group Intervention: the police patrol on the bridge and emergency call boxes stationed on the bridge. .	**Primary outcomes** The table below shows the total number of suicides jumping from the bridge Year / number 1996-1998: 25 2000-2002: 19 **Author Conclusions** The present study indicated the number of suicides from the bridge has declined, following installed crisis emergency telephones with the presence of a full-time police.

Limitations identified by author
Not reported
Limitations identified by review team
Sources of data collection were not reported, and the implementation and follow-up time only 3 years.

E.1.11 Lockley et al 2014

Lockley A, Cheung Y, Cox G, Robinson J, Williamson M, Harris M, Machlin A, Moffat C, and Pirkis J. (2014). Preventing suicide at suicide hotspots: a case study from Australia. Suicide & life-threatening behaviour, 44(4), pp.392-407.

Study details	Research Parameters	Population / Intervention	Results
Author/year Lockley et al 2014 **Quality score** - **Study type** Before and after analysis comparing number of suicides in two periods. Aim of the study To study the effects of The Gap Park Self-Harm Minimisation Masterplan project (a collaborative attempt to address jumping suicides at Sydney's Gap Park through means restriction, encouraging help-seeking, and increasing the likelihood of third-party intervention) **Location and setting** Gap Park is a coastal escarpment area of approximately 4.7 hectares, located on Sydney Harbour's South Head. It is one of Sydney's most popular tourist destinations.	**Number of participants** Not applicable for main interventions. Discussions with Stakeholders were held: 18 stakeholders including representatives from the collaborating organisations, technical contractors, and the local community. These discussions focused on the process of developing and implementing the Masterplan project and on lessons learned. People who died by jumping characteristics The gender and age profiles of the confirmed suicides were as follows: Males 56%, females 44%; < 20 years 4%, 20–29 years 30%, 30–39 years 16%, 40–49 years 27%, 50–59 years 12%, ≥60 years 11%. No equivalent break downs were available for the police call-out data. **Inclusion criteria** Potential cases were identified by examining	**Intervention / Comparison** The Masterplan project involved: 1) restricting access to means by constructing fencing 2) encouraging help seeking by installing crisis telephones and signs, and increasing the likelihood of intervention by a third party by putting in place closed-circuit television (CCTV) cameras and improving the amenity of the site. Intervention Access to means at the site was restricted by the construction of a130-cm-high fence along the cliff-tops. It consists of inward curved wire mesh and a wooden handrail. It does not offer foot- holds and can be more easily scaled from the cliff-side, so if a person manages to get over it, it is easier for them to get back to the safe side. The fencing component of the Masterplan project was completed in July 2011. Help-Seeking was encouraged by telephones and signs in 2010. These telephones link by push button activation to either the emergency services number or to specially trained Life line staff. Signs were installed at the same time and display the location of the phones. The likelihood of intervention by a third party was increased by the installation of CCTV cameras in 2010 and a new main entrance which includes seating, lighting, and tourist information displays. These works were designed to increase the probability that others would be present in the event that an individual was showing signs of distress Control group: Not applicable Statistical analysis	**Primary outcomes** *Number of suicides and number of attempted suicides (jumping incidents):* Information on the number of reported jumping incidents from 2006 to 2012 (n = 76) and confirmed suicides from 2001 to 2011 (n = 82) in the Gap Park area obtained from the police call-out dataset and the NCIS, respectively Year / Jumping incidents / Confirmed suicides 2001 / N/A / 7 2002 / N/A / 8 2003 / N/A / 4 2004 / N/A / 2 2005 / N/A / 3 2006 / 15 / 11 2007 / 11 / 11 2008 / 6 / 5 2009 / 7 / 7 2010 / 18 / 13 2011 / 12 / 11 2012 / 7 / N/A Jumping incidents - Rose Bay Police call-out data. Confirmed suicides - National Coroners Information System Discrepancies between the two sets of figures arise for various reasons. In particular, the figures for jumping incidents may be higher than those for confirmed suicides in a given year because, in a small number of cases, the incident was reported and no body was discovered or the jump did not result in death. *Join point regression on suicide numbers and police call outs:*

Length of study The study period included data on the number of suicides from 2001-2011. **Source of funding** The Australian Government Department of Health and Ageing.	Death Data from the National Coroners Information System. **Data Collection:** Data were extracted on suicides at Gap Park from 2001 to 2011 from the National Coroners Information System (NCIS). Deaths recorded on the NCIS with an ICD-10 diagnosis of "X60-X84" (deliberate self-harm) and/or with the "intent" column registered as intentional self-harm were interpreted as suicides. Suicides were included in the analysis if the primary mechanism was recorded as "blunt force"; the secondary mechanism was recorded as "falling, stumbling, jumping, pushed" Qualitative data from the stakeholder discussions and from the project documentation and related material were analysed thematically.	Quantitative data on suicides, police call-outs, and requests for live viewings of CCTV footage are reported as frequencies and percentages. Time trends in these data series were examined by join point regression, using Join point software, version 4.0.1. Join point regression was used to detect whether there were any significant changes in the direction or the rate of increase or decrease ("join points") and to calculate the estimated annual percentage change.	There was a downward trend in jumping incidents from 2006 to 2012, but join point regression analyse showed that this trend was not significant (EAPC = -2.61%, 95% confidence interval [CI] -21.1 to 20.2; p = .760). The same was true for the trend in confirmed suicides between 2001 and 2011(EAPC = 6.71%, 95% CI -2.5 to 16.8; p = .137). There were no statistically significant changes in trend in either jumps or confirmed suicides. The join- point regression analyses also showed a significant increase in total police call-outs, on average, of almost 13% per year (EAPC = 12.89%,95%CI0.3to27.1; p = .047) and, on average, of 16% per year in call-outs related to individuals located at or approaching Gap Park (EAPC = 16.04%, 95% CI7.1to25.7; p = .005). *Telephones and signs:* The evaluation of the crisis tele- phones suggests that they have experienced a number of issues which was confirmed in the stakeholder discussions. These include a large volume of silent calls, false alarms, and hoaxes. In a small number of cases, the telephones have helped either by enabling bystanders to directly summon help or through use by the suicidal person them- selves. For example, the police call-out data refer to one case where the suicidal person specifically mentioned the direct link to Lifeline having saved his life Signs were difficult to assess directly. One positive observation, taken from the evaluation of the crisis telephones was that there was an increase in calls to Lifeline that were made on mobile phones and originated in the Gap Park area. – reported in Walsh 2011 linked evaluation report? *CCTV cameras and New main entrance* Not directly assessed. Police call-outs did increase which may be related. *Qualitative data from stakeholder discussions:* Uniformly, stakeholders noted that the strength of their relationships and ongoing collaboration were key to the project's success. The police continue to be the primary interveners in potential self-harm incidents. Woollahra Council has been able to provide leadership, coordination, com- munity consultation, landscape design expertise, and funding. The Masterplan project experience has also resulted in the Council, in partnership with the Black Dog Institute and Lifeline, planning and implementing a number of community mental health and self-harm minimization education activities. **Author's conclusions:** Despite the lack of significant trends in the overall time series, the figures may nonetheless provide early suggestive evidence that suicides may have decreased at Gap Park during and following the establishment phase of the Masterplan project. Both data sets show a peak in the number of incidents in

			2010, the year that the crisis phones, signage, and CCTV system became operational. Both data sets also show there was a decrease in incidents in 2011, when these elements had been refined and when the fencing was installed and the site's amenity was improved.

Limitations identified by author

The Gap Park Masterplan project spanned a 5-year period, from 2007 to 2011. Different components of the project took varying amounts of time to complete and took effect at different times. This makes simple before and after examinations of police call-out data and confirmed suicide data difficult

In addition, several of the major components (barriers) were only completed fairly recently, so it may be too early for their true effects on suicidal activity to be judged.

The NCIS data may provide an under-count of suicides. Coroners are not required by law to find on intent unless the person died in custody or care, or the coroner believes that the public interest will be served by addressing the circumstances.

The police call-out data were limited to cases where the police became involved. They relied on coding that may sometimes have been subjective, particularly when it related to the classification of "intent."

