A rapid review of interventions to reduce suicide ideation, attempts, and deaths at public locations

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Abstract: Suicide deaths are tragic events and those that occur in public places have an impact not only on the deceased person and their family and friends, but also on members of the public. Having up-to-date information about the effectiveness of interventions allows policymakers and organisations managing locations of concern to choose the most appropriate evidence-based suicide prevention strategies for specific locations. This rapid review was conducted to help inform the development of Welsh national guidance.

The review included literature published since 2014. 24 studies were identified, and these were conducted in the UK, Australia, South Korea, Canada, USA, Denmark and Japan. The studies covered railway or underground stations, bridges, cliffs or other natural heights, tall buildings, and other types of locations.

Surveillance technologies as a means of increasing opportunity for third-party intervention showed the most promise, although the evidence of their effectiveness was limited. In one study, having more closed-circuit television (CCTV) units was associated with fewer suicides at railway stations. Another study that tested a set of interventions including CCTV, infrared security fences, and a suicidal behaviour recognition and alert system, provided some promising initial descriptive data that showed an increase in the number of prevented suicides. Three other studies showed that there was no change in outcomes following the installation of interventions including surveillance technologies. Based on the assessment of the overall body of the evidence, there is a low level of confidence in the findings related to surveillance technologies because of the quality and designs of the studies.

Promotion of suicide helplines as an intervention aimed at increasing opportunities for help seeking was examined in seven studies. Two studies reported that the number of suicides increased after the introduction of the intervention. Three studies, of which two examined a set of interventions including helplines, observed no change. In two studies the effect could not be determined. There is a low level of confidence in the evidence for this outcome.

Other interventions evaluated included staff training; deployment of specialist staff; campaigns encouraging bystanders to intervene; a crisis café; blue lights at railway stations; suicide prevention messages, memorials, or notes other than official crisis line signage; spinning rollers at the top of fences that prevent gripping; and others. The effect of these interventions could not be determined with certainty but some of them appeared promising and warrant further research.

More robust evaluations are needed before any of the interventions reviewed here can be recommended for implementation. To create a better evidence base, high-quality evaluations should be supported and encouraged. Future research should examine which interventions work for who and in what circumstances.

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EXECUTIVE SUMMARY

Report number - RR0044 (April 2025)

What is a Rapid Review?

Our rapid reviews (RR) use a variation of the systematic review approach, abbreviating or omitting some components to generate the evidence to inform stakeholders promptly whilst maintaining attention to bias.

Who is this Rapid Review for?

This rapid review is intended for policymakers responsible for suicide prevention and organisations and individuals that manage public locations of concern for suicide.

Background / Aim of Rapid Review

Suicide deaths are tragic events and those that occur in public places have an impact not only on the deceased person and their family and friends, but also on members of the public. Having up-to-date information about the effectiveness of interventions not limited to physical means restriction allows policymakers and organisations managing locations of concern to choose the most appropriate evidence-based suicide prevention strategies for specific locations.

Results of the Rapid Review

Recency of the evidence base

Bibliographic database searches were conducted at the end of October 2024 and supplementary searches between November 2024 and January 2025 for literature published since 2014.

Extent of the evidence base

- 24 studies reported in 29 documents were identified, conducted in the UK (n=8), Australia (n=7), South Korea (n=3), Canada (n=2), USA (n=2), Denmark (n=1), and Japan (n=1).
- The studies covered railway or underground stations (n=10), bridges (n=8), cliffs or other natural heights (n=3), tall buildings (n=1), and multiple types of locations with no breakdown of data by type of location (n=2).
- The same study could include multiple types of locations and interventions.

Key findings and certainty of the evidence

- Surveillance technologies as a means of increasing opportunity for third-party intervention showed the most promise, although the evidence of their effectiveness was scarce and limited. Nine studies examined such technologies, including three of the same location and set of interventions, which we only count below once. In one study, having more closed-circuit television (CCTV) units was associated with fewer suicides at railway stations. Another study that tested a set of interventions including CCTV, infrared security fences, and a suicidal behaviour recognition and alert system, provided some promising initial descriptive data that showed an increase in the number of prevented suicides. Three other studies showed that there was no change in outcomes following the installation of interventions including surveillance technologies. In the remaining two studies the effect could not be determined. Based on the assessment of the overall body of the evidence, there is a low level of confidence

in the findings related to surveillance technologies because of the quality and designs of the studies.

- Promotion of suicide helplines as an intervention aimed at increasing opportunities for help seeking was examined in nine studies, including three of the same location and set of interventions (only counted once below). Two studies reported that the number of suicides increased after the introduction of the intervention. Three studies, of which two examined a set of interventions including helplines, observed no change. In two studies the effect could not be determined. The assessment of the overall body of evidence indicates that there is a low level of confidence in the evidence for this outcome.
- Other interventions evaluated included staff training; deployment of specialist staff; campaigns encouraging bystanders to intervene; a crisis café; blue lights at railway stations; suicide prevention messages, memorials, or notes other than official crisis line signage; spinning rollers at the top of fences that prevent gripping; and others. The effect of these interventions could not be determined with certainty but some of them appeared promising and warrant further research.
- There was not enough evidence to either support or refute that implementing interventions at locations causes displacement to other locations or suicide method substitution.

Research Implications and Evidence Gaps

- There is an urgent need for more high-quality research evaluating interventions aimed at reducing suicides at locations of concern other than physical means restriction. This is especially true if there is a risk that interventions can have unintended negative effects.
- Future research should examine which interventions work for who and in what circumstances.

Policy and Practice Implications

- More robust evaluations are needed before any of the interventions reviewed here can be recommended for implementation. To create a better evidence base, high-quality evaluations should be supported and encouraged.

Economic Considerations

- Future research evaluating interventions aimed at reducing suicides at public locations should consider the economic impacts of suicides in such locations from a wider societal perspective.
- As well as being a tragic event for families and communities, suicides can cost the economy at least £1.6 million per every life lost. These costs include emergency service, healthcare, and potential productivity losses.
- The loss of life due to suicide in Wales could cost the Welsh economy at least £537 million each year.

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ABBREVIATIONS

Abbreviation	Full description
AI	Artificial intelligence
APC	Annual percentage change
CCTV	Closed-circuit television
EAPC	Estimated annual percentage change
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
IMV	Integrated motivational volitional
Med	Median
N/A	Not applicable
RR	Rapid review
VIDS	Video Incident Detection System

GLOSSARY

Academic literature is literature published in peer-reviewed academic journals.

Grey literature is literature published outside of academic journals, for example, reports by government organisations, charities, research institutes etc.

Pre-print is a version of an academic article that has been published online that has not yet been published in a journal. Pre-prints are usually not peer-reviewed.

Publication bias is the trend for studies that report positive/statistically significant findings or findings that are perceived to be important to be more likely to be published or published quickly. It can be minimised by searching grey literature.

Qualitative research is research that uses non-numeric data such as people's views, for example, findings from interviews or focus groups.

Quantitative research is research that uses numbers or statistical data.

Confounding factor is a factor that interferes in the relationship between the intervention and the outcome.

1. BACKGROUND

1.1 Who is this review for?

This rapid review was conducted as part of the Health and Care Research Wales Evidence Centre Work Programme. The question was suggested by the Welsh National Programme Lead in suicide and self-harm prevention to help inform the development of the Welsh national guidance on how to respond to and manage public locations of concern for suicide. The findings of this review may be of interest to policymakers responsible for suicide prevention and organisations and individuals that manage public locations at risk for suicide.

1.2 Background and purpose of this review

It is suggested that in some places in England around a third of suicides happen in a public location (Public Health England 2015). The exact data for Wales is not available, but it is known that between April 2022 and March 2023, there were 356 deaths by suspected suicide of Welsh residents which could occur in or outside of Wales, equal to a rate of 12.6 per 100,000 people, and of these 8.1% happened in woods or forests, 2.2% at railway, underground, or tram stations, 2.2% at rivers, 2.0% at cliffs, 2.0% at sea, and 1.7% at bridges (Public Health Wales 2024). Suicide deaths are tragic events and those that occur in public places have an impact not only on the deceased person and their family and friends, but also on members of the public. They can be traumatic for bystanders who witness the death or discover the body, and especially so for people who inadvertently become directly involved, such as train drivers (Public Health England 2015).

Public locations in which many suicides happen are sometimes referred to as “locations of concern” or “frequently-used locations”. Public Health Scotland (2022a) defines a location of concern as a “specific, usually public, site that is used as a location for suicide and that provides either means or opportunity for suicide”. This can include bridges, tall buildings, car parks, roads, railway tracks, cliffs, woodland, rural, or secluded areas, or locations that provide access to water (Pirkis et al. 2015, Public Health Scotland 2022a). Locations of concern for suicide are sometimes referred to as “suicide hotspots”, but use of this term is discouraged due to it being regarded as sensational and trivialising the issue (Public Health England 2015, Samaritans 2024b).

Public Health England (2015) recommends four areas of action to prevent suicides at locations of concern: restricting access to the site and means of suicide (commonly referred to as physical means restriction), increasing opportunity and capacity for human intervention, increasing opportunities for help seeking by individuals at risk for suicide, and changing the public image of the site to dispel its reputation as a “suicide site”. It suggests a pre-emptive approach to potential locations of concern rather than a reactive one. In Scotland, the national guidance on action to address suicides at locations of concern was published in 2022. It identifies restricting physical means, enabling another party to intervene, signposting to sources of support, and managing the public image of locations as important actions to reduce suicides (Public Health Scotland 2022a).

Physical means restriction interventions have received the most attention in the literature, and they are considered the most effective. A number of systematic reviews of interventions aimed at preventing suicides in public locations published in recent years reported their effectiveness (Barker et al. 2017, Chamberlain & Woodnutt 2024, Havârneanu et al. 2015, Okolie et al. 2020b, Pirkis et al. 2015, Zalsman et al. 2016). There is much less certainty in the literature about the effectiveness of other types of interventions.

Installing physical barriers can be expensive and is not always possible, or practical, and there may be objections to how they change aesthetic characteristics of the location (Shin et al. 2024b). Having up-to-date information about the effectiveness of other intervention measures allows policymakers and organisations managing locations of concern to choose the most appropriate evidence-based suicide prevention strategies for specific locations. This is what the present rapid review sets out to provide. It aims to answer the following question:

What is the effectiveness of interventions other than physical means restriction to reduce suicide ideation, attempts, and deaths at public locations?

2. RESULTS

We searched for international academic literature and supplemented it with grey literature from the UK. The methods used to conduct the review and eligibility criteria for selecting studies for inclusion are detailed in Section 5 of this report. A total of 24 studies reported in 29 documents were identified. The documents included both academic journal articles (n=19) and grey literature/pre-prints (n=10). The studies were conducted in the UK (n=8), Australia (n=7), South Korea (n=3), Canada (n=2), USA (n=2), Denmark (n=1), and Japan (n=1). Twenty studies used quantitative methods, two qualitative methods, and two mixed methods which included both a quantitative and qualitative element. Three of the included studies (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023) evaluated the same combination of interventions at the same location. Although these three studies were independent of each other, unless stated otherwise, we refer to them together and only count them once because they provide evidence on the same set of interventions, and may also be reporting on the same data or events. Reporting them together means that we avoid double-counting the evidence for this set of interventions.

The included studies covered multiple types of locations, including railway or underground stations (n=10), bridges (n=8), cliffs or other natural heights (n=3, covering the same location and set of interventions), tall buildings (n=1), and multiple types of locations with no breakdown of data by type of location (n=2). The interventions described in the studies were categorised as: interventions aimed at increasing opportunity for third-party intervention (n=12); interventions aimed at increasing opportunity for help seeking (n=8); physical means restriction interventions with an additional or innovative element (n=4); interventions aimed at creating a calming atmosphere (n=1); and suicide prevention messages and memorials excluding official crisis line signage (n=1). We also included studies that reported on interventions initiated by a bystander (n=3) to gather insight about what may happen if formal interventions aimed at encouraging bystanders to step in are successful. The same study could include multiple types of locations and interventions.

More information about the studies is available in Table 1 below. A detailed summary of each included study and the assessment of its methodological quality is provided in Section 6 of this report.

The results regarding the effectiveness of different interventions grouped by each category are presented separately for each type of location. An overall summary of the effectiveness of included interventions follows in a later section.

In Appendix 3, we also report a list of relevant systematic reviews identified during the literature searches which may be of interest to readers who want to further explore this area of research.

Table 1. Characteristics of the included studies, sorted by type of location

First author, year Country, literature type	Type of location	Study design	Intervention characteristics					
			Increasing opportunity for third-party intervention	Increasing opportunity for help seeking	Creating a calming atmosphere	Memorials, suicide prevention messages^	Interventions initiated by bystanders	Means^^ restriction with extra element
Giraud 2021 UK (England), Grey	Bridge	Quantitative (routine data collection)	✓	✓				
Kolves 2023 Australia, Academic	Bridge	Quantitative (pre-post)	✓	✓				
Lee 2016 South Korea, Academic	Bridge	Quantitative (pre-post)	✓					
O'Neill 2021 UK (England), Academic	Bridge	Quantitative (pre-post)				✓		
Shin 2024a South Korea, Academic	Bridge	Quantitative (pre-post)	✓					✓
Shin 2024b South Korea, Academic	Bridge	Quantitative (pre-post)	✓					✓
Sinyor 2024 Canada, Academic	Bridge	Quantitative (pre-post)						✓
Stack 2015 USA, Academic	Bridge	Quantitative (pre-post)		✓				
Lockley 2014 Australia, Academic	Cliff or other natural height	Quantitative (pre-post)	✓	✓				✓
Ross 2020 Australia, Academic		Mixed methods: quantitative (pre-post), qualitative						
Torok 2023* ** Australia, Academic		Quantitative (pre-post)						
Chow 2024 Canada, Academic	Railway or underground station	Quantitative (pre-post)		✓				
Erlangsen 2023 Denmark, Academic	Railway or underground station	Quantitative (pre-post)	✓	✓				
Katsampa 2022 UK, Academic	Railway or underground station	Qualitative					✓	

First author, year Country, literature type	Type of location	Study design	Intervention characteristics					
			Increasing opportunity for third-party intervention	Increasing opportunity for help seeking	Creating a calming atmosphere	Memorials, suicide prevention messages^	Interventions initiated by bystanders	Means^^ restriction with extra element
Local Government Association 2022 UK (England), Grey	Railway or underground station	Quantitative (routine data collection)	✓					
Matsubayashi 2014 Japan, Academic	Railway or underground station	Quantitative (quasi-experimental)			✓			
Network Rail 2018, 2019, 2020, 2024a, 2024b** UK, Grey	Railway or underground station	Quantitative (routine data collection)	✓					
Rail Safety and Standard Board 2020 UK, Grey	Railway or underground station	Quantitative (routine data collection)	✓					
Too 2020 Australia, Academic	Railway or underground station	Quantitative (pre-post)		✓				
Ngo 2022 Australia, Academic	Railway or underground station; railway tracks	Quantitative (cross-sectional)					✓	
Too 2015 Australia, Academic	Railway or underground station; railway tracks	Quantitative (cross-sectional)	✓					
Waalen 2020 USA, Academic	Tall building	Quantitative (pre-post)		✓				
Joyner 2024a*, 2024b UK, Grey/pre-print	Various: bridge; railway or underground station; railway tracks; road; tall building; cliff/other natural height; park/woodland/other green space	Mixed methods: quantitative (cross-sectional); qualitative	✓					
Owens 2019 UK, Academic	Various: bridge; railway or underground station; tall building; cliff or other natural height	Qualitative					✓	

^Excluding crisis line signage; ^^ refers to physical means.

*Referred to in this report as Joyner et al. (2024a); **as Network Rail (2018). ***Lockley et al (2014), Ross et al (2020) and Torok et al (2023) are separate studies that evaluated the same set of interventions at the same location. In this report, we refer to Torok et al (2023) when summarising the outcomes of this set of interventions.

2.1 Interventions at railway stations and tracks

2.1.1 Overview

Ten of the included studies described interventions implemented at railway stations, of which two (Ngo et al. 2022, Too et al. 2015) also covered those at railway tracks away from stations.

2.1.2 Increasing opportunity for third-party intervention

This category includes a broad range of interventions, such as closed-circuit television (CCTV) or alert systems that signal to staff members the need to take action, or campaigns aimed at encouraging bystanders to step in. Five studies (Erlangsen et al. 2023, Local Government Association 2022, Network Rail 2018, Rail Safety and Standard Board 2020, Too et al. 2015) covered such interventions at railway stations, of which one (Too et al. 2015) also included railway tracks away from stations. Two of these five studies were published as peer-reviewed academic articles (Erlangsen et al. 2023, Too et al. 2015) and three as grey literature documents. Three studies (Local Government Association 2022, Network Rail 2018, Rail Safety and Standard Board 2020) concern the UK.

Too et al. (2015) analysed the relationship between the number of CCTV units at railway stations and car parks and the number of suicides on the railways within a broader study examining the links between railway suicides and neighbourhood-level social, economic, and physical factors. As part of this cross-sectional study, univariate analysis (which focuses on examining one factor without considering or adjusting for possible relationships with other factors) showed a slight positive association between the number of CCTV units (per 10 units) and risk of railway suicide (IRR=1.04, 95% CI 1.01–1.07, p=.009), i.e., it showed that having more CCTV units was associated with more suicides. However, in multivariate analysis (adjusting for other factors), this association was negative (IRR=0.93, 95% CI 0.88–0.98, p=.004). This difference in the direction of effect, after controlling for other factors, may be explained by the high correlation between the number of CCTV units and the number of people using the station. The initial positive association suggests that stations with more CCTV units tended to have higher numbers of suicides, but after adjusting for other factors, the relationship became negative, likely because larger stations experienced more suicides due to their higher patronage. When this was accounted for, the data suggested that having more CCTV units was associated with fewer suicides. However, this was a correlational study and this design does not provide evidence of a causal relationship between the installation of CCTV units and reduced suicide rates.

Some descriptive data on interventions on UK railways was provided in grey literature documents. The UK's Network Rail published data on suicides on the rail network and interventions to prevent suicide attempts. Data between 2016 and 2020 came from annual reports (Network Rail 2018, Network Rail 2019, Network Rail 2020) and data for 2023/24 was identified from statistics published on the Network Rail website (Network Rail 2024a, Network Rail 2024b). Interventions happening in this time period included training staff in suicide prevention techniques; the "Small Talk Saves Lives" campaign launched in November 2017, which was aimed at encouraging bystanders to support people who appear to be in emotional distress; and multiple other interventions such as the "Make a Connection" campaign starting in October 2023 that encourages people to access free mental health support and various awareness campaigns in partnership with Samaritans since 2010. There may also have been new physical means restriction interventions introduced in this time period. In 2016/17, there were 1,592 interventions by police, rail staff, and the public to prevent suicide attempts. This number rose to 1,711 in 2017/18, 2,270 in 2018/19 (22% of these were by rail staff and 9% by the public) and to over 2,000 in 2019/20, and was 1,937 in 2023/24. By 2020, more than 20,000 staff had been trained in making interventions to support those in emotional crisis. In 2016/17, there were 237 suicides on the rail network,

and this rose to 246 in 2017/18, 271 in 2018/19, 283 in 2019/20, 276 in 2023/24. These data do not account for changes in population size and trends in the number of suicides more broadly, so it is not possible to infer from them whether there has been a change in suicide rates on the railways. The data on interventions to prevent suicide attempts published in the Network Rail reports suggest that a substantial number of suicides might have been averted by third parties, including bystanders, and that without such interventions the number of suicides on the rail network might have been higher.

The UK's Rail Safety and Standard Board (2020) reported on an intervention that involved introducing Trespass & Welfare Officers deployed at 49 static high-risk locations and an additional 48 high-risk locations attended by five mobile teams. These officers, who had attended the Samaritans' Managing Suicidal Contacts training course, provide support to individuals in distress and, when safe, make a physical intervention to avoid incidents. Between July 2019 and approximately one year later, Trespass & Welfare Officers carried out 130 crisis interventions, defined as "an immediate and short-term emergency responses to mental, emotional, physical, and behavioural distress". Additionally, they conducted 20 physical interventions preventing individuals from trespassing on the railway and providing assistance, though it is unclear whether these involved people at risk of suicide. However, the report states that since the Trespass & Welfare Officers were introduced, there was a displacement of suicide-related incidents from station platforms to adjacent bridges.

The Local Government Association (2022) published data on the effectiveness of a crisis café in reducing suicidal ideation. In this intervention, station staff guided people in distress to a nearby crisis café where they could receive practical and emotional support from staff and peers, for example, with crisis resolution or building coping strategies, as well as information and advice, signposting, and referrals to health and social care providers, housing and community resources, and specialised mental health services. The railway station where the intervention was implemented also had British Transport Police representatives, Samaritans signage, and Samaritans awareness events, and 58% of its staff had attended the Samaritans Managing Suicidal Contacts training course. The document reported 264 visits to the café in two months. Recorded outcomes included 29 visits resulting in reduced suicidal ideation. Other outcomes included improved coping strategies (n=121), reduced social isolation (n=73), reduced self-harm (n=13), improved daily living skills (n=13), increased crisis management strategies (n=12), and averted statutory police interventions (n=2). It is difficult to make conclusions from these data because it is unknown how many of the visitors to the café needed support for each of these outcomes.

Additionally, the study by Erlangsen et al. (2023) included motion-sensitive lights at some parts of a railway station that could attract attention of staff or bystanders (although the authors explained their potential effect through limiting the appeal of dark spots), but the main focus of the study is on signposting to a suicide prevention helpline which was implemented at the same time, so it will be described in more detail in the next section.

2.1.3 Increasing opportunity for help seeking

Three academic studies (Chow et al. 2024, Erlangsen et al. 2023, Too et al. 2020) reported on interventions at railway or underground stations aimed at increasing opportunity for help seeking. In all three studies, the intervention involved encouraging people to call helplines. In a Canadian study, subway platforms were equipped with posters and phones encouraging people to call a free suicide helpline, which connected callers with a trained counsellor (Chow et al. 2024). The counsellors assessed callers' suicide risk and if it was deemed to be low, helped them with safety planning, and if it was considered high, liaised with transit control to slow or stop trains. In the 10-year period between 2011 and 2021, 243 calls to the crisis line were made, of which 72% were classified as low-risk, 16% as medium-risk, and 12% as high-risk. There was no significant decrease in suicides in the quarter following the

implementation of the intervention (IRR=0.64, 95% CI 0.36–1.12, *p*=0.11), but after that, in each quarter an increase in suicides by around 2% was observed (IRR=1.02, 95% CI 1.00–1.04, *p*=0.02). This study controlled for such factors as population size, the number of suicides by other methods in the same city, the unemployment rate, consumer price index, and others.