Last, there are some limitations with the qualitative data. We relied on documentary evidence and evidence from a relatively small number of stakeholders. This means that some perspectives may not have been included, and those that were often subjective

Limitations identified by review team

No assessment of the effectiveness of the fencing barrier on the number of suicides *after* its installation in 2011 as data reported is only up to this point. The number of jumping incidents is however reported up to 1 year after its installation

Short duration for assessment of the effectiveness of help seeking and third party interventions (signs and telephones-CCTV and tourist attractions) on the number of suicides *after* their installation in 2010. (1 year comparison)

The effectiveness of the telephones, signs, CCTV cameras and the increase in tourist attractions were not directly assessed. Some information on police call outs to the site was reported which may be related. – Author reports an increase in calls to the lifeline according to a 'Walsh 2011' linked evaluation – but no data of this in the current study

No raw qualitative data (e.g. quotations) reported from stakeholder discussions

E.1.12 Matsubayashi 2013

Matsubayashi T, Sawada Y, Ueda M (2013) Does the installation of blue lights on train platforms prevent suicide? A before-and-after observational study from Japan Journal of affective disorders 147 (1) 385-388

Matsubayashi T, Sawada Y, Ueda M (2014) Does the installation of blue Lights on train platforms shift suicide to another station? Evidence from Japan Journal of affective disorders 169 57-60

Study details	Research Parameters	Population / Intervention	Results
Author/year Matsubayashi et al 2013 Matsubayashi et al 2014 (linked studies) **Quality score** +	Data Number of station-year observations for study ½ 781 *(calculated from 71 stations x 11 years)* 994 (calculated from 71 stations x 14 years	**Intervention / Comparison** Study 1 Treatment group: The number of suicides at 11 stations with installation of blue lights Comparison group: Other group of 60 stations without the installation of blue lights	Study 1 Descriptive analysis Total number of suicides and the average number of suicides per station in the years pre (200-2007) and post (2008-2010) blue light installation

Study type
Prospective Cohort study

Aim of the study
To evaluate the effect of blue lights on the number of suicides by using panel data from 71 train stations between 2000 and 2010 collected by one railway company. The number of suicides were compared before and after the intervention of blue lights at 11 stations in 2008.
Further study analysed whether these lights shifted suicide from 14 stations with lights installed to other nearby stations. Updated data set from 2000-2013

Location and setting
Tokyo Metropolitan area

Length of study
Data obtained over a 10 year period (2000-2010)
Data obtained over a 13 year period (2000-2013)

Source of funding

Study 1:
Station-year suicide observations at all 71 stations (2000-2010)
108 observations associated with at least one suicide
673 observations associated with 0 suicides
Average number of suicides per station-year 0.164 (SD=0.443)
Maximum number of suicides at a station per year = 3
Station with the highest number of total suicides = 10

Installation of blue lights at 11 stations
1 station in 2008
4 in 2009
6 in 2010
Blue lights stay on from sunset to sunrise
Study 2:
Station-year suicide observations at all 71 stations (2000-2013)
853 observations associated with 0 suicides
Maximum number of suicides at a station per year – 3
Average number of suicides per station-year 0.16 (SD=0.44)
Station with the highest number of suicides = 10

Study 2
Treatment group: The number of suicides at the 14 stations before and after the installation of blue lights and the neighbouring 5 stations on the same railway line

Comparison group: The number of suicides at all other stations without the installation of blue lights

Year	Group 1 (comparison) N=60 Number of suicides (mean per station)	Group 2 (intervention) (N=1) Number of suicides (mean per station)	Group 3 (intervention) (N=4) Number of suicides (mean per station)	Group 4 (intervention) (N=6) Number of suicides (mean per station)
2000-2007	67 (1.117)	5 (5)	13 (3.25)	17 (2.83)
2008	5 (0.082)	0 (0)	3 (0.750)	3 (0.500)
2009	5 (0.082)	0 (0)	0 (0)	4 (0.667)
2010	5 (0.082)	0 (0)	1* (0.250)	0 (0)

Group 1: Stations that had no blue lights installed by 2010 (N=60)
Group 2: Stations that had blue lights installed by 2008 (N=1)
Group 3: Stations that had blue lights installed by 2009 (N=4)
Group 4: Stations that had blue lights installed by 2010 (N=6)

*One case of suicide, but occurred during the day when the blue lights were off.
*The average no of suicides (prior to blue light installation) was higher in groups where blue lights were eventually installed – this could be because the railway company chose to install blue lights at stations where suicide numbers were higher.
Regression analysis
Incident rate ratio (IRR) = 0.167; 95% CI (0.032-0.867)
Introduction of blue lights resulted in a decrease in the number of suicides by 84% (CI: 14-97%)
Estimated effect of blue lights on the number of suicides

	Effect	95% CI	P-value
Blue lights	-1.788	-3.431,-0.143	0.003
Constant	-18.373	-20.477-16.269	<0.000

Table entries are Poisson regression estimates. The dependant variable is the total number of suicides at each station in a single year.

Study 2
Descriptive analysis

<table>
<tr>
<td>The Japan Society for the Promotion of Sciences and the Nomura Foundation in Japan.</td>
<td>Installation of blue lights at 14 stations
1 station in 2008
4 in 2009
6 in 2010
1 in 2011
0 in 2012
2 in 2013
Blue lights stay on from sunset to sunrise

Exclusion criteria

Not known</td>
<td></td>
<td>Mean number of suicides per year for each groups of stations before and after the installation of blue lights. In parentheses – (number of station-years)

<table>
<tr><th>Study period-2000-2013</th><th>Group 1 Blue lights</th><th>Group 2 No blue lights</th><th>Group 3 No blue lights</th><th>Group 4 No blue lights</th><th>Group 5 No blue lights</th><th>Group 6 No blue lights</th><th>Group 7 No blue lights</th></tr>
<tr><td>Before 2000-2008</td><td>0.435 (115)</td><td>0.269 (182)</td><td>0.234 (201)</td><td>0.275 (189)</td><td>0.245 (200)</td><td>0.259 (220)</td><td rowspan="2">0.0090 (546)</td></tr>
<tr><td>After 2008-2013</td><td>0.189 (53)</td><td>0.274 (84)</td><td>0.269 (93)</td><td>0.275 (91)</td><td>0.266 (94)</td><td>0.245 (102)</td></tr>
</table>

Group 1: Stations with blue lights installed (N=14)
Group 2: One station away
Group 3: Two stations away
Group 4: Three stations away
Group 5: Four stations away
Group 6: Five stations away
Group 7: Six or more stations away

*Group 1 refers to the stations who had blue lights installed from 2008-2013 (14 stations). The average number of suicides decreased after the installation of blue lights which is consistent with study 1
* The number in the post installation period for group 1 refers to 10 suicides. However 9 happened in the day when the lights were off
*Clearly no major increase or decrease in the average number of suicides before and after the installation of blue lights at nearby stations

Regression analysis
Incident rate ratio (IRR) = 0.258; 95% CI (0.127-0.523)
Introduction of blue lights resulted in a decrease in the number of suicides by 74% (CI: 48-87%)

No significant results to suggest that the installation of blue lights increased suicides at nearby stations</td>
</tr>
<tr>
<td colspan="4">Limitations identified by author
External validity limited because the analysis relies on data from a single railroad company – the installation of blue lights may not be as effective in other areas</td>
</tr>
</table>

Does not consider the possibility that people may jump in front of a train at a railway crossing as opposed to a station platform
Blue lights installed by other railway companies may be less effective due to differences in numbers, locations, and types of blue lights
Study does not examine the underlying suicide prevention of blue lights – may have a calming effect, but this hypothesis has not been systematically examined
Based on observational data- may not indicate a causal relationship between installation of blue lights and decreased suicide rates
The decision to install blue lights at stations may have been influenced by the number of suicides at the stations in previous years – to address this the effect of blue lights on the number of suicides was re-examined by controlling for the number of suicides in the previous year or the previous three years
Blue lights only expected to stop people jumping in front of trains at night, not during the day time.
Limitations identified by review team
Study described as an observational before and after study – however due to the control group (stations without blue lights) it was decided it was a prospective cohort study
Neither of the studies differentiated between suicide events that occurred at the end of platforms where blue lights are installed and those that occurred from other parts of the platforms where blue lights would not be effective, making it difficult to conclude that the reduction was definitely a result of the installation of the lights.

E.1.13 Pelletier 2007

Pelletier A R. (2007). Preventing suicide by jumping: the effect of a bridge safety fence. Injury prevention: journal of the International Society for Child and Adolescent Injury Prevention, 13(1), pp.57-9.

Study details	Research Parameters	Population / Intervention	Results
Author/year Pelletier, 2007 **Quality score** - **Study type** Before and after analysis comparing number of suicides in two periods. **Aim of the study** To study the effects of a safety net on the Memorial Bridge in Augusta and other local jumping from height hot-spots. **Location and setting**	**Number of participants** Not applicable. People who died by jumping characteristics The median age of case patients was 39.5 years (range 21–72 years), and all were white; 11 (79%) case patients were male; 8 (57%) were single, 4 (29%) were married, 1 (7%) was divorced and 1 (7%) was widowed; 10 (71%) were living in Augusta at the time of their death; the other 4 (29%) lived in neighbouring communities; 7 (50%) suicides occurred on a Friday or Saturday; 10 (71%) of the deaths were witnessed; 7 (50%) occurred between noon and 17:59 h. No more than two deaths occurred in any month of the year. No seasonal patterns	**Intervention / Comparison** The jumping site was a 2-lane, 2100 foot long bridge, 100 foot above Kennebec River. An 11 foot-high safety fence was installed on each side of the bridge in 1983. The Memorial Bridge is located near a state psychiatric hospital. Intervention period: 1 Jun 1983 to 31 Jul 2005 (22-year post-intervention period) Control group: 1 Apr 1960 to 31 May 1983 (22-year pre-intervention period). Note: data for 1968 were not available.	**Primary outcomes** Number of suicides. Number of jumping suicides at sites, before and after installation of safety net (22 & 22 years respectively) Location / Pre-installation / Post-installation Memorial Bridge: 14 / 0 Augusta (minus memorial bridge): 9 / 9 Augusta total: 23 / 9 The suicide rate in Augusta from 1 April 1960 to 31 May 1983 was 26/100 000/year and from 1 June 1983 to 31 July 2005 was 23.8/100 000/year, a decrease of 9% (p=0.49). **Author's conclusions:** The results of the study indicated that the safety fence installed in 1983 was effective in preventing further suicides from the Memorial Bridge. The number of suicides related to jumping from other structures in Augusta remained

Memorial Bridge in Augusta, Maine, US **Length of study** The study period included 22 years and 2 months both before and after installation of the safety fence in June 1983. **Source of funding** There was no external funding for this study. The work was conducted by a federal employee with the Centres for Disease Control and Prevention.	were noted. Death was due to drowning in 8 (57%) cases and due to blunt trauma in 6 (43%) cases. **Inclusion criteria** Potential cases were identified by examining death certificates with International Classification of Diseases (ICD) codes for suicides in Augusta caused by jumping from a high place or drowning. For each potential case identified through death certificates, additional information was sought from the archives of the Kennebec Journal newspaper, death investigations conducted by the state medical examiner and medical records of the state psychiatric hospital in Augusta. Information from these sources was used to describe the general characteristics of cases. Data Collection: Data on all suicides in Augusta and in Maine during the study period were obtained from death certificates using ICD codes for suicide. Population data for Augusta and Maine were obtained from the US census.		unchanged after installation of the fence, suggesting that suicidal individuals did not seek alternative sites. Although the decline in the suicide rate in Augusta after installation of the safety fence was not statistically significant, measuring the effect of a safety fence on the overall suicide rate in a community can be difficult because of the relatively small percentage of suicides from jumping
Limitations identified by author Data for 1968 were not available. However, it is unlikely that one year's data would have had a substantial effect on the study results given the length of the overall time period examined. Electronic death records from 1960 to 1974 do not meet current data quality standards. This may have resulted in an underestimate of suicides from the Memorial Bridge during that time period. Data were not available for non-fatal incidents involving the Memorial Bridge. Focusing only on deaths underestimates the public health effect of suicide attempts from the bridge. **Limitations identified by review team** There are potential biases and inaccuracies in the death certificates. The large drop in suicide rates by jumping across the city appear to be explained by the barrier only. There could be chance fluctuations in rates, economic changes, social changes, or other interventions to restrict the means of completing suicide that are not identified by the authors. Although the authors acknowledge difficulties of measuring an effect of a safety fence when there are small numbers, the issue is not explored further.			

The proximity to the bridge of the psychiatric hospital was noted, but further data and safety of patients was not described.

E.1.14 Perrron et al 2013

Perron S, Burrows S, Fournier M, Perron PA, and Ouellet F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. American journal of public health, 103(7), pp.1235-9.

Study details	Research Parameters	Population / Intervention	Results
Author/year Perron et al, 2013 **Quality score** - **Study type** Uncontrolled before & after study, natural experiment. **Aim of the study** To determine whether the installation of a suicide prevention barrier on Jacques-Cartier Bridge led to displacement of suicides to other jumping sites on Montreal Island and Monteregie, Quebec, the 2 regions it connects. **Location and setting** Jacques-Cartier Bridge, which spans the St. Lawrence River between Montréal Island and Montérégie, Montreal, Quebec, Canada **Length of study**	**Number of participants** The study was a natural experiment. People who died by jumping characteristics Individuals who jumped from Jacques- Cartier Bridge was younger than those who used other sites. The average age of suicide victims was higher in the period after installation of the barrier for all sites except Jacques-Cartier Bridge, for which there was a decrease. Most suicides by jumping were male. Jumping from Jacques-Cartier Bridge mean age (SD): Before barrier 34.9yrs (12.2) After barrier 31.8yrs (12.2) Male no (%) Before barrier 121 (82%) After barrier 121 (92%) Jacques-Cartier Bridge was the only single structure that attracted individuals from regions beyond neighbouring municipalities (13% travelled from elsewhere in Québec). Inclusion criteria	**Intervention / Comparison** Intervention: the existing 1.1 meter steel palisade fencing was extended a further 1.4 meters and curved inwardly at the top, making it high and difficult to climb. Intervention period: 5 (2005– 2009) after installation. Control period: 13.5 (1990–June 2004) before installation. Analyses Incidence rate ratios (IRRs) were calculated and represent the ratio of the incidence rate before and after the installation of the barrier. To assess possible displacement, regression models were ran for suicides from Jacques-Cartier Bridge only and then combined them in a stepwise fashion with suicides from 5 categories of other jumping sites. P value less than 0.05 was considered to be statistically significant.	**Primary outcomes** Suicide rates - Suicide rates by jumping from Jacques-Cartier Bridge decreased after installation of the barrier (incidence rate ratio [IRR] = 0.24; 95% confidence interval [CI] = 0.13, 0.43), which persisted when all bridges (IRR = 0.39; 95% CI = 0.27, 0.55) and all jumping sites (IRR = 0.66; 95% CI = 0.54, 0.80) in the regions were considered.

	Suicide rate/100 000		No. annual suicides*		P value	IRR (95% CI)
Jump Location	before	after	before	after		
Jacques Cartier	0.324	0.079	10.0	2.6	<.001	0.24 (0.13, 0.43)
all bridges	0.577	0.225	17.9	7.4	<.001	0.39 (0.27, 0.55)
all jumping sites	1.168	0.768	36.1	25.0	<.001	0.66 (0.54, 0.80)
* Corrected per capita to suicides in 1990 population; not standardised for age.						

Authors conclusions

28.5 years: 13.5 (1990–June 2004) before and 5 (2005–2009) after installation). **Source of funding** Not reported.	To be included in the data collection the death had to be ruled a suicide by the Québec chief coroner's office. Data Collection: data were extracted suicide deaths among Québec residents from the data banks of the Québec chief coroner's office for January 1, 1990---December 31, 2009. Jacques-Cartier Bridge is 1 of several bridges spanning the St. Lawrence River between Montréal Island and the Montérégie region on the south shore (Figure 1). We considered jumping sites within the 2 regions, including bridges connecting them, for potential evidence of displacement. The bridge used for a suicide was usually recorded, but in some cases the body was retrieved from the St. Lawrence River and, although bodily injury indicated a fall from height, the exact bridge used was unknown. - Population counts for Québec and Montréal Island and Montérégie were derived from census data for 1991, 1996, 2001, and 2006 and assumed linear population growth for the periods 1991---1996, 1996---2001, and 2001---2006. Population growth was estimated by extrapolating backward for 1990 to 1991 and forward for 2006 to 2009.		Little or no displacement to other jumping sites may occur after installation of a barrier at an iconic site such as Jacques-Cartier Bridge. A barrier's design is important to its effectiveness and should be considered for new bridges with the potential to become symbolic suicide sites.
Limitations identified by author			

Variables other than the barrier may possibly have influenced suicide rates at the same time at which the barrier was installed. For example, we observed an overall decrease in rates of suicide by all methods and by jumping in the province of Québec. However, the decreasing trend is unlikely to explain all of our results.