Posters and digital billboards with a crisis helpline number and a message encouraging help seeking, as well as digital billboards with a guided breathing exercise, were installed at Australian railway stations (Too et al. 2020). There was no significant difference in the rate of suicidal incidents pre- and post-intervention (IRR=0.88, 95% CI 0.59–1.30, *p*=.246). The only potential confounding factor that was accounted for was the number of station users, but there might have been other important confounders that were not controlled for. The number of crisis line calls during which suicide was identified as a safety issue did not change significantly (*p*=.169). However, the total number of crisis calls increased significantly from 154,521 before the intervention to 163,916 after (*p*<.001). The authors also surveyed station users and only 26% of the 1,844 respondents said they had noticed the campaign materials. This number ranged from 13% to 48% across stations.

In a study from Denmark (Erlangsen et al. 2023), signs encouraging help seeking with phone numbers for the national suicide prevention and emergency service as well as motion-sensitive lights were installed at a railway station. However, it was impossible to determine their effect because physical barriers were also installed at the end of some platforms during the same time period. In around 16 months since the interventions were implemented in December 2019, no new suicide deaths and one suicide attempt were recorded, compared to 11 deaths in the period between 2012 and 2018.

2.1.4 Creating a calming atmosphere

A study from Japan examined the effect of installing blue lights at station platforms and tested whether it resulted in displacement of suicides to other stations (Matsubayashi et al. 2014). They compared suicides at stations with blue lights to neighbouring stations without blue lights. At the stations where the intervention was implemented, blue lights were installed at the edges of the platforms and sometimes also in the middle of the platforms, and were on from sunset to sunrise. At stations with blue lights, there was an average of 0.435 suicides per year before the intervention and 0.189 after. After accounting for station- and year-specific variables, such as the number of passengers, population size, types of platforms, and macroeconomic conditions, blue lights were associated with a reduction in suicides (IRR=0.258, 95% CI 0.127–0.523). No systematic evidence of displacement to nearby stations was found. However, when only the data from stations one stop away was considered, without adding stations further away to the model, there was evidence of a statistically significant increase in suicides at stations one stop away (*B*=0.718, *p*=0.01). Only data from one railway company was used and the possibility that people might go to a station managed by a different company was not considered, so it was impossible to establish whether installation of blue lights resulted in a reduction of suicides in the area, which was also served by other companies, or displacement to stations managed by other companies (Matsubayashi et al. 2014). This study followed preliminary communication by the authors published a year earlier (Matsubayashi et al. 2013), which attracted criticism from Ichikawa et al. (2014), who questioned the study's methodology. Ichikawa et al. (2014) argued that it was necessary to control for the time of day at which suicides occurred, since the blue lights were only on at night, and the specific location at the station at which they occurred because the lights would only be visible in their immediate vicinity.

2.1.5 Interventions initiated by bystanders

Two academic studies (Katsampa et al. 2022, Ngo et al. 2022) reported on interventions initiated by bystanders at railway stations or tracks. These are not formal interventions that policymakers or managers of locations of concern can implement, however, we have found

that some formal interventions, such as “Small Talk Saves Lives” discussed in Section 2.1.2, aim at encouraging such behaviour. Therefore, we have included studies that addressed interventions initiated by bystanders to gather insight about what may happen if initiatives such as “Small Talk Saves Lives” are successful in encouraging bystanders to step in. In this section, “intervention” refers to an instance of a bystander taking action to prevent another person from suicide.

The UK study by Katsampa et al. (2022) examined the experiences of people intervening to prevent a suicide on the railways. The authors interviewed 21 people, of whom 11 were members of the public, including four with lived experience of suicidality and three mental health professionals, six train drivers, three railway employees, and one police negotiator. Most of the interviewees reflected positively on their experience and considered it the right thing to do, but some questioned if they should have behaved differently. A few interviewees struggled with not knowing what happened to the person they had helped afterwards and considered it an “unfinished story”. The experience of intervening in a suicide attempt was described as having made a lasting impact on some interviewees. Some of those who had previously witnessed a railway suicide described avoiding repeating such trauma as their main motivation for intervening.

Ngo et al. (2022) investigated the prevalence of preventative measures taken by bystanders in Australia at various railway locations, such as platforms, tracks, and level crossings. They also included interventions undertaken by railway staff and emergency services. During the time period between 2011 and 2019, at two heavy rail networks, there were a total of 635 interventions in suicide attempts, and of these, 139 were by bystanders. In 70 cases, bystanders acted as reporters, i.e. they alerted somebody else to the attempt, and in 69 they intervened as first responders. Of the 69 interventions, 77% involved physical interaction and 49% involved more than one bystander.

2.1.6 Bottom line results for interventions at railway stations and tracks

Ten studies evaluating or describing different types of interventions at railway stations and tracks have been identified. Only installing CCTV cameras showed some evidence of effectiveness. In one study (Too et al. 2015), a larger number of CCTV units at railway stations and car parks was associated with fewer suicides. It was a cross-sectional study that was generally well conducted.

Network Rail (2018) reported that a large number of suicide attempts were prevented by railway staff, emergency services, and members of the public during the period when staff were being trained in helping people in emotional distress and a public campaign encouraging bystanders to step in if they saw a person who appeared to be in crisis. However, there was no evidence of direct links between these interventions and prevented suicides, and no data on changes in suicide rates was available. Some suicides were prevented following the introduction of specialist Trespass & Welfare Officers, but there was some evidence that suicides might have been displaced from platforms to nearby bridges (Rail Safety and Standard Board 2020). Some data suggests that a crisis café adjacent to a railway station helped some people deal with suicidal ideation, but it is unclear if the café had any effect on suicide attempts and deaths at the station (Local Government Association 2022). These three studies only provided descriptive statistics, and no formal evaluation of any of the interventions described in them was available.

Three studies evaluating interventions aimed at increasing opportunity for help seeking were identified. All of them involved encouraging people in crisis to call helplines, either by installing phones with a link to a crisis line or signage with a phone number at stations. There was no evidence that this type of intervention was effective in reducing suicides. In the study by Chow et al. (2024), the number of suicides increased after the start of the intervention and in the study by Too et al. (2020) there was no difference in before and after the

intervention. No relationship between the intervention and suicide rates could be established in the remaining study (Erlangsen et al. 2023) because physical barriers were installed at the station at the same time as the signage. These studies varied considerably in their quality. The Chow et al. (2024) study was considered to be well-conducted, but the remaining two (Erlangsen et al. 2023, Too et al. 2020) had many limitations, such as the interventions not being described in sufficient detail and having insufficient data to provide confidence in the findings. In the study by Erlangsen et al. (2023), no statistical analysis was conducted. In Too et al. (2020), it was unclear how the outcomes were determined and whether they were determined consistently.

The study that evaluated installation of blue lights at platforms showed that they were effective in preventing suicides but a number of methodological issues, discussed in detail in Section 2.1.4, limit its validity (Matsubayashi et al. 2014).

Finally, two studies described interventions initiated by bystanders. The data presented in the study by Ngo et al. (2022) suggested that bystander interventions might have prevented a considerable number of suicides at railway stations. This study was generally performed well in terms of the outcomes of interest to this review. The other study (Katsampa et al. 2022) examined bystanders' experience of intervening. Some of the participants described the situation having had a lasting impact on them. This qualitative study did not reflect on the potential influence of the researchers on the research, and it was unclear how the researchers were situated culturally or theoretically, but otherwise it was conducted well.

2.2 Interventions at bridges

2.2.1 Overview

Eight studies described interventions conducted at bridges. The bridges could be over water, roads, or railway tracks.

2.2.2 Increasing opportunity for third-party intervention

Increasing opportunity for third-party intervention to prevent suicides at bridges was examined in five studies (Giraud 2021, Kolves et al. 2023, Lee et al. 2016, Shin et al. 2024a, Shin et al. 2024b), of which four were published as academic articles and one as a grey literature document (Giraud 2021). Three studies were about locations in South Korea, one in the UK, and one in Australia.

All three of the South Korean studies examined detection and alert systems. The study by Lee et al. (2016) described an intervention whereby security fences with infrared sensors and pole camera surveillance systems were placed on a bridge, and an intelligent safety control system that monitored people's moving trajectory, time spent in different sections of the bridge, and their behavioural patterns by using digital CCTV with an automatic suicidal behaviour recognition and alert system. This intervention was implemented on two bridges with the highest number of drowning incidents. During the 12-month trial period, a total of 101 people were stopped from suicide attempts on the two bridges, of whom 92.1% were rescued on the bridge and 7.9% in the water. Pre-post data was only available for one of the bridges. In the year before the intervention, 15 suicide attempts were prevented, compared with 93 in the year during which the intervention was trialled.

The study by Shin et al. (2024a) described the effectiveness of installing a one-metre fence over an existing 1.5-metre railing with five tension wire sensors that alerted a rescue team if a wire is cut or pulled by more than 10 centimetres. The fence also had abacus-bead-shaped spinning rails on the top that prevented people from gripping it and climbing over. We also classified this set of interventions as physical means restriction with an additional or innovative element. The bridge where it was implemented already had fixed phone boxes with direct access to a crisis line, CCTV, and signage with supportive messages. After the

intervention, there was a statistically significant reduction in the number of suicides on the bridge (IRR=0.37, 95% CI 0.26–0.54), with an average of 25.5 suicides per year pre-intervention and 9.5 per year post-intervention. The study does not specify how many suicides were prevented by the rescue team's arrival versus those prevented by the spinning rails at the top of the fence. Besides, the vertical extension to the fence would have made it more difficult to climb. Therefore, it was not possible to attribute the decrease to any specific intervention component.

Another study by Shin et al. (2024b) described a different bridge in South Korea where a Video Incident Detection System (VIDS) was installed, comprised of 14-speed sensors that warned the operation control team if the speed of a car was below 30 km/h. Meter-high spinning bars were also added to the top of the existing meter-high guard rails on both sides of the bridge three years later, so data is available pre-intervention, after the installation of the VIDS, and after the installation of the VIDS and spinning bars. For the purpose of this review, the spinning bars were classified as physical means restriction with an additional or innovative element, and are therefore also listed under Section 2.2.5. Prior to the described intervention, the bridge already had a 1-metre-high rail and CCTV. A total of 146 incidents, including both suicide deaths and prevented suicides, occurred on the bridge during the 14-year and 1-month study period. Of these, 54 incidents took place during the 6.5-year pre-intervention period, 58 incidents during the 2 years and 11 months of the VIDS-only phase, and 34 incidents during the 4 years and 8 months of the VIDS and spinning bars phase. Pre-intervention, there were 20 deaths by suicide on the bridge, equivalent to 0.008 deaths per day, compared to 11 (0.010 per day) in the VIDS-only phase and fewer than five (0.002 per day) in the VIDS and spinning bars phase. Suicide deaths increased non-statistically significantly after the installation of the VIDS compared to the pre-intervention period (IRR=1.23, 95% CI 0.59–2.56) but decreased after the installation of the spinning bars compared to the VIDS-only period (IRR=0.23, 95% CI 0.07–0.71) as well as to the pre-intervention period (IRR=0.28, 95% CI 0.10–0.82).

The study also provides details about the number of interventions to stop a suicide attempt during the three periods (Shin et al. 2024b). There were 33 such interventions, equal to an average of 0.023 per day, in the pre-intervention period, 46 (0.054 per day) in the VIDS-only period, and 29 (0.021 per day) in the VIDS and spinning bars period. The number increased statistically significantly in the VIDS-only period compared to before the intervention (IRR=2.40, 95% CI 1.65–3.47), but then decreased statistically significantly in the VIDS and spinning bars phase vs. VIDS-only (IRR=0.37, 95% CI 0.25–0.57). The difference between the VIDS and spinning bars phase vs. pre-intervention was not significant (IRR=0.90, 95% CI 0.59–1.38). Before the intervention, 61.1% of incidents were intervened in, compared to 79.3% in the VIDS-only phase and 85.3% in the VIDS and spinning bars phase.

The effectiveness of installing crisis line phones and CCTV cameras was examined in an Australian study by Kolves et al. (2023). This study reviewed data for the period between 2001 and 2021. The phones and CCTV were installed in 2012, and in 2015 physical means restriction barriers were added. The data were analysed over three-year periods. As well as suicides on the bridge, the authors examined displacement of suicides to other locations. The number of suicides on the bridge did not change between the three years before the installation of the phones and CCTV (n=21) and after (n=21). However, it started to rapidly decline after the installation of the barriers, with each of the two following three-year periods having fewer than five suicides. Clustering the numbers of suicides in three-year periods does not show that the phones and CCTVs had effectiveness, but the authors report that a joinpoint regression analysis identified 2012 – the year of their installation – as the start of the decline in the number of suicides. Over the study period, two join points were identified, i.e., points in time when a statistically significant change in trend happened. The number of suicides decreased between 2001 and 2009, with the annual percentage change (APC) being -26.7% (95% CI -43.4−-5.1%, p=0.02). Following that, there was a rapid increase in

suicides until 2012 and a period of decline between 2012 and 2021 (APC=-31.6%, 95% CI -44.9−-15.1%, *p*=0.002). Regarding displacement to other locations, there was no substantial difference in the number of suicides at other bridges and cliffs in the city (0 join points; APC=0.6%, 95% CI -3.0−4.4%) and the difference in suicides in the suburbs bordering the bridge was not statistically significant (0 join points; APC=2.8%, 95% CI -0.1−5.9%). However, there were some fluctuations in suicides at man-made constructions in the inner city, including after the installation of the phones and CCTV on the bridge, although the upward trend was less pronounced after 2012 (3 join points; 2007−2012 APC=36.8%, 95% CI -0.2−87.5%; 2012−2021 APC=4.4%, 95% CI 4.0−13.5%). There is some confusion about the reporting of the latter confidence interval for this outcome because even though it does not cross 0, the authors of the study report that the trend was not statistically significant. We suspect that a minus sign might be missing.

A UK grey literature document by Giraud (2021), prepared as a presentation to the National Suicide Prevention Annual Conference “Suicide Prevention in the Square Mile”, reported on a number of interventions aimed at increasing opportunity for third-party intervention and well as increasing opportunity for help seeking to prevent suicides on bridges. The interventions included Samaritans signs on three bridges, training sessions to the public and frontline staff at various locations around the city, leaflets handed out to pedestrians at a bridge, mental health nurses accompanying police officers who respond to incidents, training of business staff along the river, promotion of water safety and suicide awareness materials to licensed premises along the river, and leaflets about suicide prevention distributed at transport hubs and on the bridges. No formal evaluation was identified, but Giraud (2021) reported that since the introduction of the intervention package, reattendance at the bridges was reduced to zero. No other outcomes were reported. We identified an evaluability assessment of this suicide prevention initiative conducted by the National Institute for Health and Care Research Public Health Intervention Responsive Studies Teams (2024) during the literature searches for this review, so it is possible that an evaluation will be conducted in the future.

2.2.3 Increasing opportunity for help seeking

Three studies presented interventions aimed at increasing opportunity for help seeking at bridges, of which two (Giraud 2021, Kolves et al. 2023) were already described in Section 2.2.2 of this report. The remaining study (Stack 2015), from the USA, evaluated the effectiveness of installing phones with a direct link to a crisis centre on a traffic bridge across water without pedestrian walkways. Six such phones were installed. The study examined suicide numbers in the 13 years after the intervention compared to the 13 years before. Controlling for the suicide rate in the state, the number of suicides increased by an average of 2.73 (*SE*=1.57) suicides per year (R^2=.418, *p*<.05). At the same time, the city population decreased by 1.4% during the decade that falls within the 13-year period since the implementation of the intervention. During the first 10 years of the crisis phones being operational, 27 people used them. Potentially confounding factors not controlled for in the study include a website dedicated to suicides on the bridge that originated around the same time as the crisis phone and a local newspaper’s policy of publishing articles on all suicides on the bridge. These two factors might have contributed to the image of the bridge as a location for suicides and interfered with effectiveness of the intervention.

2.2.4 Memorials or suicide prevention messages other than crisis line signage

A UK study (O’Neill et al. 2021) examined the effects of placing memorials, messages, or notes (excluding official crisis line signage) on motorway bridges to deter people from suicide as well as media coverage of such “decorations”, as they are referred to in the study. Across the 26 bridges, in the period of one year, there were 160 suicides. Of these, 93 occurred pre-decoration, and 67 were post-decoration (56 with no media coverage and 11 with media coverage concerning the same bridge). This difference was not statistically significant (*p*=0.55). In terms of individual bridge-level data, 15 bridges had more incidents

pre-decoration than post-decoration, but this difference was not statistically significant (Bonferroni corrected *p*>.05). Eleven bridges had more incidents post-decoration (*p*-value not reported), of which one had more incidents post-decoration with media reporting, but that was not statistically significant either (Bonferroni corrected *p*>.05).

2.2.5 Physical means restriction with an additional or innovative element

We have already described the installation of the spinning rollers on fences, which was done in combination with another intervention (Shin et al. 2024a, Shin et al. 2024b), in Section 2.2.2 of this review. One more study described a physical means restriction intervention with an additional element on a bridge (Sinyor et al. 2024). This study described a 5-meter barrier with lights that reacted to the wind and followed pre-programmed routines at sundown, sunrise, and midnight, and whose colours depended on the season. The barrier was installed in 2003, but according to the website of a local news publication, the lights were only added in 2015 (Kupferman 2015). The study does not provide a breakdown of data before and after the lights were installed, so it is not possible to establish if they had an effect on the suicide. However, after the installation of the barrier and until the end of 2020, only two suicides occurred on the bridge, compared to 48 in the five years before, so it would not have been possible to analyse more fine-grained data. The study also analysed potential displacement to other large metropolitan cities in the same province and found no evidence of this (City 1 IRR=0.50, 95% CI 0.26–1.01, City 2 IRR=1.17, 95% CI 0.44–3.43). However, it is not necessarily reasonable to assume that preventing access to a location will cause people to travel to a different city. No data on displacement to nearby locations within the same city was available. Regarding method substitution determined by the number of suicides by methods other than jumping from bridges, Sinyor et al. (2024) found no change either (IRR=1.00, 95% CI 0.99–1.01).

2.2.6 Bottom line results for interventions at bridges

Of the interventions described in this section, physical means restriction interventions with an additional or innovative element, sometimes in combination with a technological intervention aimed at increasing opportunity for third party intervention, appeared to have the most promise. In one study (Shin et al. 2024a), suicides on a bridge decreased significantly after a fence with wire sensors that alerted a rescue team and with spinning bars that prevented people from gripping it, however, because of a vertical extension to the fence installed at the same time, it was not possible to determine whether the decrease was due to the innovative features or to the physical means restriction. In another study (Shin et al. 2024b), installing a video detection system did not reduce suicide deaths on the bridge, but adding a vertical extension with spinning bars to the guard rails did. Again, it was not possible to determine if the reduction in suicides was due to the innovative feature or to the extension to the fence. The bridge in the study by Shin et al. (2024b) had no pedestrian access, so it is not clear whether the findings of this study are generalisable to those that do. It was unclear if the bridge in Shin et al. (2024a) had any unique features that might limit the generalisability of the findings. Also, the volume of data in each of the compared periods in Shin et al. (2024b) was not large, potentially limiting how much confidence can be placed in the results of the analysis. Another South Korean study (Lee et al. 2016) examined a combination of technological interventions that included an alert system and installing fences with infrared sensors and found a reduction in the number of suicides. However, it had some methodological limitations, such as a lack of clarity on how outcomes were measured, a small amount of data, and a lack of statistical analysis. Moreover, it only provided information on prevented suicide attempts, not on suicide rates on the bridge. Another physical means restriction intervention with an additional element, reported by Sinyor et al. (2024), in which a 5-meter barrier illuminated by lights as a piece of art, appeared to reduce suicides drastically, but the lights were only installed years after the barrier itself, so it is not possible to make any assumptions about whether they had an additional effect.

Two studies examined a combination of interventions aimed at increasing the likelihood of third party intervention and help seeking (Kolves et al. 2023, Giraud 2021). Installing crisis line phones and CCTV cameras on an Australian bridge did not change the number of suicides in the three years after compared to the three years before. However, there was some statistical evidence that the downward trend in suicides started at the time these interventions were introduced (Kolves et al. 2023). It was not possible to examine their longer-term effects because barriers were installed on the bridge three years after the phones and CCTV. There was a small amount of data for analysis for each period, limiting the validity of the statistical analysis. The grey literature document that also described a combination of these two types of interventions only reported that reattendance was reduced to zero, and no other data was available (Giraud 2021).

A study that examined the installation of crisis phones on a bridge as a means of increasing help-seeking found that suicides increased in the 13 years after the introduction of the intervention, but this bridge had consistently received attention from media and from a website dedicated to reporting and discussing suicides on the bridge, potentially counteracting any positive effects that the intervention might have had (Stack 2015). Limitations of this study included issues with generalisability to other locations due to the specific features of the bridge, particularly in terms of the levels of attention from the media and online, and the lack of consistency in how outcomes were recorded because the information on them came from multiple sources, including media articles. Finally, another study that investigated the effect of placing of memorials, messages, or notes excluding official crisis line signage on motorway bridges found no difference in the number of suicides before and after (O'Neill et al. 2021).

2.3 Interventions at cliffs or other natural heights

2.3.1 Overview

Interventions at cliffs or other natural heights were described in three studies which covered the same location and set of interventions (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023).

2.3.2 Increasing opportunity for third-party intervention and help seeking, and physical means restriction with an additional or innovative element

The studies by Lockley et al. (2014), Ross et al. (2020), and Torok et al. (2023) described a set of interventions carried out at the same park with access to a cliff in Australia. The park is described as a 4.7-hectare big coastal escarpment area, and suicides have been recorded there since the 1800s (Lockley et al. 2014). The interventions included two crisis telephones, two signs with the crisis line number and a suicide prevention message, and CCTV cameras, all installed by February 2010, as well as landscaping work that included a new main entrance, improved seating, lighting, and tourist information displays, and a 1.3-meter-high fence along the clifftops with sensors that activated an alarm for the security monitoring service and alert police, completed in July 2011 (Lockley et al. 2014, Ross et al. 2020).

The earliest of the identified studies that examined the effectiveness of this set of interventions was by Lockley et al. (2014). There was a non-significant downward trend in jumping incidents between 2006 and 2012, with an estimated annual percentage change (EAPC) of -2.61% (95% CI -21.1–20.2; p=.760). The change in confirmed suicides between 2001 and 2011 was not significant either (EAPC=6.71%, 95% CI -2.5–16.8; p=.137). However, there was a significant increase in police call-outs related to individuals located at or approaching the park between 2006 and 2012 (EAPC=16.04%, 95% CI 7.1–25.7; p=.005). The change in police call-outs when an individual was located over the fence during the same time period was not significant (EAPC=-0.89%, 95% CI -22.1–26.0; p=.927). There was no numeric data on the use of the crisis line, but it was suggested that in a small

number of cases the telephones had played an important role, either because the suicidal persons themselves used them or because they allowed bystanders to call for help.

Another study, which had both a quantitative and a qualitative element, published data for the period between 2000 and 2016 (Ross et al. 2020). This study found a non-statistically significant increase in suicides in the park over this period (APC=5.41%, 95% CI 0.38–11.53, *p*=.07). An examination of the breakdown of data by gender found that while the change in trend was not statistically significant for men (APC=6.23%, 95% CI 0.41–13.30, *p*=.06), it was significant for women, with suicides rising in the pre-intervention period of 2000–2010 (APC=16.64%, 95% CI 8.18–25.76, p<.001) and falling during and following intervention implementation in 2010–2016 (APC=-21.27%, 95% CI -33.14–-7.30, *p*=.01). During interviews, police officers trained in responding to suicidal individuals at the park highlighted the need to improve communication between emergency responders, hospital staff, and mental health teams. The authors of the study reported a consensus that while the fence was not a strong deterrent and was easy to climb, the CCTV and alarms were effective in preventing suicides through detection and location of individuals in crisis. However, it was pointed out that re-attempting individuals were aware that the CCTV and alarms would notify the police, which meant they might act faster to avoid being intercepted. In terms of the personal impact on police officers working in the park, some described the stress and a sense of responsibility to save people's lives, as well as anxiety about the scrutiny in case they were not successful in doing so. Some interviewees described their own and their colleagues' distress caused by witnessing suicides, and how seeking help could have a negative effect on them due to the stigma associated with mental health difficulties.

The most recent study covering this location, by Torok et al. (2023), focused on displacement from the immediate area of the park to other locations in the local and broader areas as well as method substitution. Data between 2006 and 2019, with 2006–2011 being pre-intervention and 2012–2019 post-intervention, was analysed. The authors did not detect any statistically significant changes in suicides during the study period in the park itself (0 join points; APC=-1.95%, 95% CI -6.9–3.3, *p*=.140), in the local area (0 join points; APC=6.81%, 95% CI -4.6–19.5, *p*=.226), or in the broader area (0 join points; APC=1.85%, 95% CI -7.4–12.1, *p*=.683). Regarding changes in suicides by different methods, the difference in the number of jumping deaths in the areas under examination was not significant (0 join points; APC=0.90%, 95% CI -3.9–5.9, *p*=.695), but there was a slight statistically significant increase in all suicide deaths in the city area (0 join points; APC=1.39%, 95% CI 0.1–2.7, *p*=.037).

2.3.3 Bottom line results for interventions at cliffs or other natural heights

All three studies considered in this section related to the same location and set of interventions, which included crisis phones, signs with the crisis line number and a suicide prevention message, CCTV cameras, landscaping work, and a short fence with sensors. There was no statistically significant long-term reduction in suicides following the introduction of these interventions in the park, in the local area, or in the broader area (Torok et al. 2023). A shorter-term study found that suicides among women decreased after the start of the interventions, but there was no significant change in trend for men or overall (Ross et al. 2020). The studies used different cut-off dates for what they considered pre- and post-intervention periods because installation of the different elements of the set of interventions was carried out over a period of approximately 1.5 years. The main limitation of these studies is the volume of data available for analysis, which meant that the power to detect changes was low.

2.4 Interventions at tall buildings

2.4.1 Overview

Tall buildings were considered in one study (Waalen et al. 2020).

2.4.2 Increasing opportunity for help seeking

Waalen et al. (2020) described measures taken to prevent suicides on campus and at parking structures of a university in the USA. Several interventions were implemented: helpline signs at the roof perimeter in parking structures, banners and bungee cords in light wells, landscape improvements, planters and concrete bins, patio furniture and umbrellas. These interventions were implemented over a period between November 2013 and 2015. Around the same time, various physical means restriction interventions, such as fence barriers, wire mesh screens, and awnings, were also installed, so it is not impossible to attribute any changes to non-physical means restriction interventions exclusively. In an area on campus, six suicides occurred in 2002–2013, two in 2013, one in 2014, and none in 2015–2016. In the parking structures, there were eight suicides in 2002–2012, two in 2013, and none in 2014–2016.

2.4.3 Bottom line results for interventions at tall buildings

Only one study was available for this type of location and it had some serious methodological issues. The interventions were not described clearly, the volume of data was not large enough to make conclusions, and no statistical analysis was performed. Besides, physical means restriction interventions were implemented in the same period, so no outcome change could be attributed to the other kinds of interventions.

2.5 Interventions at multiple types of locations

2.5.1 Overview

Two studies covered interventions that happened at multiple types of locations. The study by Joyner et al. (2024a) included bridges (24.7%); railway or underground stations (17.3%); railway tracks (6.2%); roads (8.6%); tall buildings (21.0%); cliffs or other natural heights (4.9%); and parks, woodlands, or other green spaces (6.2%). The study by Owens et al. (2019) included bridges, railway or underground stations, tall buildings, and cliffs or other natural heights. In these studies, no breakdown of data by type of location was available.

2.5.2 Increasing opportunity for third-party intervention

Joyner et al. (2024a) surveyed representatives of organisations such as local authorities (32%), emergency services (13%), health services (10%), rail industry (9%), and management of green spaces (4%) and properties (7%) from all regions of the UK about their perceptions of effectiveness of smart surveillance technologies (SSTs) to prevent suicides in public spaces. On a scale from 0–100, the median response regarding perceived effectiveness of SSTs was 50.00 (IQR=8.75–70.75). There was a lot of variation in perceived effectiveness of different types of SSTs. Drones were rated the highest (Med=73.00 [50.00–89.00]), followed by virtual fencing (Med=60.00, IQR=32.50–83.75), AI camera/video analytics systems (Med=60.00, [34–70]), Bluetooth Low Energy Beacons (Med=60 [15–75]), CCTV activated by movement/proximity (Med=55, IQR=20–72.5), and Automated Number Plate Recognition (Med=8.00 [0–70]). The respondents were also asked to rate other interventions, including radars, infrared sensors, online interceptive tools deployed over public Wi-Fi networks, and technology to digitally observe electronic devices and the combined median for those was 42 (IQR=14.50–84.25). Standalone interventions, such as those producing audible deterrents or visual alerts, were rated higher (Med=62.5, IQR=37.5–88.5) than those that initiated human response, such as alerting the control room or calling emergency services (Med=55.00, IQR=31.50–77.5). Moreover, interventions whose primary intended use was to prevent suicide or suicide attempts were rated more highly (Med=74.00, IQR=51.25–80.00) than those that had other primary uses, such as to prevent accidental injury or death, trespass, or crime or anti-social behaviour (Med=42.00, IQR=12.50–70). This difference was statistically significant (U=153.50, p=.009). This study only examined perceived effectiveness and did not provide information on changes in actual suicide numbers following the introduction of the interventions it discussed.

2.5.3 Interventions initiated by bystanders

Owens et al. (2019) interviewed 21 people who had intervened in suicide attempts as bystanders, and 12 people who had been stopped from suicide. The interveners included 13 members of the public, six railway workers, including two off-duty at the time, and two highways officers. In total, 19 interventions were reported by the survivors and 31 by the interveners. Both interventions that included handover to services and those that did not were described as difficult. In the event of handover, the interveners sometimes felt excluded and at a loss, as well as afraid of what was going to happen to the person they helped, especially if they were arrested or sectioned under the Mental Health Act. If there was no handover, the interveners said it was difficult to judge when it was safe to leave the person. Some described being disturbed by the experience of intervention.

2.5.4 Bottom line results for interventions at multiple types of locations

Limited data was available for interventions covering multiple types of locations. Participants in the study by Joyner et al. (2024a) rated the effectiveness of different SSTs and, unsurprisingly, interventions that were primarily aimed at preventing suicides rather than those that were initially designed for other purposes were rated as more effective. It was a cross-sectional study that was generally conducted well. The qualitative study by Owens et al. (2019) reported people's experiences of intervening in suicide attempts, and of experiencing a bystander intervention. This study did not reflect on the potential influence of the researchers on the research, and it was unclear how the researchers were situated culturally or theoretically, but other than that, it was well-conducted.

2.6 Overall summary of the findings

2.6.1 Changes in suicide numbers

In this rapid review, we focused on interventions other than physical means restriction, which has already received substantial attention in previous research and whose effectiveness is rarely disputed (Public Health Scotland 2022a, Public Health England 2015). We identified 24 studies reported in 29 documents, of which three studies reported on the same location and set of interventions.

The types of interventions described in these studies included increasing opportunity for third-party intervention; increasing opportunity for help seeking; creating a calming atmosphere; memorials or suicide prevention messages other than crisis line signage; interventions initiated by bystanders; and physical means restriction interventions with an additional or innovative element.

Within these broad types, a wide range of interventions has been identified, and in some cases an intervention included elements that fell within more than one category. Interventions aimed at increasing opportunity for third-party intervention included technological interventions such as CCTV, sensors, and suicidal behaviour recognition and alert systems as well as non-technological interventions such as training staff and encouraging bystanders to help people who appear to be in distress. Interventions aimed at increasing opportunity for help seeking included encouraging people to use suicide helplines by installing free phones and signs with the phone number, or just signs. In one study, creating a calming atmosphere through installing blue lights was tested. Additional or innovative elements to physical means restriction interventions included installing spinning rollers or sensors on fences and adding artistic lights.

Table 2 below summarises the evidence of effectiveness and important caveats of each of the included studies.

Table 2. Summary of the effectiveness of intervention in the identified studies, sorted by type of location

First author, year Study design	Type of location	Intervention	Effectiveness*	Comments regarding effectiveness statement
Giraud 2021 Quantitative (routine data collection)	Bridge	Samaritans signs; staff and public training; leaflets; mental health nurses; water safety and suicide prevention materials	Cannot determine	Not a formal evaluation; only data on reattendance was available, with no information about how it was collected
Kolves 2023 Quantitative (pre-post)	Bridge	Suicide helpline (phones); CCTV	No change	Some evidence that a downward trend in suicides started after the start of the intervention but no evidence of change in the number of suicides in that period; confounding factors were not controlled for
Lee 2016 Quantitative (pre-post)	Bridge	Infrared security fences, CCTV, suicidal behaviour recognition and alert system	Some evidence of effectiveness	Only descriptive data on prevented suicides was available and no statistical analysis was conducted; confounding factors were not controlled for
O'Neill 2021 Quantitative (pre-post)	Bridge	Suicide prevention messages, memorials, or notes other than official crisis line signage	No change	Not controlled for confounding factors
Shin 2024a Quantitative (pre-post)	Bridge	A fence with tension wire sensors that alert a rescue team if a wire is cut or pulled; a vertical extension of the fence with spinning rollers to prevent gripping	Cannot determine	The study showed effectiveness of the set of interventions but it is not possible to determine if the reduction in suicide numbers was due to the innovative elements or the height of the fence alone; confounding factors were not controlled for
Shin 2024b Quantitative (pre-post)	Bridge	A video incident detection system with speed sensors that alert the operation control team	No change	The study showed effectiveness of spinning bars but it is not possible to determine if the reduction in suicide numbers was due to the innovative element or the height of the fence alone; confounding factors were not controlled for
		A vertical extension of the fence with spinning bars to prevent gripping	Cannot determine	
Sinyor 2024 Quantitative (pre-post)	Bridge	A 5-meter barrier with artistic lights added later	Cannot determine	Suicides were reduced after the installation of the barrier but it is not possible to attribute the change to the artistic element
Stack 2015 Quantitative (pre-post)	Bridge	Suicide helpline (phones)	Suicides increased after the intervention	A pre-post study that controlled for the broader suicide trends; the bridge received a lot of attention from the media and a dedicated website, which was not controlled for
Lockley 2014 Quantitative (pre-post) **Ross 2020** Mixed methods: quantitative (pre-post), qualitative **Torok 2023** Quantitative (pre-post)	Cliff or other natural height	Suicide helpline (phones, signs with the phone number and a suicide prevention message); CCTV; landscaping work; short fence with sensors that alert the security monitoring service and the police	No change overall, a decreasing trend for females	Not controlled for confounding factors
Chow 2024 Quantitative (pre-post)	Railway or underground station	Suicide helpline (posters and phones)	Suicides increased after the intervention	A time series study that controlled for various potential confounding factors
Erlangsen 2023 Quantitative (pre-post)	Railway or underground station	Suicide helpline (signs with the phone number and a suicide prevention message); motion-sensitive lights	Cannot determine	Physical barriers were installed at the same time and after the installation there were no suicide deaths at the station

Katsampa 2022 Qualitative	Railway or underground station	Interventions initiated by bystanders	Cannot determine	Not a formal evaluation; only qualitative data on experiences of intervening in suicide attempts was available
Local Government Association 2022 Quantitative (routine data collection)	Railway or underground station	Crisis café	Cannot determine	Nor a formal evaluation, only some descriptive data on reduced suicidal ideation was available but the percentage of people for whom it was successful is unclear
Matsubayashi 2014 Quantitative (quasi-experimental)	Railway or underground station	Blue lights at stations	Some evidence of effectiveness	A quasi-experimental study that controlled for various potential confounding factors but not for broader suicide trends; the lights could only be visible at night and in their immediate vicinity but that was not controlled for
Network Rail 2018 Quantitative (routine data collection)	Railway or underground station	Staff training; a bystander campaign to encourage people to intervene	Cannot determine	Not a formal evaluation; suicide and intervention data available but not analysed
Rail Safety and Standard Board 2020 Quantitative (routine data collection)	Railway or underground station	Trespass & Welfare Officers	Cannot determine	Not a formal evaluation; only descriptive data on the number of crisis interventions was available
Too 2020 Quantitative (pre-post)	Railway or underground station	Suicide helpline (signs with the phone number and a suicide prevention message); billboards with a guided breathing exercise	No change	The number of station users was accounted for but not other potential confounding factors
Ngo 2022 Quantitative (cross-sectional)	Railway or underground station; railway tracks	Interventions initiated by bystanders	Cannot determine	Not a formal evaluation; only descriptive data on the number of interventions initiated by bystanders is available
Too 2015 Quantitative (cross-sectional)	Railway or underground station; railway tracks	CCTV	Some evidence of effectiveness	A cross-sectional study that controlled for various potential confounding factors; causality cannot be determined from this study design
Waalen 2020 Quantitative (pre-post)	Tall building	Banners, bungee cords in light wells, landscape improvements, helpline signs; planters/concrete bin, patio furniture and umbrellas	Cannot determine	Various physical means restriction interventions were installed at the same time; only descriptive data was provided
Joyner 2024a Mixed methods: quantitative (cross-sectional); qualitative	Various	Various smart surveillance technologies	Cannot determine	Not a formal evaluation; only data on perceived effectiveness was available
Owens 2019 Qualitative	Various	Interventions initiated by bystanders	Cannot determine	Not a formal evaluation; only qualitative data on experiences of intervening in suicide attempts was available

* Refers to the evidence of effectiveness of interventions in scope of the review in reducing the number of suicides at locations of concern.

Potentially effective interventions

Technological interventions, i.e. surveillance technologies including CCTV, have shown the most promise, even though the evidence of their effectiveness was scarce and limited. In one study (Too et al. 2015), having more CCTV units was associated with fewer suicides at railway stations. It is not possible to establish whether the number of suicides was reduced because of the CCTV due to the cross-sectional design of this study. Another study (Lee et al. 2016) tested a set of interventions including CCTV, infrared security fences, and a suicidal behaviour recognition and alert system and provided some promising descriptive data that showed an increase in the number of prevented suicides, but a full evaluation that includes data on suicide rates, statistical analysis, and controls for confounding factors is needed to make any firmer conclusions. At the same time, there were studies that examined surveillance technology interventions that showed no change in outcomes after the start of the interventions. These will be discussed in the next sub-section.

The only other study that showed some evidence of effectiveness was one that examined the effects of installing blue lights at railway stations (Matsubayashi et al. 2014). It reported that suicides significantly decreased after the intervention but had a number of methodological limitations, such as not accounting for the fact that the lights were only visible at night and in their immediate vicinity. The authors also acknowledged that the underlying mechanism of action for this intervention was unclear. With than in mind, further research, including a replication study, is needed to make any firmer conclusion.

Interventions where no change was recorded

No change in suicides was observed as a result of five interventions or intervention sets. Promoting crisis helplines (Too et al. 2020), including in combination with CCTV (Kolves et al. 2023), and with CCTV and a whole range of other interventions including landscaping work and a short fence with sensors that alerted the security monitoring service and the police (Torok et al. 2023) showed no evidence of effectiveness. Another study (Shin et al. 2024b) showed no change after the introduction of a video detection system with speed sensors that alerted the operation control team if the speed of a car was too slow. The possible mechanism of action here would have been through identifying drivers that act unusually on a bridge and may be planning to stop with the intention to end their life, however, there are many other reasons why a car may be driving slowly. Finally, in another study (O'Neill et al. 2021), placing suicide prevention messages, memorials, or notes other than official crisis line signage on bridges had no effect on the number of suicides either. There might have been important confounding factors that were not accounted for in these studies, so it is not possible to rule out that there were external factors that caused the number of suicides to increase and countered the effects of the interventions.

Interventions that may result in unintended harms

Two studies, both examining the effects of promoting crisis lines, reported that suicides increased after the start of the interventions. In the study by Chow et al. (2024), the number of suicides at an underground station increased after the installation of phones connected to a crisis line and posters. Although various potential confounding factors were controlled for in the study, there might have been others that were not accounted for that resulted in the increase in suicides over time. Another explanation is that installing the phones and posters contributed to the negative image of the location as a place where it is possible to die by suicide and attracted more people intending to end their life to it. The other study, by Stack (2015), examined the change in suicide numbers following the installation of crisis phones on a bridge and also reported that suicides increased after the intervention. The important confounding factor in this study that was not controlled for was the attention that suicides on the bridge received from the local press and a dedicated website, which might have

contributed to maintaining the image of the bridge as a suicide location. Installing the phones could also have potentially exacerbated that.

Interventions whose effect could not be determined

Finally, there were studies in which it was not possible to determine the effectiveness of the interventions of interest to this review, due to their designs and/or quality, and in some cases because physical means restriction interventions were implemented at the same time. A few of them were not formal evaluations (Giraud 2021, Joyner et al. 2024a, Katsampa et al. 2022, Local Government Association 2022, Network Rail 2018, Ngo et al. 2022, Owens et al. 2019, Rail Safety and Standard Board 2020), so they did not provide data necessary to make a judgement regarding effectiveness. In five studies physical means restrictions were either installed at the same time as interventions in scope of this review (Erlangsen et al. 2023, Waalen et al. 2020) or were their intrinsic element (Shin et al. 2024a, Shin et al. 2024b, Sinyor et al. 2024), so no judgement regarding the effect of the non-physical means restriction intervention, or the innovative elements of the physical means restriction interventions alone, can be made based on the data provided in these studies even if they showed effectiveness of the overall set of interventions.

2.6.2 Displacement to other locations

Another outcome of interest in this review is displacement to other locations. There are concerns that if suicides are prevented at one location, it may force individuals to choose a different location. Five of the included studies examined potential displacement (Kolves et al. 2023, Matsubayashi et al. 2014, Rail Safety and Standard Board 2020, Sinyor et al. 2024, Torok et al. 2023). The studies by Kolves et al. (2023) and Torok et al. (2023) reported no evidence of displacement, but they found no change in suicides at the locations of interventions either, so no conclusions can be made from this.

Sinyor et al. (2024), who found that the intervention was effective at reducing suicides at the location, examined changes in suicides in two other large metropolitan areas in the same province and found no change. However, people turning to a different location because their chosen one becomes inaccessible may not necessarily choose, or be able, to travel to a different city and no data on displacement to nearby locations was available.

Matsubayashi et al. (2014) found no systematic evidence of an increase in suicides at neighbouring railway stations after the introduction of the intervention, but they only had access to data from one railway company and no information about changes in suicides at stations in the same area managed by other companies was available.

The Rail Safety and Standard Board (2020) reported that they had observed displacement from station platforms to adjacent bridges, but no statistical analysis was conducted and no numeric data was provided, so it is unclear how that conclusion was made.

All things considered, there is not enough evidence in this review to make conclusions about the displacement effect.

2.6.3 Method substitution

Only two studies examined whether interventions at locations of concern resulted in method substitution. One was by Torok et al. (2023) who reported an increase in the overall number of suicide deaths in the city but found no change in suicide numbers in the area of interest. The other study was by Sinyor et al. (2024), who found that there was no change in the number of suicides by other methods.

2.7 Assessment of the overall body of evidence

No formal assessment of the certainty in the overall body of evidence was performed as part of this rapid review, but here we summarise some of the main factors. Section 5.8 provides more information about how these were identified. Where possible, we assessed the confidence in the findings from the overall body of the quantitative evidence in terms of methodological quality, consistency across study findings, precision, directness of the evidence, and the possibility of publication bias. Due to the high heterogeneity in the interventions and locations, it was not possible to include all of the evidence in this assessment.