Québec suicide records have been shown to be valid and reliable, with little underreporting. The decision to ascribe a death to suicide is based on the balance of evidence indicating suicidal intent. Although some unintentional deaths or homicides may be misclassified as suicides after a fall from height, it is unlikely to present a serious bias.

Using the date when the body was discovered as the date of death for some cases will have added some inaccuracy but is unlikely to affect annual trends.

Limitations identified by review team

Not identified

E.1.15 Reisch and Michel (2005)

Reisch T and Michel K. (2005). Securing a suicide hot spot: effects of a safety net at the Bern Muenster Terrace. Suicide & life-threatening behaviour, 35(4), pp.460-7.

Study details	Research Parameters	Population / Intervention	Results
Author/year Reisch & Michel, 2005 **Quality score** - **Study type** Interrupted time series analysis assessing expected and observed numbers of suicides in 2 periods: 1995-98 (4 yr pre-intervention period) and 1999-2002 (4 yr post-intervention period). **Aim of the study** To study the effects of a safety net on the Muenster Terrace and other local jumping from height hot-spots in Bern. The researchers also considered the number of media reports on jumping at hot-spot sites and the	**Number of participants** Not applicable. People who died by jumping characteristics Not reported. Data indicate that people with suicide by jumping living outside Bern were 14 for the pre- installation period (1995-98); the total number for Bern sites over this period was 45. Inclusion criteria All deaths by suicide for Bern for the study period, confirmed by 2 datasets. Data Collection: Data were collected from the Swiss Federal Office for Stats; data includes year, residence and method of suicide used. Bern City police data was also used	**Intervention / Comparison** Intervention: In December 1998, a safety net was built to prevent people from leaping from a high terrace. The barrier is made of 4m wide metal mesh, 7m below the top level. It was built, largely, to protect people below the terrace. Commentators questioned the general prevention factor as there were 2 bridges of 50m height within 5 minutes' walk from Muenster Terrace. Intervention period: 1999-2002 (4 yr post-intervention period). Control period: 1995-98 (4 yr pre-intervention period).	**Primary outcomes** Outcomes: Suicide numbers for the reporting periods. Note: data is missing for the primary outcomes, although data were reported for this study in a systematic review (see below). In the four years after the safety net was built no more suicides at the Muenster terrace occurred and the number of suicides in Bern decreased. Three models were used to calculate statistical differences before and after the installation of the barrier. Using the best fitting model (the logarithmic model) the results suggest a significant reduction of suicides by jumping after installation of the net. The difference between the expected and observed numbers was significant (73 expected, 44 observed; binominal test: $p<0.01$) Author's conclusions: the reduction of the deaths by jumping from the Muenster Terrace does not explain the decrease of suicides by jumping in Bern.

Data reported by Reisch & Michel:

Jump location	Pre- 95-98 (4yrs)	Post- 95-98 (4yrs)	Rate ratio	CI
Muenster Terrace	NR	0	NR	NR
Bern (all sites) suicides	45	44	NR	NR

<table>
<tr>
<td>residency of people who jumped at these sites.

Location and setting
Muenster Terrace, Bern, Switzerland.

Length of study
8 years. Data were collected for the 2 periods (4yr & 4yr), pre and post-intervention.

Source of funding
Not reported.</td>
<td>as a record of death and location of death. Both data sets are completed by law and considered to be accurate and comprehensive; authors report there is a low likelihood of undetected death at Muenster Terrace.</td>
<td></td>
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<table>
<tr><td>by jumping</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Data reported in Pirkis et al 2013 (systematic review)</td></tr>
<tr><td>Jump location</td><td>Pre-95-98 (3yrs)</td><td>Post-95-98 (3yrs)</td><td>Rate ratio</td><td>CI</td></tr>
<tr><td>Muenster Terrace</td><td>7</td><td>0</td><td>0</td><td>0.0 to 0.69</td></tr>
<tr><td>Bern (all sites) suicides by jumping</td><td>19</td><td>13</td><td>0.68</td><td>0.31 to 1.46</td></tr>
<tr><td colspan="5">NR, not reported.</td></tr>
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</td>
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<tr>
<td colspan="4">Limitations identified by author
Small numbers of suicide limit the power of the statistical analyses.
Changes in suicide by jumping may be related to unrelated fluctuations.
Limitations identified by review team
There is a lack of reporting of data for the site: The authors do not report rates at the Muenster and other Bern jumping sites.
The records might be prone to bias because people found dead beneath certain bridges or after falling from any bridge or building are more likely to have been ruled as having died by suicide than by causes such as homicide or unintentional death.
The safety net was introduced to protect people below the terrace, rather than reduce suicide per se. The safety net did not prevent jumping across all of the Terrace. Although the safety net appeared to stop jumping, it is not clear whether the effect was temporary or related to the effect of media reporting about safety around the site.</td>
</tr>
</table>

E.1.16 Sinyor et al 2017/Sinyor and Levitt 2010

<table>
<tr><td colspan="4">Sinyor Mark, Schaffer Ayal, Redelmeier Donald A, Kiss Alex, Nishikawa Yasunori, Cheung Amy H, Levitt Anthony J, and Pirkis Jane (2017) Did the suicide barrier work after all? Revisiting the Bloor Viaduct natural experiment and its impact on suicide rates in Toronto. BMJ open 7(5), e015299

Sinyor M, and Levitt A J. (2010). Effect of a barrier at Bloor Street Viaduct on suicide rates in Toronto: Natural experiment. BMJ (Online), 341(7765), pp.185.</td></tr>
<tr><td>Study details</td><td>Research Parameters</td><td>Population / Intervention</td><td>Results</td></tr>
</table>

Author/year
Sinyor et al 2017
Sinyor & Levitt, 2010

Quality score
-

Study type
Uncontrolled before & after study, natural experiment.

Aim of the study
To determine whether rates of suicide changed in Toronto after a barrier was erected at Bloor Street Viaduct, and whether media reporting had any impact on suicide rates.

Location and setting
Toronto, Canada

Length of study
Data were collected for the periods: 1993-2003 (eleven years before the barrier) and July 2003-June 2014 (eleven years after the barrier).

Source of funding

American Foundation for Suicide Prevention and the University of Toronto, Department of Psychiatry Excellence Fund.Sinyor

Number of participants
The study was a natural experiment involving 5403 people who died by suicide in the city of Toronto.

People who died by jumping characteristics
The study provides data for the last known residences of people who died by jumping from Toronto bridges.

jumping from Bloor Street Viaduct

Sinyor and Levitt (2010)Location of last known residence of people who died by jumping from Toronto bridges. No (%)

Location of residence	Bloor street	Other bridges	Post-barrier
Toronto	17 (29.8)	23 (40.4)	41 (67.2)
Suburbs or beyond	2 (3.5)	0 (0)	9 (14.8)
No fixed/ unknown	4 (7.0)	11 (19.3)	11 (18.0)

Of the 57 people who completed suicide by jumping from Toronto bridges from 1999-2001 (before the barrier), only two were known to live outside the city and both jumped at Bloor Street Viaduct.

Inclusion criteria
To be included in the data collection
the death had to occur between 1 January 1993 and 31 December 2014 and be ruled a suicide by the coroner's office.

Sinyor and Levitt (2010)
To be included in the data collection the death had to be ruled a suicide by the coroner's office

Intervention / Comparison

Intervention: barrier at Bloor Street Viaduct, was constructed between April 2002 and June 2003. The barrier is about 5 m high and consists of thousands of thin steel rods spaced closely together and supported externally by an angled steel frame.

Jumping at other locality hotpots were noted to assess whether the barrier prevents suicides or simply result in people substituting one bridge for another or attempting suicide by other means.

SInyor and Levitt (2010)
Intervention period: July 2003-June 2014 (four years after the barrier)

Sinyor et al (2017)
Intervention period: July 2003-June 20072014
(four eleven years after the barrier)

Control period: 1993-2003 (eleven years before the barrier)

Statistical analysis
Sinyor et al (2017)

To examine differences between **suicide rates** before and after the barrier the authors carried out Poisson regression analyses with time (prebarrier/postbarrier) and population adjusted suicide deaths per year as the independent and dependent variables, respectively.

For the **media analysis**, Poisson regression was run to compare the

Primary outcomes
Sinyor et al 2017Changes in yearly rates of suicide by jumping at Bloor Street Viaduct, other bridges including nearest comparison bridge and walking distance bridges, and buildings, and by other means.

Relationship between media reporting of suicide and suicide rates.

Sinyor and Levitt (2010)
Changes in yearly rates of suicide by jumping at Bloor Street Viaduct, other bridges, and buildings, and by other means.

Results: Suicide rates

Rates of suicide before and after the suicide barrier are presented in the table below. Only one person has died by jumping off the Bloor Street Viaduct since the barrier was completed. Per-capita rates at that location declined from 9.0 deaths per year before the barrier to 0.1 deaths per year after the barrier (p=0.002).

Suicide deaths from bridges in Toronto declined by a similar absolute number (18.8 deaths per year before the barrier vs 10.0 deaths per year after the barrier, p<0.0001).

There was no statistically significant rise in deaths by jumping from other bridges in the city overall, walking distance bridges, the nearest comparison bridge or from buildings.

There was a numeric but non-significant reduction in overall suicide deaths by jumping (57.0 deaths per year before the barrier vs 51.3 deaths per year after the barrier, p=0.07).

Suicide deaths from the nearest comparison bridge rose in the years when the barrier was constructed and in the 2 years afterwards, but suicide deaths at that location have declined to prebarrier levels.

Per capita rates of suicide overall and by means other than jumping declined significantly over the study period (p<0.0001; p=0.001, respectively).

	Obs	Cor*	Obs	Cor*		

and Levitt (2010) received no funding.	according to the standard of a high degree of probability. **Data Collection** Suicides: Sinyor and Levitt (2010) Records from the Office of the Chief Coroner of Ontario covering all suicides in Ontario were examined. Sinyor et al (2017) The barrier at the Bloor Street Viaduct was completed in 2003. Accordingly, the study classified the 11 year from January 1993 to December 2003 as being before the barrier and the 11 years from January 2004 to December 2014 as being after the barrier. Data Collection Media: A media tracking service, provided media articles related to suicide. 11 local and national publications with the highest circulation in the Toronto media market: were identified. A database search was run for suicide and related keywords. Trained coders included articles with a major focus on suicide (having greater than two sentences or a short paragraph devoted to the subject). Coders then searched the identified articles for the keywords 'Viaduct', 'Bridge' and 'Jump'. Identified articles were then coded on a yes/no basis for whether they (1) were related to the Bloor Street Viaduct, (2) if so, if they expressed negative views about the barrier or suicide barriers in general (defined as describing the barrier as a poor use of resources, an ineffective strategy or both) and/or included the cost of the barrier, (3) were related to jumping from a bridge other than the Bloor Street Viaduct and/or (4) included a message of hope that suicide is preventable. None of these codes were mutually exclusive. Five inter-rater reliability tests were spaced throughout coding, and collectively, 94% agreement was achieved.	population-adjusted counts of suicide per year in relation to the yearly number of articles. Because of the risk that media reports on a given year could be the result of specific deaths rather than the cause of them, the models applied a 1 year lag on the article predictor variable. That is, the analysis tested whether media occurrences on the previous calendar year had any relationship with suicide deaths. P value less than 0.05 was considered to be statistically significant. Sinyor and Levitt (2010) To examine differences between suicide rates before and after the barrier the authors carried out Poisson regression analyses. They analysed demographic data using two tailed, independent sample t tests for continuous variables and two sided $\chi 2$ tests for categorical variables. P value less than 0.05 was considered to be statistically significant.

Toronto (total)	257.0	247.8	234.2	211.7	<0.001	0.85 (0.79 to 0.93)
Jumping	59.3	57.0	56.7	51.3	0.07	0.90 (0.80 to 1.01)
Building	39.6	38.1	45.5	41.2	0.29	1.08 (0.94 to 1.24)
All Bridge	19.6	18.8	11.1	10.0	<0.0001	0.53 (0.40 to 0.71)
Bloor St Viaduct	9.5	9.0	0.1	0.1	0.002	0.009 (0.0005 to 0.19)
Other bridges	10.1	9.6	11.0	10.0	0.84	1.03 (0.76 to 1.40)
Walking distance bridges	6.7	6.3	5.5	5.0	0.36	0.79 (0.48 to 1.30)
Nearest comparison bridge	2.3	2.2	2.6	2.4	0.77	1.11 (0.54 to 2.29)
Other means	197.7	190.8	177.5	160.4	0.001	0.84 (0.76 to 0.93)

* Corrected per capita to suicides in 1993 population; not standardised for age.
**IRR of suicides postbarrier compared with prebarrier; df=15.

Sinyor and Levitt (2010)

A mean of 9.3 suicides took place annually before the barrier and none after the barrier (P<0.01).Jump Location	Mean ann. suicide pre-barrier		Mean ann. suicide post-barrier		P value	Incident rate ratio (95% CI)
	Obs	Cor*	Obs	Cor*		
Building	39.7	38.5	45.8	42.7	0.32	1.11 (0.90 to 1.36)
All Bridges	18.6	17.9	15.3	14.2	0.22	0.79 (0.55 to 1.15)
Bloor st	9.6	9.3	0	0	<0.01	0.05 (0.01 to 0.31)
Other bridges	9.0	8.7	15.3	14.2	0.01	1.64 (1.13 to 2.39)

* Corrected per capita to suicides in 1993 population; not standardised for age.

Results: Media analysis

			The authors found no significant relationship between number of articles and suicide deaths by jumping or overall in the following year. Articles about suicide at the Bloor Street Viaduct were associated with a significant increase in suicide deaths by jumping from bridges the following year (incidence rate ratio (IRR) 1.011, 95% CI 1.0014 to 1.0207, p=0.02). These articles were also associated with a decline in suicide deaths by jumping from buildings the following year (IRR 0.9939, 95% CI 0.9902 to 0.9976, p=0.001). Articles describing the cost of the barrier were associated with an increase in suicides on bridges (IRR 1.025, 95% CI 1.0001 to 1.05, p=0.05). Messages of hope were associated with a decrease in suicide deaths by jumping from buildings only (IRR 0.9869, 95% CI 0.9776 to 0.9962, p=0.006). There was no significant impact of articles expressing negative views about the suicide barrier or articles about bridges other than the Bloor Street Viaduct. Authors conclusion The study demonstrated that, over the long term, suicide by jump declined in Toronto after the barrier with no associated in suicide by other means. That is, the barrier appears to have had its intended impact at preventing suicide despite a short-term rise in deaths at other bridges that was at least partially influenced by a media effect.
Limitations identified by author Sinyor et al (2017)Potential ecological fallacy. As an uncontrolled natural experiment, it is possible that factors that could not be accounted for may have impacted suicide rates. (e.g. societal changes that might have impacted on chosen suicide methods, the impact of economic changes). Only able to examine print and online media sources. The authors speculate that these should serve as a proxy for other types of media reporting including television and radio reports although this was not established. Possibility that a small number of suicide deaths by jumping from bridges or buildings in Toronto were either never identified or was misclassified by the coroner as accidental or due to homicide. Sinyor and Levitt (2010) Despite the relatively high rate of suicides by jumping at Bloor Street Viaduct, the absolute numbers may have been too low to achieve adequate power in a study of this kind. The relative comprehensiveness of the chief coroner's records, it is possible that suicide rates by all causes were overestimated or underestimated in the period before or after the barrier owing to incompleteness or inaccuracy of records. The coroner's records might be prone to bias because people found dead beneath certain bridges or after falling from any bridge or building are more likely to have been ruled as having died by suicide than by causes such as homicide or unintentional death. The possibility that rates of suicide at other bridges increased after the barrier for reasons other than substitution of location cannot be discounted. These reasons might include chance fluctuations in rates, economic changes, social changes, or other interventions to restrict the means of completing suicide. **Limitations identified by review team** There may be biases in coroner's reporting of suicide cases based on changes in culture and attitudes to suicide. Study weakness exists relating to any naturalistic experiment.			

E.1.17 Skegg and Herbison (2009)

Skegg K and Herbison P. (2009). Effect of restricting access to a suicide jumping site. The Australian and New Zealand journal of psychiatry, 43(6), pp.498-502.