2.7.1 The effect of interventions aimed at increasing opportunity for help seeking on the number of suicides

Firstly, we focus on promoting suicide helplines as an intervention aimed at increasing opportunity for help seeking. Three studies of interventions at railway or underground stations (Chow et al. 2024, Erlangsen et al. 2023, Too et al. 2020), two at bridges (Kolves et al. 2023, Stack 2015), one at tall buildings (Waalen et al. 2020), and three reporting on the same location and intervention at a cliff (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023) reported on this kind of interventions. Only in two of them (Chow et al. 2024, Stack 2015) suicide helplines were not combined with another kind of intervention. In the other studies, they were combined with motion lights and physical barriers (Erlangsen et al. 2023), CCTV (Kolves et al. 2023), CCTV, landscaping work, and a short fence with sensors that alert the security monitoring service and the police (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023), billboards with a guided breathing exercise (Too et al. 2020), or a range of interventions including banners, bungee cords in light wells, landscape and interior design improvements, and physical barriers (Waalen et al. 2020). The presence of the other interventions is a limitation of this assessment since it is impossible to untangle the effect of the crisis phone lines from that of the rest of the interventions.

The first dimension we focus on is the methodological quality of these studies, and the risk of bias resulting from it. All of these studies used a pre-post design. They varied considerably in quality, from not having serious methodological concerns (Chow et al. 2024), to having some issues, particularly related to confidence in the findings being reduced due to the small amount of data available for analysis (Kolves et al. 2023, and the three studies reporting on the same location and set of interventions: Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023), to having a number of number of methodological issues limiting the validity of the findings (Erlangsen et al. 2023, Stack 2015, Too et al. 2020, Waalen et al. 2020). In addition, only three of these studies (Chow et al. 2024, Stack 2015, Too et al. 2020) accounted for at least some confounding factors. Therefore, there is a high risk of bias related to the outcomes of this kind of intervention. Section 6.3 provides more detailed information on the quality assessment of each study and Section 5.6 explains how it was performed.

The next area is consistency across study findings. While Chow et al. (2024) and Stack (2015) reported that suicides increased after the introduction of the intervention, Kolves et al. (2023), Too et al. (2020) and, reporting on the same location and set of interventions, Lockley et al. (2014), Ross et al. (2020), and Torok et al. (2023) observed no change. In the case of the studies by Erlangsen et al. (2023) and Waalen et al. (2020), the effect could not be determined. No studies reporting on promoting suicide helplines found that they resulted in a reduction in the number of suicides. Overall, there was little consistency in the findings, with some reporting an increase in suicides and others reporting no change.

Regarding precision, all of the studies had a small amount of data available for the analysis apart from Chow et al. (2024), in which whether it was large enough to provide confidence in the findings or not could not be determined, and Stack (2015), which was judged to have sufficient data. The confidence intervals were narrow in the Chow et al. (2024) study, but

there was less precision in the Kolves et al. (2023), Too et al. (2020), Lockley et al. (2014), Ross et al. (2020), and Torok et al. (2023) studies. Confidence intervals were not reported in the remaining three studies (Erlangsen et al. 2023, Stack 2015, Waalen et al. 2020), although Stack (2015) provided standard errors. Overall, there was low precision in these findings.

The evidence was direct in all of the studies since they all examined changes in suicides at locations of concern, so no proxy outcomes were used. The final dimension is publication bias. In this type of review, it is not possible to formally assess publication bias, however, we took steps to counter it by extensively searching grey literature.

All in all, the assessment of the overall body of evidence indicates that there is a low level of confidence in the evidence for this outcome.

2.7.2 The effect of surveillance technologies on the number of suicides

In this section, we assess the overall body of evidence related to surveillance technologies, as a sub-category of interventions aimed at increasing opportunity for third-party intervention. Most of these were CCTV, but some studies also included technologies such as sensors, video detection and alert systems, and others. These kinds of interventions were examined in nine studies (Joyner et al. 2024a, Kolves et al. 2023, Lee et al. 2016, Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023, Shin et al. 2024a, Shin et al. 2024b, Too et al. 2015), which included three studies of the same location and set of interventions (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023). Of the nine studies, four were at bridges (Kolves et al. 2023, Lee et al. 2016, Shin et al. 2024a, Shin et al. 2024b), three reporting on the same location and interventions at a cliff (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023), one at railway stations and railway tracks (Too et al. 2015), and one included different kinds of locations (Joyner et al. 2024a). Some of these studies included some other kinds of interventions as well, including a suicide helpline (Kolves et al. 2023), a suicide helpline and landscaping work (Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023, reporting on the same location and set of interventions), and vertical extension of the fence with spinning rollers to prevent gripping (Shin et al. 2024a). As in the previous section, this is a limitation in the assessment of the overall body of evidence related to surveillance technologies as an intervention aimed at increasing opportunity for third-party intervention. The study by Kolves et al. (2023) also evaluated a suicide helpline and was included in the previous section of this assessment as well.

Regarding methodological limitations, and the risk of bias resulting from them, again there was a lot of variability between the studies. The cross-sectional study by Too et al. (2015) was considered to be well-conducted but its design precludes us from making assumptions about the causal relationship between the intervention and the number of suicides. Most of the other studies were fairly well-conducted, but included some methodological limitations, such as having too little data available for analysis to give confidence in the findings (Kolves et al. 2023, Lee et al. 2016, Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023, Shin et al. 2024b). One of the studies included a larger number of methodological limitations, including a lack of clarity regarding how the outcomes were determined and a lack of statistical analysis (Lee et al. 2016). Of the studies that examined these types of interventions, only one (Too et al. 2015) controlled for confounding factors. Overall, there is a high risk of bias related to the outcomes of surveillance technology interventions.

In terms of consistency in the findings, only two studies found some evidence of effectiveness of these interventions (Lee et al. 2016, Too et al. 2015), but it was limited either by methodological issues (Lee et al. 2016) or the study design (Too et al. 2015). The rest of the studies either reported no change (Kolves et al. 2023, Shin et al. 2024b, as well as the three studies on the same location and interventions: Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023), or the effect could not be determined because no formal evaluation

was conducted (Joyner et al. 2024a) or it could not be untangled from physical means restriction interventions within the study (Shin et al. 2024a). With some studies indicating some evidence of effectiveness and others showing no effect, there was little consistency regarding this kind of interventions.

In terms of precision, most of these studies (Kolves et al. 2023, Lee et al. 2016, Shin et al. 2024b, as well as Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023) had little data available for analysis to give confidence in the findings. Regarding confidence intervals, they were quite narrow in the study by Too et al. (2015), but less precise in the rest of the studies where they were available (Kolves et al. 2023, Shin et al. 2024a, Shin et al. 2024b, Lockley et al. 2014, Ross et al. 2020, Torok et al. 2023). In the study by Joyner et al. (2024a) only response ranges were provided and they tended to be wide. No indication of precision was available in the remaining study (Lee et al. 2016).

All of these studies examined the effect of surveillance technologies on suicide numbers directly, apart from the one by Lee et al. (2016), who reported prevented suicide attempts rather than the number of suicides, and Joyner et al. (2024a), who used perceptions of effectiveness as the outcome. As previously stated, although in this type of review it was not possible to formally assess publication bias, we took steps to reduce it by performing grey literature searches.

Based on the assessment of the overall body of the evidence, there is a low level of confidence in the findings related to surveillance technologies.

3. DISCUSSION

The Scottish national guidance on action to address suicides at locations of concern (Public Health Scotland 2022a) uses the integrated motivational volitional (IMV) model of suicidal behaviour as a theoretical framework for understanding the transition from suicidal ideation to action. This model includes three stages: 1) pre-motivational, that includes background factors and triggering events; 2) motivational, during which intentions are formed; 3) and volitional, also referred to as behavioural enaction (O'Connor & Kirtley 2018). During the last stage, access to means of suicide is considered an important factor in determining whether suicidal ideation/intent will transition to suicidal behaviour.

Therefore, as previous research has shown (Okolie et al. 2020b, Pirkis et al. 2015), preventing physical access is important, but removing means of suicide does not only entail installing fences and nets. As the Public Health Scotland (2022a) national guidance explains, interrupting the suicidal process is the aim of actions to reduce suicides at locations of concern. This may include interventions by other people, such as emergency services, railway staff, or bystanders, or any other sort of intervention that delays or disrupts suicidal behaviour long enough to allow the individual in distress to receive help (Public Health England 2015). Heightened risk of suicide is often short-term, so interrupting a suicidal act and providing timely support can be life-saving (World Health Organization 2014).

To provide policymakers and organisations and individuals managing locations of concern with an evidence base to allow them to choose from a range of interventions at specific locations, the present review focused on any interventions other than physical means restriction aimed at reducing suicides at public locations. However, we found that research aimed at evaluating such intervention was limited and had many methodological limitations. As discussed previously in this report in detail, some technology-based interventions appeared to show promise, but the effectiveness of the other types of identified interventions could not be determined based on the available research. The main takeaway of this review is that more robust research is needed to create a high-quality evidence base.

3.1 Strengths and limitations of the available evidence

Twenty-four studies were included in this review, covering a wide range of interventions and types of public locations of concern. Most of these were uncontrolled pre-post studies, with three cross-sectional studies that do not evidence a causal relationship between the interventions and outcomes, and only one controlled quasi-experimental study which, despite its design, also had methodological limitations. Some qualitative evidence regarding the experience of intervening to prevent a suicide attempt was also available.

The overall quality of the identified evidence is quite low and precludes us from making firm conclusions about the effectiveness of any of the included interventions. In addition to methodological issues present in almost all of the included studies, the quality of reporting was low, with the interventions often poorly described. Most of the included studies were based on little data and did not account for confounding factors, which limits the validity of their findings. Some of the included literature provided some descriptive data but did not include a formal evaluation of the interventions. This was especially true of the identified grey literature. A few of the studies included physical means restrictions introduced at the same time as the interventions of interest in this review, so it was not possible to determine if any of the observed effect could be attributed to the interventions in scope of the review.

Despite these limitations, some of the included studies provided some initial evidence regarding potentially effective interventions that future research may examine in more detail.

3.2 Strengths and limitations of this rapid review

The question and the eligibility criteria for this review were developed in consultation with stakeholders from the NHS Wales Executive, a Health and Care Research Wales Evidence Centre Public Partnership Group member, and a representative from Public Health Scotland. We conducted extensive literature searches including systematic searches of nine bibliographic databases of academic literature and supplementary searches of almost fifty websites of relevant government, third sector, and research organisations and a grey literature database. We also reviewed literature citing, and cited by, the already identified studies as well as that included in existing relevant systematic reviews. The literature was independently screened for inclusion by two reviewers. This allowed us to maximise the amount of identified relevant evidence. All of the academic literature was critically appraised and its methodological limitations considered in the interpretation of the findings.

The limitations of this review are as follows. First, due to it being a rapid review conducted within a limited timeframe, only grey literature from the UK was included, although academic literature from any country was accepted. Even though this review is primarily targeted at UK policymakers and managers of locations of concern, there may be international grey literature relevant to decision making. The grey literature was not formally critically appraised, but since it did not include formal evaluations, it did not have a substantial influence on our interpretation of the findings.

Regarding literature searches, we suspect that there may be more studies in scope of this review that evaluated physical means restriction interventions with an additional or innovative element that we were unable to identify because the interventions were not described in sufficient detail in the publications. For example, we were only able to identify the study by Sinyor et al. (2024) as being in scope because the name of the barrier described in it suggested that the intervention included an artistic element, which we verified through a report in a newspaper local to the site.

Another limitation is in the critical appraisal of the included studies. The critical appraisal checklists were designed for studies of human populations, not locations, so some of the

questions, particularly in the checklist for pre-post studies, were not applicable. We countered this limitation by using the checklists only as a guide for the appraisal and using our own judgement, in discussion within the review team, when determining the quality of the studies and considering it in reporting their results.

3.3 Implications for policy and practice

The main finding of this review is that more robust evaluations are needed before any of the reviewed interventions can be recommended for implementation. There is some initial evidence that surveillance-based interventions aimed at increasing opportunity for third-party intervention may be effective, however, more research is needed. We also identified through grey literature that there are many initiatives happening across the UK, however, they are either not being evaluated, or the evaluations are not being made public. To create a better evidence base, robust evaluations should be supported and encouraged, and their findings shared so that places can learn from each other's experience.

3.4 Implications for future research

There is an urgent need for more high-quality research evaluating interventions aimed at reducing suicides at locations of concern other than physical means restriction. From our searches of grey literature, we know that such interventions are being implemented in various places across the UK (e.g., the "Small Talk Saves Lives" or "Make a Connection" campaigns across the rail networks, or a set of different interventions in the City of London), however, the evidence of their effectiveness is lacking.

Concerningly, we identified two studies that showed that suicides increased at the locations after the introduction of interventions promoting the use of suicide helplines, which may potentially be explained by the visibility of the phones and signs contributing to the negative image of the locations as places where many suicides happen, although there may be other factors obscuring the relationship between the interventions and the number of suicides. This shows the need for robust evaluations to create a strong evidence base that allows policymakers and managers of locations of concern to ensure that evidence-based interventions are used to prevent unintended harm and save resources.

Another important avenue for future research is to understand which interventions work for who and in what circumstances. For example, future studies may examine whether different demographic groups experience interventions differently and have different outcomes.

Our literature searches identified a number of studies reporting the development of artificial intelligence models that aim to detect suicidal behaviour (Li et al. 2022, Onie et al. 2023, Yogesan et al. 2023). We anticipate that once such models are finalised and implemented, there may be future evaluation studies assessing their effectiveness in preventing suicides at public locations.

3.5 Economic considerations*

The loss of life due to suicide in Wales could cost the Welsh economy at least £537 million[1] each year. As well as being a tragic event for families and communities, suicides can cost the economy at least £1.6 million[1] per every life lost (Samaritans 2024a).

The largest contributions to this economic loss are intangible costs (costed using HM Treasury Green book guidance of £60,000 per statistical year of life). Other considerable impacts include future potential employment and productivity, emergency service callout, healthcare, and potential productivity losses.

Suicides in public spaces pose unique economic impacts. The Office of Rail and Road calculated the rail and road industry faces a cost of £306,000[1] per suicide event (Prosser 2022).

Future research evaluating interventions aimed at reducing suicides at public locations should consider the economic impacts of suicides in such locations from a wider societal perspective. Future studies may wish to utilise a cost-of-illness methodology, such as those identified in the review by Jain et al. (2024).

*This section has been completed by the Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University

[1] Figures updated to January 2025 prices from 2022 prices using the Bank of England Inflation calculator (Bank of England. (2025). Inflation calculator. Available at: https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator?number.Sections%5B0%5D.Fields%5B0%5D.Value=482604852&current_year=121.7&comparison_year=135.403 [Accessed 20 March 2025].)

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5. RAPID REVIEW METHODS

The protocol for this rapid review was published on the OSF website before the review process commenced (Kiseleva et al. 2024). It is available through the following URL: https://doi.org/10.17605/OSF.IO/3XGRA.

5.1 Eligibility criteria

The inclusion and exclusion criteria for this review, developed in consultation with stakeholders from the Welsh Government, a Health and Care Research Wales Evidence Centre Public Partnership Group member, and a representative from Public Health Scotland, are provided in Table 3. These criteria guided the literature search and selection process.

5.2 Literature search

5.2.1 Evidence sources

The following bibliographic databases were systematically searched: MEDLINE via Ovid, PsycInfo via Ovid, Cochrane Library (CDSR and CENTRAL), Scopus, Sociology Collection (Applied Social Sciences Index & Abstracts, Sociological Abstracts, Sociology Database) via ProQuest, Social Science Database via ProQuest.

The policy and grey literature database Overton and websites of relevant government, third sector, and research organisations were searched for grey literature. Forward and backward citation searching was performed on the relevant primary studies identified through database searches.

During preliminary work, we identified or were supplied with a number of existing rapid (Public Health Scotland 2022b) and systematic (Barker et al. 2017, Chamberlain & Woodnutt 2024, Havârneanu et al. 2015, Okolie et al. 2020a, Okolie et al. 2020b, Pirkis et al. 2015) reviews of interventions targeted at reducing suicides at locations of concern. These reviews, and any other reviews that we identified during literature searches, were unpicked and relevant primary studies included in this review.

5.2.2 Search strategy

A search strategy was developed in MEDLINE via Ovid by one review member and checked by two other members. The stakeholders provided input into the search terms. The search strategy was then translated for the other bibliographic databases before searches were performed in them.

Details of the database searches are presented in Appendix 1. The list of searched websites is provided in Appendix 2.

Literature published since 2014 was searched for. The bibliographic database searches were conducted at the end of October 2024, the Overton database was searched in November 2024, citations were searched in December 2024, reviews were unpicked in January 2025, and websites were searches between November 2024 and January 2025.

5.2.3 Reference management

Identified references were exported from the bibliographic databases and deduplicated using the reference management software EndNote, after which they were uploaded into the online screening tool Rayyan, where deduplication was completed.

Table 3. Eligibility criteria

	Inclusion criteria	Exclusion criteria
Problem / place	Public locations where suicide attempts and deaths happen, including but not limited to: • Tall buildings, bridges, cliffs, and other manufactured or natural structures that allow access to a height • Rural/secluded locations (woodlands, parks etc) • Railway lines and stations • Roads • Locations with access to water • Heritage or historical sites	Non-public locations, such as homes or other residential settings
Intervention	• Interventions aimed at increasing the likelihood of third-party intervention • Interventions aimed at increasing help seeking/help giving • Non-barrier design interventions aimed at creating a calming atmosphere • Non-barrier design interventions aimed at reducing fatality • Means restriction interventions with an innovative or artistic element, such as planting bushes • Suicide prevention messages, memorials, artworks • Community engagement, including but not limited to designing and delivering interventions • Media campaigns • Placement of animals around the location • Any other intervention other than physical means restriction	Means restriction through creating physical barriers such as fencing or netting or otherwise preventing physical access to a location
Comparison	• Any other intervention • No intervention • No comparison	
Outcomes	Primary outcomes: • Suicide rates at locations of concern • Suicide ideation at locations of concern • Suicide attempts at locations of concern Secondary outcomes: • Displacement to other similar nearby locations • Suicide method substitution • Impact on communities (individuals, family, witnesses, first responders, service delivery, infrastructure, financial)	
Study design	Any quantitative, qualitative, or mixed methods study design	
Countries	Academic literature: No limits Grey literature: UK	
Language	English	
Publication date	From 2014	
Publication type	• Published academic studies • Grey literature reports	• Conference abstracts • Editorials • Comments • Book chapters • Theses and dissertations

5.3 Study selection process

5.3.1 Literature identified through bibliographic databases, review unpicking, and citation searching

All records identified through database searches, review unpicking, and citation searching were screened independently by two reviewers in Rayyan based on the information provided in the titles and abstracts. Where a record appeared to meet the eligibility criteria, or if a decision could not be made based on the information in the titles and abstracts alone, it was retained and proceeded to the full-text screening stage. Full-text screening was performed by two reviewers independently. Conflicts were resolved through discussion, involving a third reviewer where necessary.

5.3.2 Literature identified through grey literature database and website searches

The Overton database and website searches were performed by a single reviewer. On Overton, the first ten pages (500 results) were reviewed and potentially relevant documents retrieved. For searching most websites, both the integrated search function where available and Google Advanced Search were used. If >100 results were returned, a decision was made whether to refine the search to reduce the number of results or only screen the first few pages. Retrieval of relevant literature was maximised by using two search methods on each website where possible. The identified documents were briefly scanned at full text by a single reviewer and those that appeared to meet the eligibility criteria, or where a decision could not be made without a more careful examination, were proceeded to be screened independently by two reviewers, with any conflicts resolved through discussion and involving a third reviewer where necessary.

5.4 Data extraction

Data extraction was performed by one reviewer and checked by another. The following data were extracted where available: country, study aim, study design, dates of data collection, data collection methods, details of the location(s) of concern, details of the intervention and, where applicable, comparison, and relevant findings. The data extraction table was first piloted on a selection of studies of different designs.

5.5 Study design classification

Study design classification was performed for the purpose of selecting the most appropriate quality appraisal checklist by one reviewer and checked by another, resolving any disagreements through discussion or by involving a third reviewer where necessary. No formal identification algorithm was used.

5.6 Quality appraisal

The following critical appraisal checklists were used to assess the methodological quality of the studied, depending on the study design: the Quality Assessment Tool for Before-After (Pre-Post) studies with no control group (National Heart Lung and Blood Institute 2013), the JBI Checklist For Analytical Cross Sectional Studies (Moola et al. 2020), the JBI Checklist For Quasi-Experimental Studies (Barker et al. 2023), or the JBI Critical Appraisal Checklist For Qualitative Research (Lockwood et al. 2015). The quality appraisal was conducted by one reviewer and checked by another, with any disagreements resolved through discussion or by involving a third reviewer where necessary. Because these critical appraisal checklists were designed for studies of human populations and not locations, some of the questions were not applicable. We interpreted the population questions of the checklists as referring to locations (e.g., whether the location was representative of other locations where the same intervention could be used).

5.7 Synthesis

Data was synthesised narratively according to types of locations and interventions. Consideration was given to the methodological limitations of the included studies when reporting the results.

5.8 Assessment of body of evidence

No formal assessment of the overall body of evidence was performed, however, the dimensions included in the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach (Schünemann et al. 2023) were considered. Therefore, when narratively describing the overall body of the quantitative evidence, where possible, we reflected on the risk of bias, imprecision, inconsistency, and indirectness of the evidence as well as possible publication bias.