Study details	Research Parameters	Population / Intervention	Results
Author/year Skegg and Herbison 2009 **Quality score** - **Study type** Quasi-experimental **Aim of the study** To assess whether loss of vehicular access would lead to a reduction in suicide and emergency police callouts for threatened suicide at the site. **Location and setting** In the city of Dunedin, a rocky headland (Lawyer's Head) projecting into the Pacific Ocean nears a population city beach, New Zealand. Length of study August 1996 to July 2006 **Source of funding** Not reported.	**Participant characteristics and number** Not applicable Characteristics of the Cantonal Hospital In the city of Dunedin, a rocky headland (Lawyer's Head) projecting into the Pacific Ocean near a population city beach has acquired a reputation as a place from which jumping will result in almost certain death. Lawyer's Head became a high-frequency location, with symbolic significance for local people. Not only were some people actually dying by jumping off it, but also many threatened jump off it not infrequently resulting in police being informed. At times this information would lead to a police callout to Lawyer's Head. **Inclusion criteria** Suicide jumps off the cliff (Lawyer's Head) Exclusion criteria Not reported **Data collection** Between August 1996 and July 2006, and for a 2 year period of closure (1 August 2016-31 July 2008). Information from 3 data sources was checked: Coroner's	**Intervention / Comparison** Intervention: The only vehicular access to the headland was closed by the Dunedin City Council on 1 August 2006 because a new sewage outfall was being built. Comparison: The number of suicides jumping or falling from a height before and after restricted access to Lawyer's Head.	**Primary outcomes** *Number of suicides* Between August 1996 and July 2006, and for a 2 year period of closure (1 August 2016-31 July 2008) Time period / No. episode of jump / No. of death Before restricted access / 16 / 14 (11 suicide based on coroner's verdict) 2 years after restriction of access / 0 / The difference was statistically significant both for the total of 16 jumping episode and 13 deaths with suicide/open verdicts. During the 4 year period prior to restrict access to Lawyer's Head there were 77 police callouts (19.3 per year). In the 2-year period following restricted access, there was 19 callouts (9.5 per year). These figures give an incident rate difference of 9.8 (95%CI 3.7 to 15.8) and an incident rate ratio of 2.0 (95%CI 1.2 to 3.5) indicating a statistically significant reduction in callouts. **Author Conclusions** The study reported in the 2 years following erection of a fate preventing vehicular access to a cliff that had become of high-frequency location, no deaths by jumping occurred either at the cliff or anywhere else in the city of Dunedin.

	pathologist' records, the police records, and the records of Dunedin Marine Search and Rescue.		

Limitations identified by author

The present study was that numbers per year rather than incidence rates were used. There was no evidence of any decline in the local suicide rate that could explain the present results.

The small size of the population at risk. Without including those with open verdicts would have been too few deaths to show a significant difference.

Limitations identified by review team

Data on the number of suicides jumps at the cliffs by each calendar year was not available.

E.1.18 Stack (2015)

Stack S. (2015). Crisis phones-Suicide prevention versus suggestion/contagion effects: Skyway Bridge, 1954-2012. Crisis: The Journal of Crisis Intervention and Suicide Prevention, 36(3), pp.220-224.

Study details	Research Parameters	Population / Intervention	Results
Author/year Stack 2015 **Quality score** - **Study type** Retrospective cohort study Aim of the study To assess the impact of crisis lines on the number of suicides from the Skyway Bridge **Location and setting** Skyway bridge, St Petersburg, Florida, USA – ranked fourth in the USA for the number of bridge suicides	**Number of participants** Not applicable **Participant characteristics** *Number of suicidal persons who used the phones:* 27 people used the phones over the 10 year period after they were installed. However 80 people died by suicide without picking up the phones during this period. **Inclusion criteria** Unknown **Exclusion criteria** Unknown **Data collection**	**Intervention / Comparison** Six crisis phones with signs were installed in 1999 at Skyway Bridge, Florida. The bridge was selected as the site for intervention as it was one of the first sites to install phones (July 1999) with direct links to a crisis counsellor. This allows for assessing the impact of phones over a long follow up period. Bridge suicide phones were publicised with signs on the bridge and coverage in the media. Intervention group: The bridge is 4.1 miles long. Crisis phones were placed on the bridge where the highest area is reached (193 feet). This area of the bridge has an emergency lane where cars can stop – which h is the most common site for suicides. Data on the number of suicides from the bridge were collected at several year points before the installation of crisis phones. (x=2, x=7, x =13)	**Primary outcomes** Regression analysis: Compared with the control for the Florida suicide rate

	1997-1998 vs (2000-2001	1992-1998 vs 2000-2006	1986-1998 vs 2000-2006	1986-1998 vs 2000-2012 *
Phones vs Pre-phones	-5.0 (2.0) t = -2.50	1.71 (1.83) t = 0.935	4.46 (1.26) t = 3.52	2.73 (1.57) t = 1.74
Florida suicide rate	-	-	-	-1.22 (.703) t= 1.75)
Constant	10.0 (1.41) t= 7.07	5.57 (1.296) t = 4.29	3.69 (.89) t = 4.12	22.67 (10.89) t = 2.08
R^2	.758	.068	.341	.418

Length of study Suicide data retrieved from 1954-2012. Crisis phones were installed in 1999. **Source of funding** Not reported	Yearly suicide counts were found for the year the bridge opened in 1954 through to 2012. Crisis phones were installed in 1999 so this year was omitted from the analysis. The analysis compared the number of suicides before the year of intervention (1999) and after for the same duration of years. Suicide data for the complete window of 1954-2012 was also reported. Overall suicide data for Florida was taken from the Suicide Prevention Coalition and the Florida State Department of Health 2012). In contrast to most other locales, the local paper has had a long standing policy that since suicides on the bridge occur in public, that it will publish an article on every suicide on the bridge as well as individual characteristics. This information is provide in detail on a readily accessible website. A search was made through available reports for the numbers of persons used the crisis phones.	Control group: Data on the number of suicides from the bridge were collected at several year points after the installation of crisis phones. (x=2, x=7, x=13) Suicide rates in the state of Florida were also incorporated as a control	Numbers are unstandardized regression co-efficient. Standard errors are in the parentheses. T statistics refer to t ratios. Those highlighted in red were statistically significant ($p<0.05$) The control period was further extended back to the beginning of the series, 1954. Over this long period, the installation of phones was associated with 7.3 additional suicides per year ($p<0.000$) compared with the control period 0r 1954-1998. *2 years pre and post phones (x=2)* – Suicides declined by 5.0 per year, but the decline was not statistically significant. *7 years pre and post phones (x=7)* – The experimental period did not differ from the control period but the direction was positive with 1.71 more suicides per year in the former. *13 years pre and post phones (x=13)* - 4.46 additional suicides per year on average, over the period after installation compared with the control period. *Control for suicide rates in Florida* – The coefficient was negative, the suicide rates in Florida declined over time despite the rates increasing at the Bridge (no evidence that this was related).
Limitations identified by author Generalisability limited due to the Skyway Bridge having no pedestrian walkways – pedestrian bridges are thought to promote additional opportunities for suicides. The impact of crisis phones may be different on pedestrian bridges to the extent that jumpers spend more time on the bridge and are more likely to notice the phones. Any changes in suicide rates from the bridge may be a reflection of larger social forces affecting suicide throughout the state, such as the great recession. Study is based on just one location **Limitations identified by review team** Comparison of the rates of suicide in the overall Florida region - not specific to a particular site or method of suicide			

E.1.19 Ueda (2015)

Ueda M, Sawada Y, Matsubayashi T (2015) The effectiveness of installing physical barriers for preventing railway suicides and accidents: Evidence from Japan Journal of affective disorders 178 1-4

Study details	Research Parameters	Population / Intervention	Results
Author/year Ueda et al 2015 **Quality score** **+** **Study type** Aim of the study To examine whether the installation of half-height PSD's has contributed to the reduction of the incidents of fatal and non-fatal railway suicide. The study also tests whether the installation of PSDs has resulted in the reduction of unintentional falls onto railway tracks (not reported here). **Location and setting** Tokyo metropolitan area **Length of study** Suicide and accident data between 2004 and 2014 provided by one major railway company **Source of funding** Supported by Japan Society of Science	**Number of stations included in analysis** 168 **Participant characteristics and number** Not applicable Characteristics of PSD's at stations At the beginning of the study period in April 2004, 19/168 stations had PSDs installed. 52 stations were subsequently fitted with half height PSDs at different timings. By March 2014, 71 stations (42.76% of 168) had PSD's. Among them, 73.24% had half-height PSDs and the rest had full height PSD's. The height of half height PSDs is 1.3m which is not impossible for an adult to climb over. They are not fitted with alarm systems. **Inclusion criteria** Both fatal and non-fatal incidents of suicide. Incidents of suicide were determined as such only when the motives for entering train tracks became evident based on	**Intervention / Comparison** Intervention: The number of suicides throughout the installation of half and full heights PDS's at stations with them fitted Comparison: The number of suicides throughout the installation of half and full heights PDS's at stations without them fitted	**Primary outcomes** *Number of suicides* The average number of suicides per station-month was 0.007 (SD= 0.084).The minimum number was 0, while the maximum was 1. The station with the largest number of suicides had a total of 7 suicides during the study period. The total number of suicides during the 10 year study period was 144

	Stations without PSDs		Stations with PSDs	
Year	N (station-months)	Suicides	N (station-months)	Suicides
2004	1758	19	258	0
2005	1752	14	264	0
2006	1675	13	341	0
2007	1504	22	512	1
2008	1441	14	575	2
2009	1440	13	576	1
2010	1411	14	605	1
2011	1320	13	696	1
2012	1241	6	775	0
2013	1201	9	815	1
Total	-	137	-	7

Poisson Regression results

	Co ef	95% CI	P-value
Effect of PSD on suicides	-1.427	-2.458,-0.397	0.007
N	20,160		

Grants-in-Aid for Scientific Research, the Ministry of Health, Labour and Welfare of Japan Grant, the Itochube Foundation and the Sumitomo Life Insurance Research Grant for Female Researchers.	the investigation by the police or by victims own account. **Exclusion criteria** All stations of the network from the railway company, except for ones on the newest line which started in 2008 (8.7% of all stations) were included in the analysis. These stations were excluded because their suicide records were available only for a subset of years – only 1 suicide occurred between 2008 and 2013 at these stations. **Data collection** The railway company maintains a database that records all incidents and suicides (both fatal and non-fatal) that occurred on its railway system. Data on suicides covers the period of April 2004-March 2014. Monthly data was used for analysis, and the unit of observation was the station-month. The total number of station-month observations totalled 20,160 (=168 stations x 120 months)		The regression coefficient was estimated to be negative, indicating that the number of suicides became lower after installation of PSD's. To interpret the substantive effect of the PSD's the incidence Rate Ratio (IRR) was computed at 0.240 with a 95% confidence interval 0.086-0.673. This suggested that the introduction of PSD's resulted in a decrease in the number of fatal and non-fatal suicides by 76% (CI 33-93%). **Author Conclusions** Installing PSD's can be an effective method of suicide prevention. The installation of PSD's contributed to a large reduction of suicide attempts at railway stations; however it was also found that half-height doors cannot completely block intentional area and can be climbed over.
Limitations identified by author Data from only one railway company, thus the generalisability of results may be limited. Potential substitution effects are not examined – possible that the locations of suicides were shifted to stations in other networks without PSDs **Limitations identified by review team** Although the majority of stations had half-height PSDs fitted there is no clear indication of whether the suicides after the installations were at stations fitted with half-height or full height PSDs- therefore the effectiveness of each of these barriers cannot be adequately compared. Study reports both fatal and non-fatal suicides together			

No clear and before and after design – at the start of the study (2004) some stations already had PSD's fitted which gradually increased over time.

Appendix F:GRADE tables

F.1 Physical barriers

Quality assessment							Number of suicides		Effect		Committee confidence
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Pre intervention (per year)	Post intervention (per year)	IRR (95% CI)	Difference in number of suicides per year	
All physical barriers											
Suicides at sites where physical barriers installed											
11 studies[b]	Before-after	No serious[1]	No serious[2]	No serious[3]	No serious[4]	none	1001 over 317 study-years (3.16per year)	116 over 161 study-years (0.72 per year)	0.2 (0.15 to 0.38)	2.4 fewer per year	HIGH
Subgroup – Suicides at jump sites with physical barriers (such as bridges, cliffs, viaducts) only											
8studies [c]	Before-after	No serious[1]	No serious[5]	No serious[3]	No serious[4]	none	669 over 238.7 study-years(2.80 per year)	98.0 over 108 study years (0.91 per year)	0.26 (0.14 to 0.48)	1.9 fewer per year	HIGH
Subgroup – Suicides at sites with safety netonly											
2 (Reisch and Michel 2005; Hemmer et al 2017)	Before-after	Serious[6]	No serious	No serious[3]	No serious[4]	none	63 over 58 study-years (1.1 per year)	8 suicide over 33 study-years	0.21 (0.10 to 0.46)	1.0 fewer per year	MODERATE

[b] 12 studies as following: Beautrais 2009; Bennewith 2007/2011; Chung 2016;; Hemmer et al 2017; Law et al 2014; Lockeley et al 2014;;Pelletier 2007; Perron et al 2013; Reisch and Michel 2005;Sinyor and Levitt 2017; Ueda 2015.

[c] 7 studies as following: Beautrais 2009; Bennewith 2007/2011; Hemmer et al 2017; Law et al 2014; Lockeley et al 2014; Pelletier 2007; Perron et al 2013; Sinyor and Levitt 2017.

								(0.23 per year)			
Subgroup – Suicides at sites with platform screen doors (railway or subway stations) only											
2 (Chung et al 2016; Ueda et al 2015)	Before-after	Serious[8]	No serious	No serious[3]	No serious[4]	none	269 over 20 study-years (13.5 per year)	10 over 20 study-years (0.5 per year)	0.19 (0.09 to 0.37)	13.0 fewer per year	MODERATE
Displacement to other sites with no physical barriers in place											
7 studies[d]	Before-after	No serious[1]	No serious[2]	No serious[3]	Serious[7]	none	216.1 over 58.5 study-years (3.69 per year)	284.5 over 45 study-years (6.32 per year)	1.46 (0.84 to 2.54)	1.1 more per year	MODERATE

1. Concerns over pre and post intervention periods varied across studies, missing or in-completing study data but had little effect on pooled estimated effect.
2. Visual interpretation of forest plot indicates some variability but heterogeneity could due to different types of interventions included in the subgroups.
3. Interventions, population and outcomes are in line with review protocol.
4. 95% CI of estimated effect not crossing line of no effect which the committee agreed should be the minimal important difference.
5. Visual interpretation of forest plot indicates some variability but the direction of all estimated effect was the same - favouring post-intervention, only 2 studies had 95%CI of estimated effect crossing 1 accounting for 21.6% of weight.
6. Observation period was sensitive to fluctuations (Reisch and Michel 2005); concerns over the completing data collection (Hemmer et al 2017)
7. 95% CI of estimated effect crossing line of no effect which the committee agreed should be the minimal important difference.
8. Selection bias (data from one subway or train operator and did no include suicide cases at station run by other subway or railway operators)

F.2 Restriction on road access (due to road maintenance or outbreak of foot & mouth disease)

Quality assessment							No of suicides		Effect		Committee confidence
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Pre intervention (per year)**	**Post intervention (per year)**	**IRR (95% CI)**	**Difference in number of suicides per year (range)**	

[d] 7 studies as following: Beautrais 2009; Bennewith 2007/2011; Law et al 2014;; Pelletier 2007; Perron et al 2013; Reisch and Michel 2005; Sinyor and Levitt 2017)

Suicides											
2 (Issa and Bennett 2005; Skegg and Herbison 2009)	Naturalistic studies	Serious[1]	No serious[2]	No serious[3]	No serious[4]	none	234 over 24 study-years (9.75)	0	0.12 (0.02 to 0.87)	9.75 fewer per year (14.5 fewer to 1.1 fewer)	MODERATE

1. Concerns over accuracy of reporting and suicide cases.
2. Visual interpretation of forest plot indicates little variability.
3. Intervention, targeted population and outcomes are in line with review protocol
4. 95% CI of estimated effect not crossing line of no effect which the committee agreed should be the minimal important difference.

F.3 Blue lighting at train stations

Quality assessment							No of suicides		Effect		Committee confidence
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**before blue lighting installed**	**after blue lighting installed**	**IRR (95% CI)**	**Difference in number of suicides per year**	
Suicides											
1 (Matsubayashi et al 2013)	Before-after	Serious[1]	NA	No serious[2]	No serious[3]	none	112 over 11 study-years (10.2 per year)	16 over 11 study-years (1.5 per year)	0.14 (0.08 to 0.24)	8.7 fewer	MODERATE
Number of suicide attempts											
1 (Ichikawa et al 2014)	Before-after	Serious[1]	NA	No serious[2]	No serious[3]	none	79 over 7 study-years (11.3)	53 over 3 study-years (17.7)	1.55	6.4 more	MODERATE

									(1.11 to 2.22)		

1. Selection bias (concerns over study selection (both studies had data from one railway or subway company) and no. of suicides recorded at the ends of platforms.
2. Intervention, targeted population and outcomes are in line with review protocol.
3. 95% CI of estimated effect not crossing line of no effect which the committee agreed should be the minimal important difference.