6. EVIDENCE

6.1 Search results and study selection

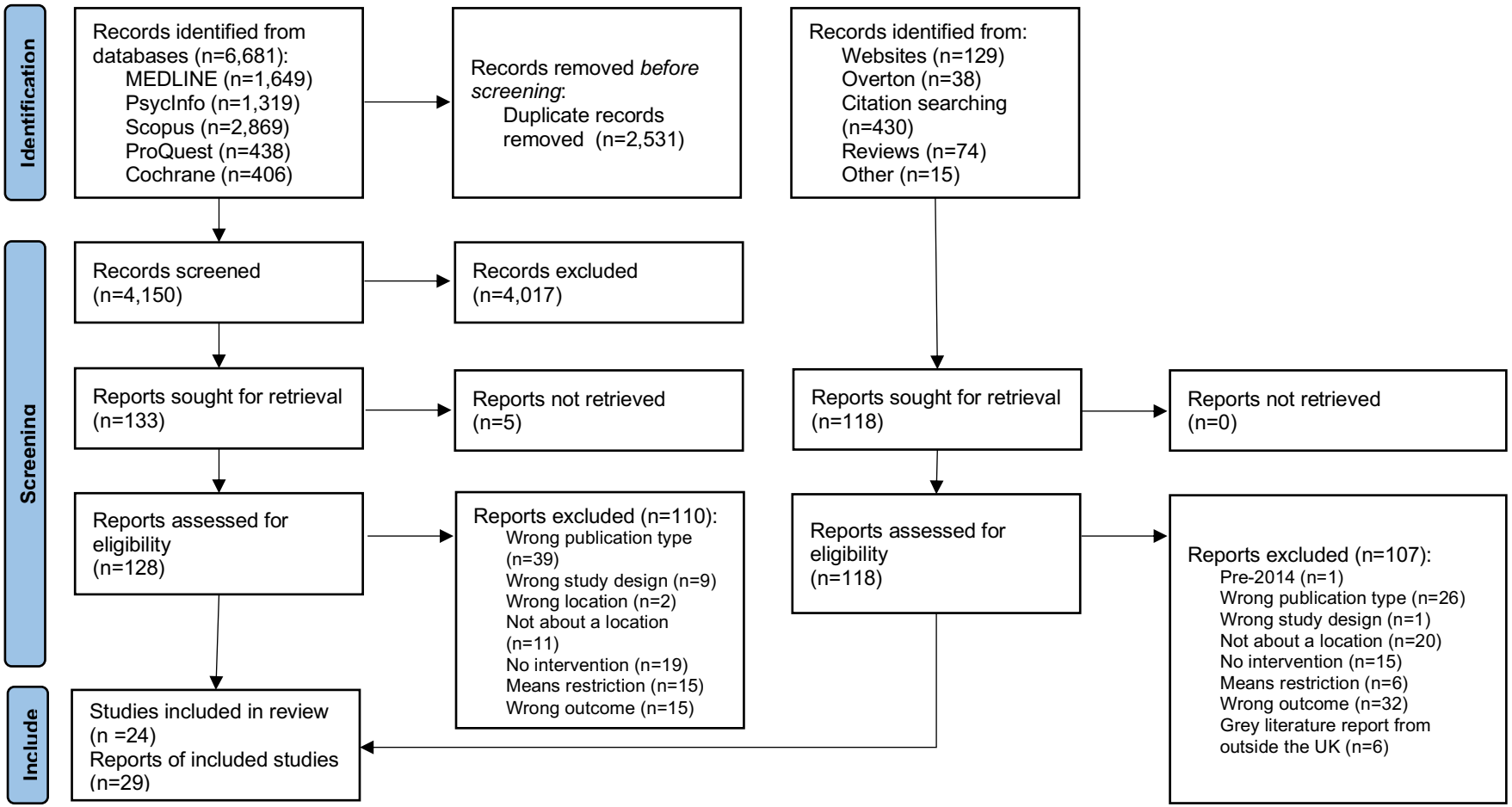

Figure 1. PRISMA flow diagram

6.2 Data extraction

Citation (Type)	Study details	Outcomes and relevant findings
Chow et al. (2024) **(Academic)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing opportunity for help seeking **Country of intervention:** Canada **Study aim:** To investigate how suicide rates on the Toronto Transit Commission (TTC) subway system have changed over the period of data availability and after Crisis Link was introduced **Study design:** Quantitative (time series) **Comparison:** Historical comparison before the introduction of Crisis Link **Timeframe for the data:** 1998–2021 for suicides, 2004–2021 for non-fatal suicide attempts; 12/2012–2021 for Crisis Link calls **Intervention start date:** 04/2011 **Data collection methods:** Official records for suicides in the Greater Toronto Area and TCC's records on non-fatal suicide attempts on the subway; Distress Centres of Greater Toronto data on calls to Crisis Link **Location characteristics:** TTC subway system **Number of interventions:** 1 **Intervention characteristics:** Crisis Link free suicide helpline that connects callers with a trained counsellor who assesses their suicide risk and provides de-escalation and safety planning if the caller is at low risk of harm or liaise with TTC Transit Control to slow or stop trains if there are imminent safety concerns; all platforms were equipped with posters and payphones **Organisation(s) delivering intervention(s):** TTC, Distress Centres of Greater Toronto, Bell Canada **Number of locations:** All TTC platforms; number not stated	**Outcomes of interest & outcome measures:** • Quarterly suicide counts • Non-fatal suicide attempts • Mental Health Act (MHA) apprehensions for suicidal behaviour **Control variables:** • Number of media articles on suicide on TTC • Number of suicides by other methods in Toronto • Unemployment rate in Ontario • Consumer Price Index (CPI) in Toronto • Seasonal variation • Covid-19 pandemic • Toronto population **Relevant findings:** *Total deaths 1998–2021:* 302 (92% died on the scene, 7% died in hospital, 0.3% died at home, 0.7% location of death unknown) *Total non-fatal suicide attempts 2004–2021:* 258 *Total MHA apprehensions for suicidal behaviour 2011–2021:* 473 *Calls to Crisis Link 2011–2021:* 243 (72% low-risk, 16% medium-risk, 12% high-risk) *Crisis Link involvement in non-fatal suicide attempts 2011–2021 (n=197):* 0.51% yes, 93.40% no, 6.09% unknown Association between the implementation of Crisis Link with TTC-related suicide rates: *Step change (intervention-Crisis Link):* IRR=0.64 (95% CI 0.36–1.12), *p*=0.11 *Pre-intervention trend (linear time in quarters):* IRR=0.99 (95% CI 0.98–1.001), *p*=0.07 *Post-intervention trend (intervention*time in quarters):* IRR=1.03 (95% CI 1.01–1.06), *p*=0.00 *Effect of time in the post-intervention period:* IRR=1.02 (95% CI 1.00–1.04), *p*=0.02 *Sensitivity analysis with a shorter study window (2005–2016):* IRR=0.54 (95% CI 0.24–1.22)
Erlangsen et al. (2023) **(Academic)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing opportunity for help seeking **Country of intervention:** Denmark	**Outcomes of interest & outcome measures:** • Number of suicides • Calls to the helpline • Callers' suicide risk

	Study aim: To review incidents of suicidal behaviour at a Danish railway station; to install signs and other measures; to monitor calls to a helpline for suicide prevention and reports of suicidal incidences at the station **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 01/2012–04/2021 **Intervention start date:** 12/2019 **Data collection methods:** Data on calls to the helpline from an electronic database recording the caller's risk of suicide and whether callers had seen the signs at the railway station; incidence of suicide attempt and suicide data from Danish State Railways and Rail Net Denmark **Location characteristics:** Railway station at which physical barriers were also installed at the end of some platforms in the same time period **Number of interventions:** 2 **Intervention characteristics:** 1) 12 signs with the text, "Is life difficult? We are here to help" and phone numbers for the national helpline for suicide prevention and emergency service; 2) motion-sensitive lights at two locations **Organisation(s) delivering intervention(s):** Railway safety managers and analysts, suicide prevention researchers, risk managers from a psychiatric hospital, heads of communication from the Danish suicide prevention helpline Livslinien **Number of locations:** 1	• Impact on individuals **Control variables:** N/A **Relevant findings:** *Suicide deaths 2012–2018:* 11 *Suicide deaths 2020–04/2021:* 0 *Suicide attempts 2020–04/2021:* 1 *Calls to the helpline 2020–04/2021:* 14 (from 13 individuals: 46% female, 54% male, mean age = 41 years) who mentioned the signposting at the station *Callers' suicide risk at each call:* 21.4% none, 35.7% low, 21.4% middle, 14.3% high, 7.1% acute *Additional information:* The research team were in touch with two users of the station who had found the signs disturbing and were concerned they might invoke suicidal thoughts in them.
Giraud (2021) **(Grey)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for third-party intervention; increasing opportunity for help seeking **Country of intervention:** UK (England) **Study aim:** Not reported **Study design:** Quantitative (routine data collection) **Comparison:** N/A **Timeframe for the data:** 04/2016–04/2017 **Intervention start date:** April 2016 **Data collection methods:** Not reported **Location characteristics:** Not reported **Number of interventions:** 6 **Intervention characteristics:** Samaritans signs on 3 bridges; training sessions to the public and frontline staff at various city locations; leaflets handed out to pedestrians at London Bridge; mental health nurses accompanying police officers; training of business staff along the river through the business healthy network; promotion of water safety and suicide awareness materials to licensed premises along the water; leaflet	**Outcomes of interest & outcome measures:** • Reattendance **Control variables:** N/A **Relevant findings:** Reattendance was reduced to zero.

	about suicide prevention in the City distributed regularly at transport hubs and on the bridges **Organisation(s) delivering intervention(s):** The Tidal Thames Water Safety Forum, Safe Public Place, The National Suicide Prevention Alliance **Number of locations:** 3	
Joyner et al. (2024a), Joyner et al. (2024b) **(Academic pre-print)**	**Type(s) of location:** Bridge (24.7%); railway or underground station (17.3%); railway tracks (6.2%); road (8.6%); tall building (21.0%); cliff or other natural height (4.9%); park, woodland, or other green space (6.2%) **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** UK **Study aim:** To understand the ways in which smart surveillance technologies (SSTs) are used in suicide prevention in public spaces in the UK; to collate key insights on the implementation, effectiveness, and sustainability of SSTs for cross-location learning **Study design:** Mixed methods: quantitative (cross-sectional); qualitative (content analysis) **Comparison:** N/A **Timeframe for the data:** N/A **Intervention start date:** Various **Data collection methods:** Survey of representatives of organisations such as local authorities (32%), emergency services (13%), health services (10%), rail industry (9%), management of green spaces (4%) and properties (7%) from all regions of the UK about implemented, planned, and discontinued interventions (07/2023–01/2024) **Location characteristics:** 81.0% of the locations had public access, 67.7% were "high-risk" **Number of interventions:** 54 implemented; 82 implemented, planned, or discontinued **Intervention characteristics:** SST such as Automated Number Plate Recognition (ANPR) (16.7% of the implemented, planned, or discontinued interventions), Bluetooth Low Energy (BLE) Beacons (5.6%), CCTV activated by movement/proximity (MA CCTV) (34.7%), AI cameras/video analytics systems (16.7%), drones (4.2%), virtual fencing/proximity warning systems (5.6%), and other including radars, infrared sensors, online interceptive tools deployed over public Wi-Fi networks, technology to digitally observe electronic devices (16.7%); At 66.7% of locations that had implemented interventions and 68.3% of all locations, interventions were used to prevent suicide attempts and deaths (but suicide prevention was the primary intended use in 17.1% of all interventions); 79.7% initiated human response	**Outcomes of interest & outcome measures:** • Perceived effectiveness for preventing suicides **Control variables:** N/A **Relevant findings:** <u>Perceived effectiveness of SSTs for preventing suicides (Median on the scale 0–100 (IQR)):</u> *All SSTs:* 50.00 (8.75–70.75) <u>Perceived effectiveness for preventing suicides by type of SST (Median on the scale 0–100 (IQR)):</u> *ANPR (n=10):* 8 (0–70) *BLE Beacons (n=3):* 60 (N/A; range=15–75) *MA CCTV (n=21):* 55 (20–72.5) *AI camera/video analytics system (n=11):* 60 (34–70) *Drones (n=3):* 73 (N/A; range=50–89) *Virtual fencing (n=4):* 60 (32.50–83.75) *Other including radars, infrared sensors, online interceptive tools deployed over public WiFi networks, technology to digitally observe electronic devices (n=10):* 42 (14.50–84.25) <u>Perceived effectiveness for preventing suicides by type of response (Median on the scale 0–100 (IQR)):</u> *Human response (n=49):* 55 (31.5–77.5) *Standalone intervention, e.g. producing audible deterrents or visual alerts (n=6):* 62.5 (37.5–88.5) *Other, such as technology was piloted to develop use case (no response) or notify parking company (n=3):* 3 (N/A; range: 6–60) <u>Perceived effectiveness for preventing suicides by primary intended use (Median on the scale 0–100 (IQR)):</u> *To prevent suicide/suicide attempts (n=12):* 74 (51.25–80) *Other, such as prevent accidental injury or death, trespass, or* crime/anti-social behaviour (n=58): 42 (12.5–70) *Difference:* U=153.50, *p*=.009

	Organisation(s) delivering intervention(s): Various (see data collection methods for responders' organisations) **Number of locations:** 81 **Number of respondents:** 108	
Katsampa et al. (2022) **(Academic)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Intervention initiated by bystanders **Country of intervention:** UK **Study aim:** To shed light on the experience of intervening to prevent a suicide at a railway location, including how and why people intervene, and their feelings and reflections in the aftermath **Study design:** Qualitative (thematic analysis) **Comparison:** N/A **Timeframe for the data:** N/A **Intervention start date:** N/A **Data collection methods:** Semi-structured face-to-face, telephone, or Skype interviews (04/2019–11/2019) with people who had intervened in a suicide attempt **Location characteristics:** Railway station **Number of interventions:** 1 **Intervention characteristics:** Verbal and non-verbal and physical interventions by commuter, bystander or member of staff**;** talking to the individual in a calm manner, helping them feel listened to and asking questions; non-verbal interactions such as eye contact, smiling or standing close to someone; physical interventions such as restraining someone; interventions by train drivers included practical means of informing colleagues at the upcoming station and bringing the train to an immediate stop; calling for professional help (e.g. railway staff, British Transport Police or other emergency services) **Organisation(s) delivering intervention(s):** Railway and train company staff, commuters/bystanders, mental health professionals and emergency services **Number of locations:** Not reported **Number of respondents:** 21 (11 were members of the public, including 4 with lived experience of suicidality and 3 mental health professionals; 6 train drivers; 3 railway employees; 1 police negotiator)	**Outcomes of interest & outcome measures:** • Interventions in suicide attempts by bystanders **Control variables:** N/A **Relevant findings:** <u>Theme 1: what is an intervention at a railway location?</u> *Up-close and interactive interventions* The importance of talking to the individual in a calm manner, and helping them feel listened to; distraction being potentially helpful; visually monitoring the person's behaviour; using their body as an obstacle to prevent the person getting near to or on the track. Restraining someone was viewed as a last resort and something to be avoided if possible. *Interventions from afar* Informing colleagues at the upcoming station, calling in an emergency and bringing the train to an immediate stand; calling for professional help; infrastructure points that may help encourage members of the public to seek professional assistance when concerned about someone. *Value of teamwork* Involving multiple people made the intervention more manageable. Lay bystanders are important because encountering the police may make people thing that they are going to be involuntarily committed. <u>Theme 2: deciding to intervene: gut instinct versus calculated decision</u> *Quick: 'an instantaneous decision'* Some situations appeared urgent and required immediate action. *Considered interventions* The first factor influencing whether they intervened was how safe it might be for themselves and the person in distress. Confidence to approach the person was another factor. Participants also expressed a feeling of responsibility toward the person in distress. <u>Theme 3: looking back</u> *Hindsight* Most participants reflected positively on their intervention(s), and thought it was the right and responsible thing to do. Sometimes the intervention was considered a stepping stone for the person in distress to get professional support. Some participants questioned whether they should have behaved differently. *Interventions without endings* Some participants described their intervention as an "unfinished story" and struggled with not knowing what happened after the intervention. A participant

		had fear that the person they helped was going to come back and try again. The interventions made a lasting impact on some participants, especially if they had witnessed a fatality on the railways, which can be traumatic. For some participants, avoiding such trauma was the main motivation for intervening to prevent further suicides.
Kolves et al. (2023) **Academic (research letter)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for third-party intervention; Increasing opportunity for help seeking **Country of intervention:** Australia **Study aim:** To examine the impact of interventions on suicides from the bridge and the potential substitution effect by comparing changes in nearby locations **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 2001–2018, interim for 2019–2021 **Intervention start date:** 2012 (also installed barriers in 12/2015) **Data collection methods:** Queensland Suicide Register (full register includes information from police reports to coroners, post-mortem autopsy reports, toxicology reports, and coroners' findings; interim register information comes from police reports and includes confirmed and probable suicides) **Location characteristics:** 74-m-high bridge across a river **Number of interventions:** 2 **Intervention characteristics:** 1) Crisis line (Lifeline) phones; 2) CCTV **Organisation(s) delivering intervention(s):** The Story Bridge Suicide Prevention Reference Group **Number of locations:** 1	**Outcomes of interest & outcome measures:** • Number of suicides • Displacement to other locations **Control variables:** N/A **Relevant findings:** <u>Number of suicides</u> *At the bridge:* 16 in 2001–2003, 8 in 2004–2006, <5 in 2007–2009, 21 in 2010–2012, 21 in 2013–2015, <5 in 2016–2018, <5 in 2019–2021 *At other bridges and cliffs:* 8 in 2001–2003, 9 in 2004–2006, 10 in 2007–2009, 6 in 2010–2012, 9 in 2013–2015, 10 in 2016–2018, 8 in 2019–2021 *In inner city (not bridges or cliffs):* 8 in 2001–2003, 10 in 2004–2006, 6 in 2007–2009, 11 in 2010–2012, 16 in 2013–2015, 18 in 2016–2018, 21 in 2019–2021 *In suburbs bordering the bridge (without the bridge):* 12 in 2001–2003, 21 in 2004–2006, 21 in 2007–2009, 28 in 2010–2012, 21 in 2013–2015, 23 in 2016–2018, 28 in 2019–2021 <u>Change in suicide numbers</u> *At the bridge:* 2 join points, 2001–2009 APC=-26.7% (95% CI -43.4−-5.1%, *p*=0.02); rapid increase (unspecified) until 2012; 2012–2021 APC=-31.6% (95% CI -44.9−-15.1%, *p*=0.002) *At other bridges and cliffs:* 0 join points, APC=0.6% (95% CI -3.0−4.4%) *At manmade constructions in inner city (not bridges or cliffs):* 3 join points, 2007−2012 APC=36.8% (95% CI -0.2−87.5%), 2012−2021 APC=4.4% (95% CI 4.0−13.5%) *In suburbs bordering the bridge (without the bridge):* 0 join points, APC=2.8% (95% CI -0.1−5.9%)
Lee et al. (2016) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** South Korea **Study aim:** To analyse the first-year performance of a sensor system at two locations on Han-River bridges **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** Pre-period: 2012, trial period: 2013 **Intervention start date:** 01/2013 (correction 01/2013–03/2013, stabilisation 04/2013–07/2013, trial runs 08/2013–12/2013)	**Outcomes of interest & outcome measures:** • Suicide attempts **Control variables:** N/A **Relevant findings:** *Suicide attempts prevented:* 15 at Mapo bridge, not reported at Seogang Bridge pre-intervention; 101 total (93 at Mapo bridge, 8 at Seogang Bridge; 92.1% rescued on the bridge, 7.9% in the water) during the trial period

	Data collection methods: Official records of drowning from Seoul Metropolitan Fire & Disaster Headquarters **Location characteristics:** 2/25 bridges over the Han-River with the highest number of drowning incidents **Number of interventions:** 1 **Intervention characteristics:** Infrared security fences placed 60 m apart and pole camera surveillance systems placed 400 m apart in the upper and outer direction of the edge of the bridge; "Intelligent Integrated Safety Control System" installed in conjunction with an existing command system to monitor people's moving trajectory, time spent in different sections of the bridge, and their behavioural patterns by using digital surveillance cameras with an automatic suicidal behaviour recognition and alert system **Organisation(s) delivering intervention(s):** Seoul Metropolitan Government **Number of locations:** 2	
Local Government Association (2022) **(Grey)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** UK (England) **Study aim:** Not reported **Study design:** Quantitative (Routine data collection) **Comparison:** N/A **Timeframe for the data:** 30/06/2022–31/08/2022 **Intervention start date:** 06/2022 **Data collection methods:** Crisis Care Concordat group and Thameslink Railway station data and statistics **Location characteristics:** Stevenage train station that also has British Transport Police representatives, Samaritans signage, Samaritans Managing Suicidal Contacts training course for rail staff already attended by 58%, Samaritans awareness events **Number of interventions:** 1 **Intervention characteristics:** Instead of contacting the police, station staff guide individuals in distress to the NightLight Café located over the footbridge from the station, where they can receive crisis support, including: a safe space in a welcoming environment, peer support, 1:1 staff support (practical and emotional), support with crisis resolution and building coping strategies, advice and information, signposting, onward referrals to other health and social care providers, housing and community resources, facilitated access to specialist mental health services when needed **Organisation(s) delivering intervention(s):** The Stevenage Suicide Prevention Task and Finish Group, National Suicide Prevention Alliance,	**Outcomes of interest & outcome measures:** • Suicidal ideation **Control variables:** • N/A **Relevant findings:** *Total visits to the Café:* 264 *Reduced suicidal ideation:* 29 *Other outcomes:* improved coping strategies (n=121), reduced social isolation (n=73), reduced self-harm (n=13), improved daily living skills (n=13), increased crisis management strategies (n=12), averted statutory police intervention (n=2)

	Number of locations: 1	
Lockley et al. (2014) **(Academic)**	**Type(s) of location:** Cliff or other natural height **Type(s) of intervention:** Increasing opportunity for third-party intervention; increasing opportunity for help seeking **Country of intervention:** Australia **Study aim:** To document the project as a case study to provide guidance for others who might be undertaking similar exercises in other parts of Australia or overseas **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** Crisis telephones: not reported; written materials related to requests for live viewing of footage from CCTV cameras: 02/2010–12/2012; death data: 2001–2011; police call-out data: 01/2006–12/2012 **Intervention start date:** Crisis telephones, signs, and CCTV: 02/2010; landscaping work: 07/2011 **Data collection methods:** Crisis telephones: not reported; written materials related to requests for live viewing of footage from CCTV cameras: the firm King's Security; death data: the National Coroners Information System (ICD-10 codes and/or "intent" column registered as intentional self-harm used to determine suicide as cause of death); police call-out data: Rose Bay Police **Location characteristics:** Gap Park, a coastal escarpment area of approx. 4.7 hectares; suicides by jumping recorded since the 1800s **Number of interventions:** 5 **Intervention characteristics:** 1) 2 crisis telephones; 2) 2 signs with the Lifeline number and a message encouraging hope or promoting action; 3) CCTV cameras; 4) landscaping work: new main entrance, improved seating, lighting, tourist information displays; 5) 1.3m-high fence along the clifftops with sensors that alert the security monitoring service and the police (information on sensors from Ross 2020) **Organisation(s) delivering intervention(s):** Woollahra Municipal Council, New South Wales Police, the Black Dog Institute, Lifeline, Security Consultants International, private security company King's Security, Thompson Berrill Landscape Design **Number of locations:** 1	**Outcomes of interest & outcome measures:** • Jumping incidents • Confirmed suicides • Police call-outs **Control variables:** NA **Relevant findings:** *Trend in jumping incidents 2006–2012:* estimated annual percentage change (EAPC)=-2.61%, 95% CI -21.1–20.2; *p*=.760) *Trend in confirmed suicides 2001–2011:* EAPC=6.71%, 95% CI -2.5–16.8; *p*=.137) *Police call-outs related to individuals located at or approaching Gap Park 2006–2012:* EAPC=16.04%, 95% CI 7.1–25.7; *p*=.005). *Police call-outs when individual was located over the fence 2006–2012:* EAPC=-0.89%, 95% CI -22.1–26.0; *p*=.927. *Crisis line:* No numeric data, but it is suggested that in a small number of cases, the telephones have played an important role, either by enabling bystanders to directly summon help or through use by the suicidal person themselves.
Matsubayashi et al. (2014) **(Academic)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention**: Creating a calming atmosphere **Country of intervention:** Japan **Study aim:** To test whether the substitution phenomenon exists in the case of railway and metro suicides **Study design:** Quantitative (quasi-experimental)	**Outcomes of interest & outcome measures:** • Number of suicides • Displacement to other similar nearby locations **Control variables:** • Number of passengers • City population size

	Comparison: Stations next to the blue light station; stations 2–5 stops away; stations with no blue light stations within 5 neighbouring stations **Timeframe for the data:** 04/2000–03/2014 **Intervention start date:** At 1 station in 2008, another 4 in 2009, 6 in 2010, 1 in 2011, 0 in 2012, 2 in 2013 **Data collection methods:** Railway company data **Location characteristics:** Railway platforms **Number of interventions:** 1 **Intervention characteristics:** Blue lights were installed at the edges of the platforms; at some stations also in the middle of the platform; lights are on from sunset to sunrise **Organisation(s) delivering intervention(s):** Railway company **Number of locations:** 71	• Types of platforms • Macroeconomic conditions (unspecified) **Relevant findings:** Average number of suicides per year *At stations with blue lights:* 0.435 pre-intervention, 0.189 post-intervention *One station away:* 0.269 pre-intervention, 0.274 post-intervention *Two stations away:* 0.234 pre-intervention, 0.269 post-intervention *Three stations away:* 0.275 pre-intervention, 0.275 post-intervention *Four stations away:* 0.245 pre-intervention, 0.266 post-intervention *Five stations away:* 0.259 pre-intervention, 0.245 post-intervention *Six or more stations away:* 0.090 total Estimated effect of blue lights on the number of suicides *At stations with blue lights: B*=-1.356, *p*<.01; IRR=0.258 (95% CI 0.127–0.523), i.e. -74% (95% CI 48–87%) *One station away: B*=0.526, *p*>.01 *Two stations away: B*=0.379, *p*>.01 *Three stations away: B*=0.438, *p*>.01 *Four stations away: B*=0.040, *p*>.01 *Five stations away: B*=-0.201, *p*>.01
Network Rail (2018), Network Rail (2019), Network Rail (2020), Network Rail (2024a), Network Rail (2024b) **(Grey)** **Additional information from https://www.networkrailmediacentre.co.uk/news/network-rail-encourages-public-to-make-a-**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** UK **Study aim:** To reduce rail suicide and vulnerable presentations **Study design:** Quantitative (routine data collection) **Comparison:** N/A **Timeframe for the data:** 2016/17, 2017/18, 2018/19, 2019/20, 2023/24 **Intervention start date:** Staff training: not reported; Small Talk Saves Lives: November 2017 **Data collection methods:** Administrative data **Location characteristics:** Railway stations **Number of interventions:** 2 in focus but multiple other interventions were happening across the network at the same time **Intervention characteristics:** Training in suicide prevention techniques to enable railway employees and stakeholders to identify and support those who come to the railway in emotional crisis; “Small Talk Saves Lives”, a bystander campaign that encourages people travelling on the railway to support those who may be in emotional crisis around them **Organisation(s) delivering intervention(s):** Network Rail, Samaritans, British Transport Police **Number of locations:** Not reported	**Outcomes of interest & outcome measures:** • Number of suicides • Interventions to prevent suicide attempts **Control variables:** N/A **Relevant findings:** *Completed suicides:* 237 in 2016/17, 246 in 2017/18, 271 in 2018/19, 283 in 2019/20, 276 in 2023/24. *Interventions by police, rail staff, and the public to prevent suicide attempts:* 1,592 in 2016/17, 1,711 in 2017/18, 2,270 in 2018/19 (22% by rail staff and 9% by the public), >2,000 (exact number not reported) in 2019/20, 1,937 in 2023/24. *Staff trained to make interventions to support those in emotional crisis:* >20,000 (exact number not reported) by 2020.

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Ngo et al. (2022) **(Academic)**	**Type(s) of location:** Railway or underground station; railway tracks **Type(s) of intervention:** Intervention initiated by bystanders **Country of intervention:** Australia **Study aim:** To investigate the prevalence of preventative actions by bystanders; the relationship between first-hand preventions by bystanders and the degree of ambiguity around the imminence of danger; the nature of first-hand preventions by bystanders **Study design:** Quantitative (cross-sectional) **Comparison:** N/A **Timeframe for the data:** 2011–2019 **Intervention start date:** N/A **Data collection methods:** Railway security reporting database **Location characteristics:** Platforms, tracks near platforms, tracks not at platforms, other (e.g., level crossing) within heavy rail networks (Sydney metropolitan network and regional New South Wales network) **Number of interventions:** 1 **Intervention characteristics:** Bystanders, rail personnel at stations, other rail personnel, emergency services, and others intervening to prevent suicides and acting as first responders or reporters **Organisation(s) delivering intervention(s):** N/A **Number of locations:** 2	**Outcomes of interest & outcome measures:** • Number of interventions in suicide attempts **Control variables:** N/A **Relevant findings:** *Number of attempted suicide attempts (including non-train):* 984 *Number of suicide deaths involving trains:* 191 *Number of interventions in train suicide attempts:* 635 *Number of interventions in train suicide attempts by bystanders:* 139 *Number of interventions in train suicide attempts by bystanders as reporters:* 70 *Number of interventions in train suicide attempts by bystanders as first responders:* 69 (77% involved physical interaction; 49% involved more than one bystander)
O'Neill et al. (2021) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Suicide memorials or prevention messages other than crisis line signage **Country of intervention:** UK (England) **Study aim:** To compare incidents of suicidal behaviour at bridges before and after decorations were erected, and subsequent media reporting of decorations **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 2018 **Intervention start date:** 2018 **Data collection methods:** Linking three datasets from Highways England: dates when a decoration was placed, incident cases, media reports; incidents were considered proximal to a decoration if they occurred on the same bridge or within 300 m of the decoration location **Location characteristics:** Motorway bridges **Number of interventions:** 1	**Outcomes of interest & outcome measures:** • Suicidal behaviour **Control variables:** N/A **Relevant findings:** *Incidents of suicidal behaviour:* 160 total (93 pre-decoration, 56 post-decoration with no media coverage, 11 post-decoration with media coverage on the same bridge; χ^2 pre-post p=0.55) *Incident rate/day:* M=0.017 (SD=0.013) pre-decoration, M=0.014 (SD=0.014) post-decoration with no media; Mann Whitney U p=0.46 *Bridge-level data:* 15 had more incidents pre-decoration than post-decoration (Bonferroni corrected p>.05); 11 had more incidents post-decoration (p-value not reported), of which 1 had more incidents post-decoration and media reporting (4 pre-decoration and 11 post-decoration and post-media reporting; Bonferroni corrected p>.05)

	Intervention characteristics "decorations" defined as any message, memorial, or note placed on a bridge in an effort to deter someone from taking their own life and does not include official crisis-line signage; also considered media coverage of "decorations" **Organisation(s) delivering intervention(s):** Not an organisational intervention **Number of locations:** 26	
Owens et al. (2019) **(Academic)**	**Type(s) of location:** Bridge; railway or underground station; tall building; cliff or other natural height **Type(s) of intervention:** Intervention initiated by bystanders **Country of intervention:** UK **Study aim:** To identify the core components of an effective intervention by a member of the public **Study design:** Qualitative (thematic analysis) **Comparison:** N/A **Timeframe for the data:** N/A **Intervention start date:** N/A **Data collection methods:** Face-to-face, by telephone or Skype interviews with survivors that had been stopped from a suicide attempt in a public location and interveners (members of the public and staff in non-health agencies) **Location characteristics:** Rail/underground/bridge, over railway, Road network/bridge over, Road, High building, cliffs and other **Number of interventions:** 19 reported by survivors, 31 by interveners **Intervention characteristics:** "Bursting the bubble", e.g. by starting conversation; moving the person to a safer location; summoning help **Organisation(s) delivering intervention(s):** Members of public, (included students, teachers/lecturers, youth leaders, church and charity workers, civil servants, office workers and an actor) railway workers, highway officers (support from Network Rail, Highways England and bridge authorities) **Number of locations:** Not reported **Number of respondents:** 12 in the survivor group, 21 in the intervener group (13 members of the public; 6 railway workers, including 2 off-duty at the time; 2 highways officers)	**Outcomes of interest & outcome measures:** • Interventions in suicide attempts by bystanders **Control variables:** N/A **Relevant findings:** <u>Recognition</u> Recognition that a person is at risk is a pre-requisite for intervention. This can be because the person places themselves in physical danger or otherwise positions themselves oddly. <u>Three intervention tasks</u> The three main identified tasks were: 1) "bursting the bubble"; 2) moving to a safer location; 3) summoning help. Some interventions involved physical restraint, others asking permission before taking any action. Sometimes interveners stayed with the person for several hours until they were no longer at risk. Some enquired about someone who could be contacted, e.g. family or friends. Those survivors who had been asked about what brought them to the point of suicide said that they couldn't answer; others said they were glad they had not been asked. Keeping conversation "light" was helpful in some cases. <u>Endings and aftermath</u> Ending an intervention without a handover to services was difficult because the interveners did not always know if it was safe to leave the person. With handover, interveners sometimes had a feeling of exclusion, loss and fear of consequences for the person, especially when they were taken away in handcuffs or sectioned under the Mental Health Act. Some were left feeling disturbed.
Rail Safety and Standard Board (2020) **(Grey)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** UK **Study aim:** Not reported **Study design:** Quantitative (routine data collection) **Comparison:** NA **Timeframe for the data:** 07/2019 – approx. 08/2020	**Outcomes of interest & outcome measures:** • Prevented trespassing incidents • Crisis interventions • Displacement to other locations **Control variables:** N/A **Relevant findings:**

	Intervention start date: 07/2019 **Data collection methods:** Network Rail and South Western Railway administrative data **Location characteristics:** High-risk railway stations based on historical incident data **Number of interventions:** 1 **Intervention characteristics:** Trespass & Welfare Officers who had attended the Samaritans' Managing Suicidal Contacts course deployed at high-risk stations who provide a visible presence, support those that are deemed to be vulnerable, and, when safe to do so, make a physical intervention to avoid incidents **Organisation(s) delivering intervention(s):** Network Rail and South Western Railway **Number of locations:** 49 static locations and 48 mobile locations attended by 5 mobile teams	*Physical interventions where an individual was deterred from trespass and given assistance:* 20 *Crisis interventions (immediate and short-term emergency responses to mental, emotional, physical, and behavioural distress):* 130 Since the introduction of the intervention, there has been a displacement of suicide-related incidents from station platforms along the route to adjacent bridges.
Ross et al. (2020) **(Academic)**	**Type(s) of location:** Cliff or other natural height **Type(s) of intervention:** Increasing opportunity for third-party intervention; increasing opportunity for help seeking; physical means restriction with an extra element **Country of intervention:** Australia **Study aim:** To further understand the impact of combined suicide prevention initiatives **Study design:** Mixed methods: quantitative (pre-post) and qualitative (thematic analysis) **Comparison: N/A** **Timeframe for the data:** 2000–2016 **Intervention start date:** 2010–2011 **Data collection methods:** Suicide data: National Coronial Information System (NCIS) for cases closed by the coroner that occurred within the park's postcode and within the Gap Park Masterplan area; Qualitative data: face-to-face semi-structured interviews (03/2018–06/2018) with police officers trained in responding to suicidal individuals at the park **Location characteristics:** Gap Park, located on a coastal escarpment area **Number of interventions:** 5 **Intervention characteristics:** 1.3-meter fences with sensors that activate an alarm for the security monitoring service and alert police; CCTV; protocols with police; phone booths; promotion of the Lifeline Suicide Hot Spot Emergency Phone Service **Organisation(s) delivering intervention(s):** Woollahra Council in collaboration with several partners **Number of locations:** 1 **Number of respondents:** 8	**Outcomes of interest & outcome measures:** • Suicide deaths • Responding to a person in crisis • Reattempts • Impact on police officers **Control variables:** N/A **Relevant findings:** <u>Number of suicides with the intervention area (joinpoint analysis):</u> *All:* APC=5.41%, 95% CI 0.38–11.53, *p*=.07 *Males:* APC=6.23%, 95% CI 0.41–13.30, *p*=.06 *Females*: 2000–2010 APC=16.64%, 95% CI 8.18–25.76, *p*<.001, 2010–2016 APC=-21.27%, 95% CI -33.14–-7.30, *p*=.01 Similar trends within the park's postcode. <u>Responding to a person in a suicidal crisis</u> Police officers stressed that it is important not to problem-solve, but rather to apply a consequence management approach, i.e. talking to the individual about the consequences of their choices and trying to reconnect them back to their own life. <u>Reattempts</u> The importance of appropriate care after a person has been brought to safety was emphasised, as it was reported that many individuals reattempt. The importance of being genuine and not making false promises to the suicidal individual was highlighted, such as promising to solve child custody or legal issues, as a means to coaxing them back to safety. Officers highlighted the need to improve communication between emergency responders, hospital staff, and mental health teams to ensure the best possible outcomes.

		Types of interventions There was a consensus that while the fencing is not a strong deterrent to suicide, the CCTV and alarms are extremely effective in saving lives through detection and location of people attempting suicide. The fencing was considered relatively easy to climb and possibly more of a visual or psychological barrier, than a physical barrier. However, climbing the fence sets off sensors which activate an alarm for the security monitoring service and alerts police. One negative aspect is that following an intervention, individuals are aware that the CCTV and alarms will notify polices. For some this means if they cross the fence in future, they will jump immediately to avoid being intercepted. Personal impacts on police officers Officers described their stress and the extreme caution necessary to avoid saying anything that might inadvertently trigger the person to jump. The need to effectively apply communication techniques and to build a genuine rapport with the suicidal person was cited as critical. Police reported an enormous sense of responsibility to save the person's life, and anxiety about the scrutiny they may face if they failed. Some officers mentioned concerns about the legal ramifications of police losing someone to suicide. Officers described their own and other officers' distress at witnessing suicides and how recalling particular incidents (e.g., hearing a person's screams after jumping) can cause ongoing distress. Several officers mentioned that responding to a suicide intervention can be more personal for new recruits who are lacking in experience. Some officers believed there was a perception that asking for help could be interpreted negatively, both professionally and in terms of the stigma attached to mental health issues.
Shin et al. (2024a) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for third-party intervention; physical means restriction with an extra element **Country of intervention:** South Korea **Study aim:** To evaluate the effectiveness of structures that offer partial restriction of access to means on bridges; to inform practical recommendations for those seeking to secure bridges to prevent jumping suicides **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 01/01/2013–31/12/2020 (pre-intervention: 01/01/2013–31/12/2016, post-intervention: 01/01/2017–31/12/2020) **Intervention start date:** 31/12/2016 **Data collection methods:** From a book published by the Korean Foundation for Suicide Prevention, originally sourced from police investigation suicide reports	**Outcomes of interest & outcome measures:** • Number of suicides **Control variables:** N/A **Relevant findings:** *Number of suicides:* 140 (M=17.5 per year) total, 102 (M=25.5 per year) pre-intervention, 38 (M=9.5 per year) post-intervention; IRR=0.37, 95% CI 0.26–0.54

	Location characteristics: A bridge over a river that has ten vehicle lanes and footpaths on both sides that already had fixed phone boxes with direct access to a crisis line, CCTV, and signage with supportive messages **Number of interventions:** 2 **Intervention characteristics:** 1) A 1-metre fence over an existing 1.5-metre railing with 5 tension wire sensors that alert a rescue team if a wire is cut or pulled by more than 10 centimetres; 2) abacus-bead-shaped spinning rails on the top of the upper fence that prevent people gripping the top of the fence to climb over it **Organisation(s) delivering intervention(s):** Metropolitan government **Number of locations:** 1	
Shin et al. (2024b) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for third-party intervention; physical means restriction with an extra element **Country of intervention:** South Korea **Study aim:** To investigate whether a Video Incident Detection System (VIDS) and spinning bar barriers have an impact on suicidal behaviour on a bridge **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 01/07/2008–31/07/2022 (pre-intervention: 1/07/2008–31/12/2014, VIDS only: 01/01/2015–30/11/2017, VIDS and spinning bars: 01/12/2017–31/07/2022) **Intervention start date:** 01/01/2015 VIDS; 01/12/2017 spinning bars **Data collection methods:** Operation company records **Location characteristics:** A dual two-lane highway toll bridge over a bay with no pedestrian access; already had a 1-metre-high rail and CCTV **Number of interventions:** 2 **Intervention characteristics:** The VIDS is 14 speed sensors at 300-metre intervals on the bridge that warn the operation control team if the speed of a car is below 30 km/h; 1-metre high spinning bars over existing 1-metre guard rails **Organisation(s) delivering intervention(s):** Operating company **Number of locations:** 1	**Outcomes of interest & outcome measures:** • Suicidal acts where intervention occurred before jumping • Non-fatal suicide attempts by jumping • Suicide deaths by jumping **Control variables:** N/A **Relevant findings:** *All incidents (deaths and prevented):* 146 total (54 pre-intervention, 58 VIDS only, 34 VIDS and spinning bars) *Suicidal acts where intervention occurred before attempt (incidents per day):* 33 (0.023) pre-intervention, 46 (0.054) VIDS only, 29 (0.021) VIDS and spinning bars; VIDS only vs. pre-intervention IRR=2.40 (95% CI 1.65–3.47), VIDS and spinning bars vs. pre-intervention IRR=0.90 (95% CI 0.59–1.38), VIDS and spinning bars vs. VIDS only IRR=0.37 (95% CI 0.25–0.57) *Non-fatal suicide attempts:* <5 in each period *Suicide deaths (incident per day):* 20 (0.008) pre-intervention, 11 (0.010) VIDS only, <5 (0.002) VIDS and spinning bars; VIDS only vs. pre-intervention IRR=1.23 (95% CI 0.59–2.56); VIDS and spinning bars vs. pre-intervention IRR=0.28 (95% CI 0.10–0.82), VIDS and spinning bars vs. VIDS only IRR=0.23 (95% CI 0.07–0.71) *Proportion of suicidal acts that were intervened in:* 61.1% pre-intervention, 79.3% VIDS only, 85.3% VIDS and spinning bars
Sinyor et al. (2024) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Means restriction with an extra element **Country of intervention:** Canada **Study aim:** To test whether the barrier led to a longer-term reduction of suicides by jumping from any bridges in Toronto, and whether there was a substitution effect of suicide by other methods **Study design:** Quantitative (pre-post) **Comparison:** N/A	**Outcomes of interest & outcome measures:** • Suicide rates/incidences • Displacement to other similar nearby locations **Control variables:** • Monthly unemployment rate in Ontario • Consumer price index in Toronto • Population of Toronto

	Timeframe for the data: 04/1998–12/2020 **Intervention start date:** 07/2003 (lights installed 07/2015) **Data collection methods:** Suicide deaths: Office of the Chief Coroner of Ontario; monthly unemployment rate in Ontario and consumer price index in Toronto: Statistics Canada; population of Toronto: Canadian Census of Population **Location characteristics**: A Toronto viaduct that prior to the installation of the barrier had the second-highest yearly suicide counts of any bridge in North America **Number of interventions:** 1 **Intervention characteristics:** A 5-meter barrier that consists of thousands of thin steel rods spaced closely together and supported externally by an angled steel frame; since 2015 it includes lights that react to the wind and follow pre-programmed routines at sundown, sunrise, and midnight, and whose colours depend on the season **Organisation(s) delivering intervention(s):** Citywide initiative led by municipal authorities **Number of locations:** 1	**Relevant findings:** *Number of suicides on the viaduct:* 48 pre-intervention, 2 post-barrier installation *Association between the barrier and bridge-related suicide rates:* 49% step decrease in the next quarter; IRR=0.51, 95% CI 0.30–0.86 *Rebound in bridge-related suicides:* IRR=0.99, 95% CI 0.96–1.03) *Method substitution right after barrier construction*: IRR=1.04, 95% CI 0.90–1.20 *Method substitution long-term:* IRR=1.00, 95% CI 0.99–1.01 *Association between the barrier and bridge-related suicide rates in Ottawa:* IRR=0.50, 95% CI 0.26–1.01 *Rebound in bridge-related suicides in Ottawa:* IRR=0.98, 95% CI 0.93–1.04 *Association between the barrier and bridge-related suicide rates in Hamilton:* IRR= 1.17, 95% CI 0.44–3.43 *Rebound in bridge-related suicides in Hamilton:* IRR=1.06, 95% CI 0.99–1.14
Stack (2015) **(Academic)**	**Type(s) of location:** Bridge **Type(s) of intervention:** Increasing opportunity for help seeking **Country of intervention:** USA **Study aim:** Not reported **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 1954–2013 **Intervention start date:** 07/1999 **Data collection methods:** Suicide data: information from local newspapers, police reports, statements from survivors, friends of the deceased and witnesses, obituaries, court records, and Facebook pages of the deceased gathered by a local website; suicide rate in Florida: the Suicide Prevention Coalition and Florida State Department of Health **Location characteristics:** A 193 feet-tall traffic bridge across water without pedestrian walkways **Number of interventions:** 1 **Intervention characteristics:** 6 crisis phones with a direct link to a crisis centre counsellor **Organisation(s) delivering intervention(s):** Not reported **Number of locations:** 1	**Outcomes of interest & outcome measures:** • Number of suicides • Suicidal persons using crisis phones **Control variables:** • Suicide rate in Florida • City population size (not formally controlled) **Relevant findings:** *Short-term 2-year impact (1997–1998 vs 2000–2001):* −5.00 (SE=2.00) suicides per year; R^2=.758, *p*>.05 *Medium-term 7-year impact: 1992–1998 vs 2000–2006:* +1.71 (SE=1.83) suicides per year, R^2=.068, *p*>.05 *Long-term 13-year impact 1986–1998 vs 2000–2012:* +4.46 (SE=1.26) suicides per year, R^2=.341, *p*<.05 *Long-term 13-year impact 1986–1998 vs 2000–2012 with control for the Florida suicide rate:* +2.73 (SE=1.57) suicides per year, R^2=.418, *p*<.05 *Suicidal persons using crisis phones in first 10-year period:* 27 The number of suicides in Florida decreased during the study period. The city population decreased by 1.4% between 2000–2010.
Too et al. (2015) **(Academic)**	**Type(s) of location:** Railway or underground station; railway tracks **Type(s) of intervention:** Increasing opportunity for third-party intervention **Country of intervention:** Australia	**Outcomes of interest & outcome measures:** • Number of suicides **Control variables:** • Age