F.4 Encouraging help-seeking: crisis telephones or signpost at sites

Quality assessment							No of suicides		Effect		Committee confidence
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Pre intervention (per year)	Post intervention (per year)	IRR (95%CI)	Difference in number of suicides per year	
Suicides											
4[e]	Before-after	Serious[1]	Serious[2]	No serious[3]	Serious[4]	none	199 over 36.6 study-years (5.44 per year)	146 over 21.4 study-years (6.82 per year)	0.91 (0.43 to 1.93)	1.39[5] more per year	VERY LOW

1. Concerns over accuracy of data collection in three studies (King and Frost 2005; Stack 2015) which together account for more than 50% of weighted in the meta-analysis)
2. Visual interpretation of forest plot indicates high variability (the direction of the estimated effect of Stack 2015 was opposite to the rest of studies; 95%CIs of estimated effected in Lester 2005 and Lockley 2014 were cross 1)
3. Interventions, targeted population and outcomes are in line with review protocol.
4. 95% CI of estimated effect crossing line of no effect which the committee agreed should be the minimal important difference.
5. Absolute difference between before and after the intervention, and heterogeneity is not taken into account.

[e] 4 studies as following: King and Frost 2005;Lester 2005; Lockley 2014;Stack 2015;

F.5 Surveillance

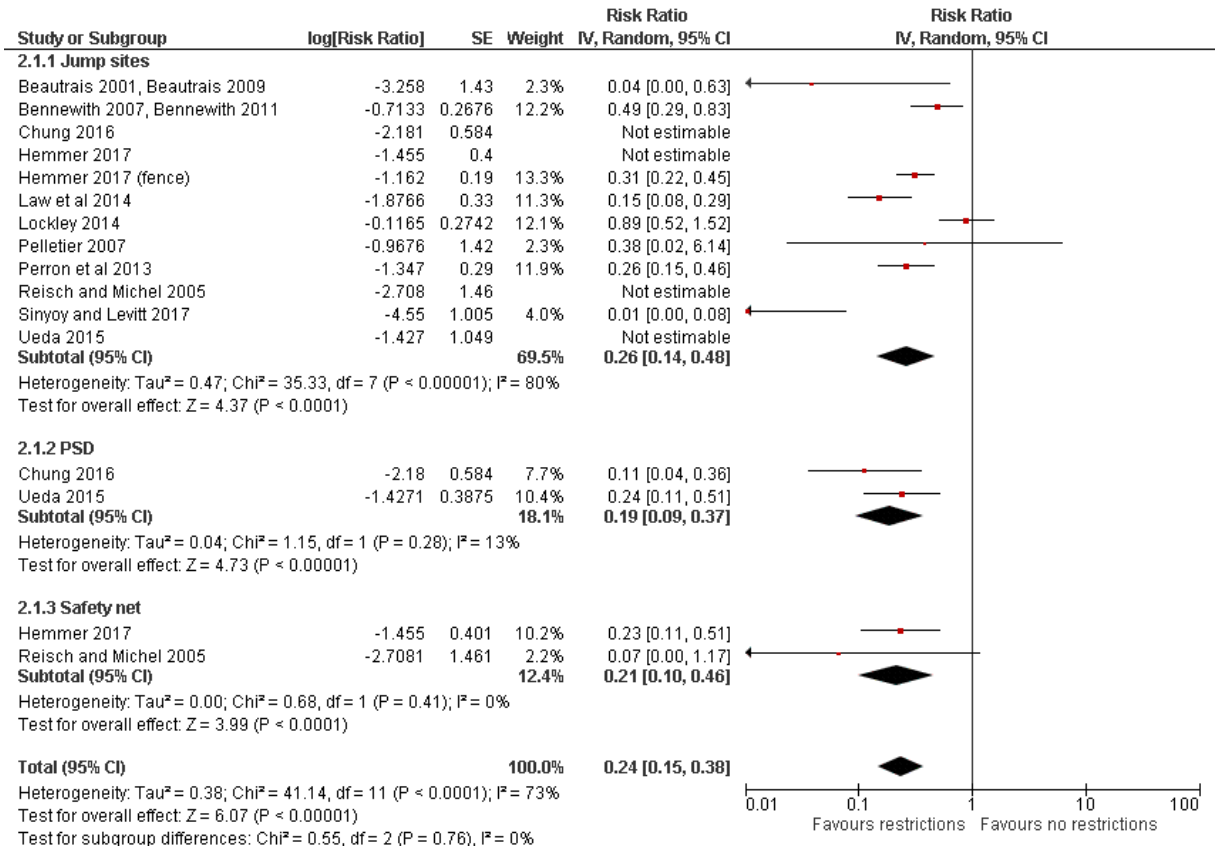
Quality assessment							No of suicides		Effect		Committee confidence
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Pre intervention (per year)	Post intervention (per year)	IRR (95%CI)	Difference in number of suicides per year	
Suicides at sites											
3[f]	Before-after	Serious[1]	Serious[2]	Serious[3]	No serious[4]	none	145 over 18.6 study-years (7.79 per year)	55 over 10.4 study-years (5.29 per year)	0.68 (0.50 to 0.94)	2.50 fewer per year	LOW
Suicides at nearby sites											
1 (Bennewith 2007/2011;)	Before-after	Serious[1]	NA	No serious[3]	Serious[6]	none	31 over 5.0 study-years (6.2 per year)	42 over 5.0 study-years (8.4 per year)	136 (0.85 to 2.16)	2.2 more per year	LOW

1. Missing or incompletion of data (Bennewith et al 2007/2011) study intervention took varying time to complete and took effect at different time (Lockley et al 2014)
2. Visual interpretation of forest plot indicates some variability (95%CIs of estimated effected in Lester 2005 and Lockeley 2014 were cross 1)
3. Interventions, targeted population and outcomes are in line with review protocol.
4. 95% CI of estimated effect not crossing line of no effect which the committee agreed should be the minimal important difference.
5. Visual interpretation of forest plot indicates little variability.
6. 95% CI of estimated effect crossing line of no effect which the committee agreed should be the minimal important difference.

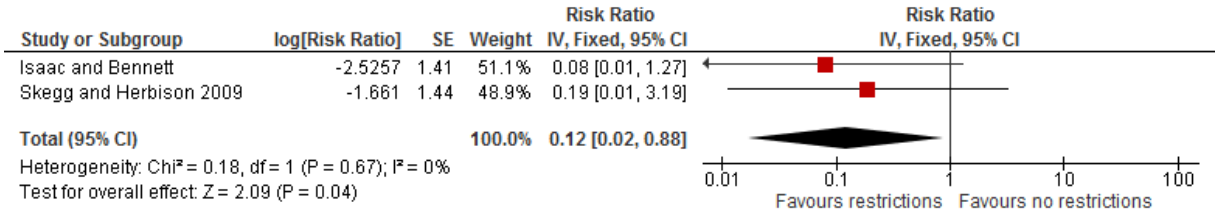
[f] 4 studies as following: Lester 2005; Bennewith, Lester 2007/2001; Lockley et al 2014

Appendix G: Forest plot

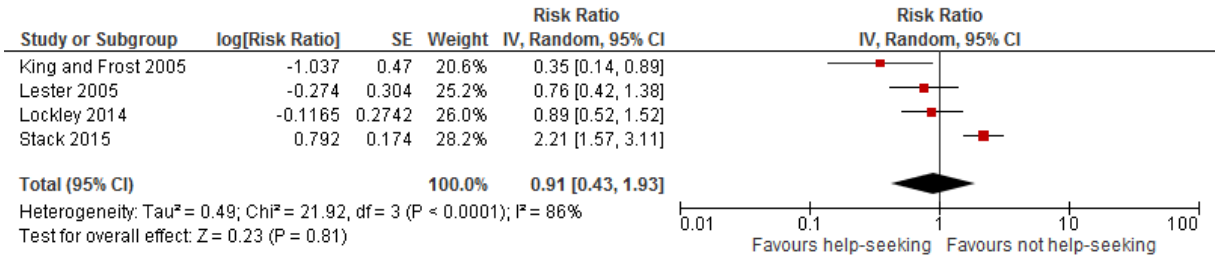
G.1 Physical barrier



G.2 Restriction on road access



G.3 Encouraging help-seeking



G.4 Surveillance