	Study aim: To examine how neighbourhood-level social, economic, and physical factors influence railway suicide while distinguishing between contextual (area characteristics) and compositional (individual risk) effects **Study design:** Quantitative (cross-sectional) **Comparison:** N/A **Timeframe for the data:** 01/01/2001–31/12/2012 **Intervention start date:** N/A **Data collection methods:** Railway suicide data: National Coronial Information System; population estimates: ABS Census; neighbourhood-level variables: railway regulators and operators **Location characteristics:** Railway stations and car parks **Number of interventions:** 1 **Intervention characteristics:** CCTV **Organisation(s) delivering intervention(s):** Not reported **Number of locations:** Not reported	• Sex • Social fragmentation • Index of economic resources • Train frequency • Number of stations in each postcode • Number of station patronage **Relevant findings:** *Association between the number of CCTV units (per 10 units) and risk of railway suicide (univariate):* IRR=1.04, 95% CI 1.01–1.07, *p*=.009 *Association between the number of CCTV units (per 10 units) and risk of railway suicide (multivariate):* IRR=0.93, 95% CI 0.88–0.98, *p*=.004
Too et al. (2020) **(Academic)**	**Type(s) of location:** Railway or underground station **Type(s) of intervention:** Increasing help-seeking **Country of intervention**: Australia **Study aim:** To measure the impact of the campaign on help-seeking intentions and help-seeking behaviours, the change in the proportion of calls to the Lifeline service for crisis support, and the change in the proportion/incidence rate of rail suicidal behaviours **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 12/2016–11/2018 **Intervention start date:** 12/2017 **Data collection methods:** Suicide attempts and deaths: railway operators; crisis calls: routinely collected Lifeline data; survey of railway commuters **Location characteristics**: 8 metropolitan and 2 regional stations **Number of interventions:** 1 **Intervention characteristics:** Posters and digital billboards showing the Lifeline crisis helpline number and the "Pause. Call. Be Heard" messages, digital billboards with a guided breathing exercise **Organisation(s) delivering intervention(s):** TrackSAFE Foundation, Lifeline Research Foundation **Number of locations:** Not reported	**Outcomes of interest & outcome measures:** • Suicide rates/incidents • Calls to the crisis line • Noticeability of the campaign **Control variables:** • Station patronage **Relevant findings:** <u>Suicidal incidents</u> *Suicidal incidents (% of patrons):* 58 (0.023%) pre-intervention, 51 (0.020%) post-intervention (IRR=0.88, 95% CI 0.59–1.30, *p*=.246) <u>Lifeline calls</u> *Lifeline crisis calls (% of all Lifeline calls):* 154,521 (75%) pre-intervention, 163,916 (79%) post-intervention (*p*<.001) *Lifeline calls identifying suicide as a safety issue (% of all Lifeline calls):* 27,070 (13.2%) pre-intervention, 26,526 (12.8%) post-intervention (*p*=.169) <u>Noticeability of the campaign (n=1,844 survey responders)</u> *Saw campaign materials*: 26% (13–48% across stations) *Saw Lifeline posters:* 22% *Saw digital billboards:* 3% *Saw both posters and digital billboards:* <2%
Torok et al. (2023) **(Academic)**	**Type(s) of location:** Cliff or other natural height **Type(s) of intervention:** Increasing opportunity for third-party intervention; increasing opportunity for help seeking **Country of intervention:** Australia	**Outcomes of interest & outcome measures:** • Suicide deaths • Displacement effect (immediate, local, and broader areas) • Method substitution

	Study aim: To compare the pre and post-intervention periods to identify if there is evidence of displacement of suicides from areas subject to physical means restriction activities in the immediate Gap Park Masterplan area to local and broader surrounding cliffs **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 2006–2019 (2006–2011 pre-intervention, 2012–2019 post-intervention) **Intervention start date:** 2010 to 2011 **Data collection methods:** Suicide data: National Coronial Information System (ICD-10 Australian Modification codes used to determine suicide as cause of death) **Location characteristics:** Coastline **Number of interventions:** 4 **Intervention characteristics:** 1) inwardly curved fence along the cliff edge at the main access point (with sensors that activate an alarm for the security monitoring service and alert police, according to Ross 2020); 2) help-seeking signage; 3) phones linked to the crisis service Lifeline, 4) CCTV **Organisation(s) delivering intervention(s):** Woollahra Municipal Council **Number of locations:** 1	• Distribution of suicides across the geographic or hotspot areas **Control variables:** N/A **Relevant findings:** <u>Displacement</u> *Immediate area:* 0 join points, APC=-1.95% (95% CI -6.9–3.3), *p*=.140 *Local area:* 0 join points, APC=6.81% (95% CI -4.6–19.5), *p*=.226 *Broader area:* 0 join points, APC=1.85% (95% CI -7.4–12.1), *p*=.683 Actual vs expected suicide count: *Immediate area:* 50 vs 46 pre-intervention, 52 vs 55 post-intervention, $\chi^2(1)$ =1.10, *p*=.18 *Local areal:* 10 vs 11 pre-intervention, 15 vs 13 post-intervention, $\chi^2(1)$ =0.31, *p*=.37 *Broader area:* 40 vs 42 pre-intervention, 54 vs 51 post-intervention, $\chi^2(1)$ =0.48, *p*=.29 <u>Method substitution</u> *Total jumping deaths in areas of interest:* 0 join points, APC=0.90% (95% CI -3.9–5.9), *p*=.695 *All suicide deaths in Sydney area:* 0 join points, APC=1.39% (95% CI 0.1–2.7), *p*=.037
Waalen et al. (2020) **(Academic)**	**Type(s) of location:** Tall building **Type(s) of intervention:** Increasing opportunity for help seeking **Country of intervention:** USA **Study aim:** To describe creative, low-cost suicide prevention interventions at a California university and their effect on local suicide hotspots **Study design:** Quantitative (pre-post) **Comparison:** N/A **Timeframe for the data:** 2000–2017 **Intervention start date:** Parking structures: banners, bungee cords in light wells in 11/2013, 06/2014, 05/2015, 03/2016, landscape improvement in 06/2014, 03/2015, helpline signs at the roof perimeter date not specified; Social Science area: planters/concrete bins in 2014; patio furniture and umbrellas in 2015; signs with the National Suicide Prevention Lifeline number date not specified **Data collection methods:** Suicide data: University Campus Police Department and Public Records Act Office; details of suicide interventions: interviews and/or email correspondence with Facilities Management's head of Building Safety Mitigation Project and Director of Transportation Services	**Outcomes of interest & outcome measures:** • Number of suicides **Control variables:** N/A **Relevant findings:** *Total number of suicides (Social Sciences area, parking structure, psychiatric facility, other main campus locations, ER waiting area):* 24 *Suicides in Social Science area:* 6 in 2002–2013, 2 in 2013, 1 in 2014, 0 in 2015–2016 *Suicides in parking structures:* 8 in 2002–2012, 2 in 2013, 0 in 2014–2016

	Location characteristics: University parking structures and Social Sciences area (various physical means restriction interventions, such as fence barriers, wire mesh screens, and awnings, were installed starting in 2013) **Number of interventions:** Unclear **Intervention characteristics:** Banners, bungee cords in light wells, landscape improvements, helpline signs at the roof perimeter in parking structures; planters/concrete bin, patio furniture and umbrellas; signs with the National Suicide Prevention Lifeline number in Social Science area **Organisation(s) delivering intervention(s):** University Facilities management and transportation services **Number of locations:** 1 university; exact number of buildings is unclear	

ABS Australian Bureau of statistics; AI Artificial intelligence; ANPR Automated Number Plate Recognition; APC annual percentage change; B Beta; BLE Bluetooth Low Energy; CCTV Closed circuit television; CI Confidence intervals; CPI Consumer Price Index; EAPC estimated annual percentage change; IQR Interquartile Range; IRR Incidence rate ratios; M Mean; MA CCTV Motion activated closed circuit television; N/A Not applicable; NCIS National Coronial Information System; SD Standard deviation; SE Standard error; SST smart surveillance technologies; TTC Toronto Transit Commission; VIDS Video Incident Detection System.

6.3 Quality appraisal

6.3.1 Summary of the critical appraisal of the pre-post studies

NHLBI Quality Assessment Tool for Before-After (Pre-Post) Studies With No Control Group	Chow 2024	Erlangsen 2023	Kolves 2023	Lee 2016	Lockley 2014	O'Neill 2021	Ross 2020	Shin 2024a	Shin 2024b	Sinyor 2024	Stack 2015	Too 2020	Torok 2023	Waalen 2020
1. Was the study question or objective clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
2. Were eligibility/selection criteria for the study population prespecified and clearly described?	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No	N/A	N/A
3. Were the participants in the study representative of those who would be eligible for the test/service/intervention in the general or clinical population of interest?	Yes	CD	CD	Yes	Yes	No	Yes	CD	No	Yes	No	Yes	Yes	Yes
4. Were all eligible participants that met the prespecified entry criteria enrolled?	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5. Was the sample size sufficiently large to provide confidence in the findings?	CD	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No	No
6. Was the test/service/intervention clearly described and delivered consistently across the study population?	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
7. Were the outcome measures prespecified, clearly defined, valid, reliable, and assessed consistently across all study participants?	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
8. Were the people assessing the outcomes blinded to the participants' exposures/interventions?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9. Was the loss to follow-up after baseline 20% or less? Were those lost to follow-up accounted for in the analysis?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10. Did the statistical methods examine changes in outcome measures from before to after the intervention? Were statistical tests done that provided p values for the pre-to-post changes?	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
11. Were outcome measures of interest taken multiple times before the intervention and multiple times after the intervention (i.e., did they use an interrupted time-series design)?	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No
12. If the intervention was conducted at a group level (e.g., a whole hospital, a community, etc.) did the statistical analysis take into account the use of individual-level data to determine effects at the group level?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Overall rating	**Good**	**Poor**	**Fair**	**Poor**	**Fair**	**Poor**	**Fair**	**Fair**	**Fair**	**Good**	**Poor**	**Poor**	**Fair**	**Poor**

CD = Cannot be determined; N/A = Not applicable.

6.3.2 Summary of the critical appraisal of the cross-sectional studies

JBI Critical Appraisal Checklist For Analytical Cross Sectional Studies	Joyner 2024a	Ngo 2022	Too 2015
1. Were the criteria for inclusion in the sample clearly defined?	Yes	Yes	Yes
2. Were the study subjects and the setting described in detail?	Yes	Yes	Yes
3. Was the exposure measured in a valid and reliable way?	N/A	N/A	N/A
4. Were objective, standard criteria used for measurement of the condition?	N/A	N/A	N/A
5. Were confounding factors identified?	Yes	No	Yes
6. Were strategies to deal with confounding factors stated?	No	No	Yes
7. Were the outcomes measured in a valid and reliable way?	Yes	Yes	Yes
8. Was appropriate statistical analysis used?	Yes	Yes	Yes
Overall rating	**Fair**	**Fair**	**Good**

6.3.3 Summary of the critical appraisal of the quasi-experimental study

JBI Checklist for Quasi-Experimental Studies	Matsubayashi 2014
1. Is it clear in the study what is the “cause” and what is the “effect” (i.e. there is no confusion about which variable comes first)?	Yes
2. Was there a control group?	Yes
3. Were participants included in any comparisons similar?	Unclear
4. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes
5. Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	Yes
6. Were the outcomes of participants included in any comparisons measured in the same way?	Yes
7. Were outcomes measured in a reliable way?	No
8. Was follow-up complete and if not, were differences between groups in terms of their follow-up adequately described and analysed?	N/A
9. Was appropriate statistical analysis used?	No
Overall rating	**Fair**

6.3.4 Summary of the critical appraisal of the qualitative studies

JBI Critical Appraisal Checklist for Qualitative Research	Joyner 2024a	Katsampa 2022	Owens 2019	Ross 2020
1. Is there congruity between the stated philosophical perspective and the research methodology?	Unclear	Unclear	Unclear	Unclear
2. Is there congruity between the research methodology and the research question or objectives?	Yes	Yes	Yes	Yes
3. Is there congruity between the research methodology and the methods used to collect data?	Yes	Yes	Yes	Yes
4. Is there congruity between the research methodology and the representation and analysis of data?	Yes	Yes	Yes	Yes
5. Is there congruity between the research methodology and the interpretation of results?	Yes	Yes	Yes	Yes
6. Is there a statement locating the researcher culturally or theoretically?	No	No	No	No
7. Is the influence of the researcher on the research, and vice-versa, addressed?	Unclear	No	Unclear	No
8. Are participants, and their voices, adequately represented?	Yes	Yes	Yes	Yes
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Yes	Yes	Yes	Yes
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	Yes	Yes	Yes	Yes
Overall rating	**Fair**	**Fair**	**Fair**	**Fair**

7. ADDITIONAL INFORMATION

7.1 Information available on request

There is no additional information to be provided on request.

7.2 Conflicts of interest

The authors declare they have no conflicts of interest to report.

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- Susie Heywood, Suicide Prevention Implementation Support Lead, Public Health Scotland
- Nathan Davies, Health and Care Research Wales Evidence Centre Public Partnership Group member

8. APPENDIX

8.1 APPENDIX 1: Database search strategies

Ovid MEDLINE(R) ALL <1946 to October 29, 2024>

#	Query	Hits
1	suicide/ or suicidal ideation/ or suicide, attempted/ or suicide, completed/	68535
2	suicid*.ti,ab,kw.	104831
3	((tak* or took or end*) adj2 (own adj1 (life or lives))).ti,ab,kw.	272
4	(kill* adj1 (hersel* or himsel* or themsel* or onesel*)).ti,ab,kw.	521
5	or/1-4	118392
6	(building* or multistor* or multi-stor* or skyscraper* or high-rise* or heritage site* or castl*).ti,ab,kw.	181621
7	(flyover* or overpass* or motorway* or highway* or carriageway* or freeway* or road*).ti,ab,kw.	81899
8	(train or trains or traintrack* or rail or railtrack* or railway* or railroad* or metro or underground* or subway* or the tube).ti,ab,kw.	263725
9	(beach* or cliff* or river* or lake* or sea or canal* or reservoir* or viaduct* or coast*).ti,ab,kw.	497955
10	(car park* or carpark* or parking*).ti,ab,kw.	2269
11	bridge*.ti,ab,kw.	132511
12	((suicide adj3 location*) or hotspot* or hot spot* or high incidence location* or location* of concern).ti,ab,kw.	51682
13	(monument* or tourist site* or woodland* or park or parks or aqueduct* or balcony or balconies or shopping centre* or shopping center* or mall or malls or arcade* or roof* or water* or shore* or quarry or quarries or waste ground or playground* or pier*).ti,ab,kw.	1184657
14	(magnet or iconic or public space* or public place* or frequently used location*).ti,ab,kw.	24167
15	exp Architecture/	27736
16	Environment Design/	7480
17	or/6-16	2246395
18	Suicide Prevention/	11915
19	Crisis Intervention/	6381
20	(prevent* or reduc* or address* or manag* or interrup* or restrict* or interven* or lower* or surveil* or barrier* or help* or support* or respon* or rescue* or plan* or infrastructur* or monitor* or agenc* or chang*).ti,ab,kw.	17689629
21	(fenc* or parapet* or net* or pit* or sign* or poster* or helpline* or surveillance* or CCTV* or patrol* or media or reporting* or television* or radio* or mural* or artwork* or message* or technolog* or social media or campaign* or training or access* or planting* or spike* or roller bar* or lighting* or Artificial Intelligence or changing perception* or community awareness).ti,ab,kw.	13385027
22	18 or 19 or 20 or 21	22110594
23	5 and 17 and 22	2899
24	limit 23 to english language	2661
25	limit 24 to yr="2000 -Current"	2360
26	limit 25 to yr="2014 -Current"	1650

APA PsycInfo <1806 to October 2024 Week 4>

#	Query	Hits
1	exp Attempted Suicide/ or exp Suicide/ or exp Suicidal Ideation/ or exp Suicidal Behavior/	49943
2	suicid*.tw.	84111
3	((tak* or took or end*) adj2 (own adj1 (life or lives))).tw.	357
4	(kill* adj1 (hersel* or himsel* or themsel* or onesel*)).tw.	704
5	or/1-4	84724
6	(building* or multistor* or multi-stor* or skyscraper* or high-rise* or heritage site* or castl*).tw.	89455
7	(flyover* or overpass* or motorway* or highway* or carriageway* or freeway* or road*).tw.	24382
8	(train or trains or traintrack* or rail or railtrack* or railway* or railroad* or metro or underground* or subway* or the tube).tw.	28617
9	(beach* or cliff* or river* or lake* or sea or canal* or reservoir* or viaduct* or coast*).tw.	26716
10	(car park* or carpark* or parking*).tw.	872
11	bridge*.tw.	24813
12	((suicide adj3 location*) or hotspot* or hot spot* or high incidence location* or location* of concern).tw.	2045
13	(monument* or tourist site* or woodland* or park or parks or aqueduct* or balcony or balconies or shopping centre* or shopping center* or mall or malls or arcade* or roof* or water* or shore* or quarry or quarries or waste ground or playground* or pier*).tw.	67859
14	(magnet or iconic or public space* or public place* or frequently used location*).tw.	7269
15	exp Architecture/	2988
16	6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15	260497
17	exp Suicide Prevention/	7024
18	exp Crisis Intervention/	11778
19	(prevent* or reduc* or address* or manag* or interrup* or restrict* or interven* or lower* or surveil* or barrier* or help* or support* or respon* or rescue* or plan* or infrastructur* or monitor* or agenc* or chang*).tw.	3519833
20	(fenc* or parapet* or net* or pit* or sign* or poster* or helpline* or surveillance* or CCTV* or patrol* or media or reporting* or television* or radio* or mural* or artwork* or message* or technolog* or social media or campaign* or training or access* or planting* or spike* or roller bar* or lighting* or Artificial Intelligence or changing perception* or community awareness).tw.	2264035
21	17 or 18 or 19 or 20	4177652
22	5 and 16 and 21	2528
23	limit 22 to english language	2373
24	limit 23 to yr="2014 -Current"	1319

SCOPUS 30/10/2024

#	Query	Hits
	(EXCLUDE (DOCTYPE , "ch") OR EXCLUDE (DOCTYPE , "bk") OR EXCLUDE (DOCTYPE , "no") OR EXCLUDE (DOCTYPE , "ed") OR EXCLUDE (DOCTYPE , "cr") OR EXCLUDE (DOCTYPE , "le"))	2,869
6	PUBYEAR > 2013 AND PUBYEAR < 2026	3,258
5	LIMIT-TO (LANGUAGE , "English")	5,164
4	1 AND 2 AND 3	5,628
3	TITLE-ABS-KEY (prevent* OR reduc* OR address* OR manag* OR interrup* OR restrict* OR interven* OR lower* OR surveil* OR barrier* OR help* OR support* OR respon* OR rescue* OR plan* OR infrastructur* OR monitor* OR agenc* OR chang* OR fenc* OR parapet* OR net* OR pit* OR sign* OR poster* OR helpline* OR surveillance* OR CCTV* OR patrol* OR media OR reporting* OR television* OR radio* OR mural* OR artwork* OR message* OR technolog* OR “social media” OR campaign* OR training OR access* OR planting* OR spike* OR “roller bar*” OR lighting* OR “Artificial Intelligence” OR “changing perception*” OR “community awareness”)	60,619,984
2	TITLE-ABS-KEY (roof* OR water* OR shore* OR quarry OR quarries OR "waste ground" OR playground* OR pier* OR magnet OR iconic OR "public space*" OR "public place*" OR "frequently used location*" OR building* OR multistor* OR multi-stor* OR skyscraper* OR high-rise* OR "heritage site*" OR castl* OR flyover* OR overpass* OR motorway* OR highway* OR carriageway* OR freeway* OR road* OR train OR trains OR traintrack* OR rail OR railtrack* OR railway* OR railroad* OR metro OR underground* OR subway* OR "the tube" OR beach* OR cliff* OR river* OR lake* OR sea OR canal* OR reservoir* OR viaduct* OR coast* OR "car park*" OR carpark* OR parking* OR bridge* OR (suicide W/3 location*) OR hotspot* OR "hot spot*" OR "high incidence location*" OR "location* of concern" OR monument* OR "tourist site*" OR woodland* OR park OR parks OR aqueduct* OR balcony OR balconies OR "shopping centre*" OR "shopping center*" OR mall OR malls OR arcade*)	10,885,193
1	TITLE-ABS-KEY ((((kill*) W/1 (hersel* OR himsel* OR themsel* OR onesel*)))) OR TITLE-ABS-KEY ((tak* OR took OR end*) W/2 (own W/1 (life OR lives))) OR (TITLE-ABS-KEY (suicid*))	194,208

Proquest: Social Science Database, Sociology Collection 30/10/2024

#	Query	Hits
S1	title(suicid*) OR abstract(suicid*)	40,757
S2	title(kill* NEAR/1 (hersel* OR himsel* OR themsel* OR onesel*)) OR abstract(kill* NEAR/1 (hersel* OR himsel* OR themsel* OR onesel*))	444
S3	title((tak* OR took OR end*) NEAR/1 ("own life" OR "own lives")) OR abstract((tak* OR took OR end*) NEAR/1 ("own life" OR "own lives"))	240
S4	[S1] OR [S2] OR [S3]	40,959
S5	title(roof* OR water* OR shore* OR quarry OR quarries OR "waste ground" OR playground* OR pier* OR magnet OR iconic OR "public space*" OR "public place*" OR "frequently used location*" OR building* OR multistor* OR multi-stor* OR skyscraper* OR high-rise* OR "heritage site*" OR castl* OR flyover* OR overpass* OR motorway* OR highway* OR carriageway* OR freeway* OR road* OR train OR trains OR traintrack* OR rail OR railtrack* OR railway* OR railroad* OR metro OR underground* OR subway* OR "the tube" OR beach* OR cliff* OR river* OR lake* OR sea OR canal* OR reservoir* OR viaduct* OR coast* OR "car park*" OR carpark* OR parking* OR bridge* OR (suicide NEAR/3 location*) OR hotspot* OR "hot spot*" OR "high incidence location*" OR "location* of concern" OR monument* OR "tourist site*" OR woodland* OR park OR parks OR aqueduct* OR balcony OR balconies OR "shopping centre*" OR "shopping center*" OR mall OR malls OR arcade*) OR abstract(roof* OR water* OR shore* OR quarry OR quarries OR "waste ground" OR playground* OR pier* OR magnet OR iconic OR "public space*" OR "public place*" OR "frequently used location*" OR building* OR multistor* OR multi-stor* OR skyscraper* OR high-rise* OR "heritage site*" OR castl* OR flyover* OR overpass* OR motorway* OR highway* OR carriageway* OR freeway* OR road* OR train OR trains OR traintrack* OR rail OR railtrack* OR railway* OR railroad* OR metro OR underground* OR subway* OR "the tube" OR beach* OR cliff* OR river* OR lake* OR sea OR canal* OR reservoir* OR viaduct* OR coast* OR "car park*" OR carpark* OR parking* OR bridge* OR (suicide NEAR/3 location*) OR hotspot* OR "hot spot*" OR "high incidence location*" OR "location* of concern" OR monument* OR "tourist site*" OR woodland* OR park OR parks OR aqueduct* OR balcony OR balconies OR "shopping centre*" OR "shopping center*" OR mall OR malls OR arcade*)	324,227
S6	title(prevent* OR reduc* OR address* OR manag* OR interrup* OR restrict* OR interven* OR lower* OR surveil* OR barrier* OR help* OR support* OR respon* OR rescue* OR plan* OR infrastructur* OR monitor* OR agenc* OR chang* OR fenc* OR parapet* OR net* OR pit* OR sign* OR poster* OR helpline* OR surveillance* OR CCTV* OR patrol* OR media OR reporting* OR television* OR radio* OR mural* OR artwork* OR message* OR technolog* OR “social media” OR campaign* OR training OR access* OR planting* OR spike* OR “roller bar*” OR lighting* OR “Artificial Intelligence*” OR “changing perception*” OR “community awareness”) OR abstract(prevent* OR reduc* OR address* OR manag* OR interrup* OR restrict* OR interven* OR lower* OR surveil* OR barrier* OR help* OR support* OR respon* OR rescue* OR plan* OR infrastructur* OR monitor* OR agenc* OR chang* OR fenc* OR parapet* OR net* OR pit* OR sign* OR poster* OR helpline* OR surveillance* OR CCTV* OR patrol* OR media OR reporting* OR television* OR radio* OR mural* OR artwork* OR message* OR technolog* OR “social media” OR campaign* OR training OR “human intervention*” OR access* OR planting* OR spike* OR “roller bar*” OR lighting* OR “Artificial Intelligence” OR “changing perception*” OR “community awareness”)	2,957,665
S7	[S4] AND [S5] AND [S6]	974
S8	[S4] AND [S5] AND [S6] Limited to English language	943
S9	[S4] AND [S5] AND [S6] Limited to publication date (20140101-20241030)	438

Cochrane 30/10/2024

#	Query	Hits
#1	MeSH descriptor: [Suicide] explode all trees	2212
#2	(suicid*):ti,ab,kw	9090
#3	(kill* NEAR/1 (hersel* or himsel* or themsel* or onesel*)):ti,ab,kw	13
#4	((tak* or took or end*) NEAR/2 (own NEAR/1 (life or lives))):ti,ab,kw	11
#5	#1 OR #2 OR #3 OR #4	9092
#6	(roof* OR water* OR shore* OR quarry OR quarries OR "waste ground" OR playground* OR pier* OR magnet OR iconic OR building* OR multistor* OR multi stor* OR skyscraper* OR high rise* OR castl* OR flyover* OR overpass* OR motorway* OR highway* OR carriageway* OR freeway* OR road* OR train OR trains OR traintrack* OR rail OR railtrack* OR railway* OR railroad* OR metro OR underground* OR subway* OR "the tube" OR beach* OR cliff* OR river* OR lake* OR sea OR canal* OR reservoir* OR viaduct* OR coast* OR carpark* OR parking* OR bridge* OR hotspot OR monument* OR woodland* OR park OR parks OR aqueduct* OR balcony OR balconies OR mall OR malls OR arcade*):ti,ab,kw	91128
#7	(Public NEXT space*):ti,ab,kw	101
#8	(frequently NEXT used NEXT location*):ti,ab,kw	0
#9	(heritage NEXT site*):ti,ab,kw	0
#10	(car NEXT park*):ti,ab,kw	6
#11	(hot NEXT spot*):ti,ab,kw	258
#12	(high NEXT incidence NEXT location*):ti,ab,kw	0
#13	(location* NEXT of NEXT concern):ti,ab,kw	0
#14	(Tourist NEXT site*):ti,ab,kw	1
#15	(shopping NEXT centre*):ti,ab,kw	7
#16	(shopping NEXT center*):ti,ab,kw	11
#17	(suicide NEAR/2 location OR suicide NEAR/2 locations):ti,ab,kw	0
#18	OR 6-16	91424
#19	(roller NEXT bar*):ti,ab,kw	3
#20	(changing NEXT perception*):ti,ab,kw	38
#21	(prevent* OR reduc* OR address* OR manag* OR interrup* OR restrict* OR interven* OR lower* OR surveil* OR barrier* OR help* OR support* OR respon* OR rescue* OR plan* OR infrastructur* OR monitor* OR agenc* OR chang* OR fenc* OR parapet* OR net* OR pit* OR sign* OR poster* OR helpline* OR surveillance* OR CCTV* OR patrol* OR media OR reporting* OR television* OR radio* OR mural* OR artwork* OR message* OR technolog* OR “social media” OR campaign* OR training OR access* OR planting* OR spike* OR lighting* OR "artificial intelligence" OR “community awareness”):ti,ab,kw	1799367
#22	OR #19-#21	1799367
#23	#5 AND #18 AND #22	423
#24	#5 AND #18 AND #22 with Cochrane Library publication date Between Jan 2014 and Nov 2024	407

N.B. One is an editorial that is not relevant and wasn’t exported

Overton 27/11/2024

(suicid* AND ("public place" OR "public places" OR “public space” OR “public spaces” OR “public location” OR “public locations” OR “high incidence location” OR “high incidence locations”)) OR (“suicide location” OR “suicide locations” OR “location of concern” OR “locations of concern” OR “location suicide”~3 OR “location suicides”~3 OR “locations suicide”~3 OR “locations suicides”~3)

Published since 2014. Location: UK. Sorted by relevance.

8.2 APPENDIX 2: Searched websites

- All On Board https://allonboard.org.uk/
- British Transport Police https://www.btp.police.uk/
- Cadw https://cadw.gov.wales/
- Campaign Against Living Miserably (CALM) https://www.thecalmzone.net/
- Chasing the stigma https://www.chasingthestigma.co.uk/
- Harmless (The centre of Excellence for self-harm and suicide prevention) https://harmless.org.uk/
- Health and Safety Executive (Ireland) https://www.hse.ie
- Highways England https://highwaysengland.co.uk/
- Historic England https://historicengland.org.uk/
- Historic Environment Scotland https://www.historicenvironment.scot/
- Historic Royal Palaces http://www.hrp.org.uk/
- International Institute for Environment and Development https://www.iied.org/
- Joseph Rowntree Foundation https://www.jrf.org.uk/
- Local Government Association https://www.local.gov.uk/
- Mental Health Foundation https://www.mentalhealth.org.uk/
- MIND https://harmless.org.uk/
- National Centre for Social Research https://natcen.ac.uk/
- National Institute of Economic and Social Research https://niesr.ac.uk/
- National Suicide Prevention Alliance https://nspa.org.uk/
- Network Rail https://www.networkrail.co.uk/
- New Local https://www.newlocal.org.uk/
- NICE http://www.nice.org.uk/
- Nuffield Foundation https://www.nuffieldfoundation.org/
- Office of Health Economics https://www.ohe.org/
- Papyrus (prevention of young suicide) https://www.papyrus-uk.org/
- Public Health Agency (Northern Ireland) https://www.publichealth.hscni.net/
- Public Health Intervention Responsive Studies Teams (PHIRST) https://phirst.nihr.ac.uk/
- Public Health Scotland https://publichealthscotland.scot/
- Public Health Wales https://phw.nhs.wales/
- Rail Safety and Standards Board https://www.rssb.co.uk/
- Rail Suicide Prevention https://railsuicideprevention.co.uk/
- RESTRAIL https://www.restrail.eu/
- RAND https://www.rand.org/
- Royal College of Psychiatrists www.rcpsych.ac.uk/
- Royal Life Saving Society https://www.rlss.org.uk/
- Samaritans https://www.samaritans.org/
- Suicide prevention UK https://www.spuk.org.uk
- Tavistock Institute of Human Relations https://www.tavinstitute.org/
- The British Psychological Society (BPS) https://www.bps.org.uk/
- TRL https://www.trl.co.uk/
- UK government https://www.gov.uk/
- University of Glasgow Suicide Behaviour Research Laboratory https://suicideresearch.info/
- Wales Centre for Public Policy https://www.wcpp.org.uk/
- Water Safety Scotland https://www.watersafetyscotland.org.uk/
- Welsh Government https://www.gov.wales/
- What Works Wellbeing https://whatworkswellbeing.org/

8.3 APPENDIX 3: Identified systematic reviews

- Barker E, Kolves K, De Leo D. (2017). Rail-suicide prevention: Systematic literature review of evidence-based activities. Asia Pac Psychiatry. 9(3). doi: 10.1111/appy.12246
- Chamberlain B, Woodnutt S. (2024). Preventing suicide by jumping in public locations: a systematic review of interventions. Mental Health Practice. 27(3): 24-30. doi: 10.7748/mhp.2024.e1681
- Grabušić S, Barić D. (2023). A Systematic Review of Railway Trespassing: Problems and Prevention Measures. Sustainability (Switzerland). 15(18). doi: 10.3390/su151813878
- Havârneanu GM, Burkhardt JM, Paran F. (2015). A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents. Accid Anal Prev. 81: 30-50. doi: 10.1016/j.aap.2015.04.012
- Hoffberg AS, Stearns-Yoder KA, Brenner LA. (2020). The Effectiveness of Crisis Line Services: A Systematic Review. Frontiers in Public Health. 7. doi: 10.3389/fpubh.2019.00399
- Mishara BL, Bardon C. (2016). Systematic review of research on railway and urban transit system suicides. Journal of affective disorders. 193: 215-26. doi: https://dx.doi.org/10.1016/j.jad.2015.12.042
- Niederkrotenthaler T, Braun M, Pirkis J, et al. (2020). Association between suicide reporting in the media and suicide: Systematic review and meta-analysis. The BMJ. 368. doi: 10.1136/bmj.m575
- Okolie C, Hawton K, Lloyd K, et al. (2020a). Means restriction for the prevention of suicide on roads. Cochrane Database Syst Rev. 9(9): CD013738. doi: 10.1002/14651858.CD013738
- Okolie C, Wood S, Hawton K, et al. (2020b). Means restriction for the prevention of suicide by jumping. Cochrane Database Syst Rev. 2(2): CD013543. doi: 10.1002/14651858.CD013543
- Pirkis J, Too LS, Spittal MJ, et al. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. Lancet Psychiatry. 2(11): 994-1001. doi: 10.1016/S2215-0366(15)00266-7
- Public Health Scotland. (2022). Rapid literature review in reducing suicides at locations of concern.
- Radun I, Kannan P, Partonen T, et al. (2024). A systematic review of road traffic suicides: Do we know enough to propose effective preventive measures? Transportation Research Part F: Traffic Psychology and Behaviour. 106: 14-26. doi: 10.1016/j.trf.2024.07.028
- Too LS, Milner A, Bugeja L, et al. (2014). The socio-environmental determinants of railway suicide: a systematic review. BMC public health. 14: 20. doi: https://dx.doi.org/10.1186/1471-2458-14-20
- Zalsman G, Hawton K, Wasserman D, et al. (2016). Suicide prevention strategies revisited: 10-year systematic review. The lancet. Psychiatry. 3(7): 646-59. doi: https://dx.doi.org/10.1016/S2215-0366(16)30030-X

8.4 APPENDIX 4: Studies excluded at full-text screening

Reference	Reason for exclusion
Database searches	
(2020-11-24 2020). Another Suicide Intervention by Lake in the Hills Police. Available at: http://abc.cardiff.ac.uk/login?url=https://www.proquest.com/blogs-podcasts-websites/another-suicide-intervention-lake-hills-police/docview/2463522254/se-2?accountid=9883	Wrong publication type
(2021-11-8 2021). Lake in the Hills Police Help Another Suicidal Person. Available at: http://abc.cardiff.ac.uk/login?url=https://www.proquest.com/blogs-podcasts-websites/lake-hills-police-help-another-suicidal-person/docview/2594788037/se-2?accountid=9883	Wrong publication type
Agarwal K. (2021). Automated system for preventing suicides by train, Netaji Subhas University of Technology, Computer Science and Engineering, New Delhi, India, Institute of Electrical and Electronics Engineers Inc.	Wrong publication type
Bandara P, Pirkis J, Clapperton A, et al. (2022). Cost-effectiveness of Installing Barriers at Bridge and Cliff Sites for Suicide Prevention in Australia. JAMA network open. 5(4): e226019. doi:https://dx.doi.org/10.1001/jamanetworkopen.2022.6019	Means restriction
Bardon C, Mishara BL. (2015a). Development of a Comprehensive Programme to Prevent and Reduce the Negative Impact of Railway Fatalities, Injuries and Close Calls on Railway Employees. Journal of occupational rehabilitation. 25(3): 557-68. doi:https://dx.doi.org/10.1007/s10926-014-9562-1	Not about a location
Bardon C, Mishara BL. (2015b). Systematic Review of the Impact of Suicides and Other Critical Incidents on Railway Personnel. Suicide & life-threatening behavior. 45(6): 720-31. doi:https://dx.doi.org/10.1111/sltb.12164	Not about a location
Barker E, Kolves K, De Leo D. (2017). Rail-suicide prevention: Systematic literature review of evidence-based activities. Asia-Pacific psychiatry : official journal of the Pacific Rim College of Psychiatrists. 9(3). doi:https://dx.doi.org/10.1111/appy.12246	Wrong publication type
Berman AL, Athey A, Nestadt P. (2022). Effectiveness of restricting access to a suicide jump site: a test of the method substitution hypothesis. Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention. 28(1): 90-2. doi:https://dx.doi.org/10.1136/injuryprev-2021-044240	Means restriction
Bhui K. (2014). Preventing the tragedy of railway suicides. Mental health today (Brighton, England). 24-7.	Wrong publication type
Bommersbach TJ, Rosenheck RA, Everett AS. (2022). Suicide Hot Spots: Leveraging County-Level Data and Local Agencies to Target Prevention in High-Risk Areas. Public health reports (Washington, D.C. : 1974). 137(3): 408-13. doi:https://dx.doi.org/10.1177/00333549211016606	Wrong publication type
Caine ED. (2015). Cooling suicide hotspots. The Lancet Psychiatry. 2(11): 952-3.	Wrong publication type
Ceccato V, Uittenbogaard A. (2016). Suicides in commuting railway systems: The case of Stockholm county, Sweden. Journal of affective disorders. 198: 206-21. doi:https://dx.doi.org/10.1016/j.jad.2016.02.051	No intervention
Ceccato V, Wiebe DJ, Vrotsou K, et al. (2021). The situational conditions of suicide in transit environments: An analysis using CCTV footage. Journal of Transport & Health Vol 20 2021, ArtID 100976. 20.	No intervention
Chen Y-Y, Yeung CY, Yip PSF. (2024). Exploring the link between the increase in high-rise buildings and youth jumping suicide in Taiwan: A longitudinal study. Suicide & life-threatening behavior. 54(1): 167-72. doi:https://dx.doi.org/10.1111/sltb.13030	No intervention
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: 80-3. doi:https://dx.doi.org/10.1016/j.jad.2016.01.026	Means restriction
Clapperton A, Dwyer J, Spittal M, et al. (2023). The effectiveness of installing trackside fencing in preventing railway suicides: a pre-post study design in Victoria, Australia. Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention. 29(6): 525-7. doi:https://dx.doi.org/10.1136/ip-2023-044897	Means restriction
Clapperton A, Dwyer J, Spittal MJ, et al. (2022). Preventing railway suicides through level crossing removal: a multiple-arm pre-post study design in Victoria, Australia. Social psychiatry and psychiatric epidemiology. 57(11): 2261-6. doi:https://dx.doi.org/10.1007/s00127-022-02340-9	Means restriction
Cramer RJ, Judah MR, Badger NL, et al. (2022). Suicide on college campuses: a public health framework and case illustration. Journal of American college health : J of ACH. 70(1): 1-8. doi:https://dx.doi.org/10.1080/07448481.2020.1739053	Not about a location
Davis Molock S, Heekin JM, Matlin SG, et al. (2014). The baby or the bath water? Lessons learned from the National Action Alliance for Suicide Prevention Research Prioritization	Wrong study design

Task Force literature review. American journal of preventive medicine. 47(3): S115-21. doi:https://dx.doi.org/10.1016/j.amepre.2014.05.023	
Debbaut K, Krysinska K, Andriessen K. (2014). Characteristics of suicide hotspots on the Belgian railway network. International journal of injury control and safety promotion. 21(3): 274-7. doi:https://dx.doi.org/10.1080/17457300.2013.825630	No intervention
Dwyer J, Spittal MJ, Scurrah K, et al. (2023). Structural intervention at one bridge decreases the overall jumping suicide rate in Victoria, Australia. Epidemiology and psychiatric sciences. 32: e58. doi:https://dx.doi.org/10.1017/S2045796023000720	Means restriction
Eynan R. (2015). Preventing suicides in the toronto subway system: A program evaluation. Dissertation Abstracts International: Section B: The Sciences and Engineering. 76(4): No Pagination Specified. doi:	Wrong publication type
Farahbakhsh M, Azizi H, Fakhari A, et al. (2022). Developing a Community-based Suicide Prevention Program in Primary Health Care. Community mental health journal. 58(4): 713-9. doi:https://dx.doi.org/10.1007/s10597-021-00875-w	Wrong outcome
Fredin-Knutzen J, Hadlaczky G, Andersson A-L, et al. (2022). A pilot study evaluating the effectiveness of preventing railway suicides by mid-track fencing, which restrict easy access to high-speed train tracks. Journal of safety research. 83: 232-7. doi:https://dx.doi.org/10.1016/j.jsr.2022.08.019	Means restriction
Fredin-Knutzen J, Hadlaczky G, Wigren A, et al. (2024). A pilot study evaluating the preventive effects of platform-end lengthwise fencing on trespassing, person struck by train and traffic delays. Journal of safety research. 88: 78-84. doi:https://dx.doi.org/10.1016/j.jsr.2023.10.010	Means restriction
Gregor S, Beavan G, Culbert A, et al. (2019). Patterns of pre-crash behaviour in railway suicides and the effect of corridor fencing: a natural experiment in New South Wales. International journal of injury control and safety promotion. 26(4): 423-30. doi:https://dx.doi.org/10.1080/17457300.2019.1660376	Means restriction
Hall D, Linogao J, Zentz L, et al. (2023). Detailed Analysis of New York City Subway Pedestrian Incidents From 2019. Transportation Research Record. 2677(11): 642-50. doi:10.1177/03611981231166692	No intervention
Hallewell MJ, Ryan B, Hughes N, et al. (2023). Conceptualising innovative lighting interventions for suicide, trespass and risky behaviour on the railway. Lighting Research and Technology. 55(1): 79-99. doi:10.1177/14771535221135226	Wrong outcome
Hardy RC, Glastonbury K, Onie S, et al. (2024). Attitudes Among the Australian Public Toward AI and CCTV in Suicide Prevention Research: A Mixed Methods Study. American Psychologist. 79(1): 65-78. doi:10.1037/amp0001215	Wrong outcome
Harris BR, Harris D, Flanagan E, et al. (2024). Crisis Intercept Mapping for Community-Based Suicide Prevention: An Assessment of the Crisis Infrastructure and Future Considerations for 988. Community mental health journal. doi:https://dx.doi.org/10.1007/s10597-024-01329-9	Not about a location
Havârneanu GM, Bonneau MH, Colliard J. (2016). Lessons learned from the collaborative European project RESTRAIL: REduction of suicides and trespasses on RAILway property. European Transport Research Review. 8(2). doi:10.1007/s12544-016-0203-y	Wrong study design
Havarneanu GM, Burkhardt J-M, Paran F. (2015). A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents. Accident; analysis and prevention. 81: 30-50. doi:https://dx.doi.org/10.1016/j.aap.2015.04.012	Wrong study design
Havarneanu GM, Burkhardt J-M, Silla A. (2017). Optimizing suicide and trespass prevention on railways: a problem-solving model from the RESTRAIL project. International journal of injury control and safety promotion. 24(4): 469-86. doi:https://dx.doi.org/10.1080/17457300.2016.1232275	Wrong publication type
Havârneanu GM. (2017). Behavioural and organisational interventions to prevent trespass and graffiti vandalism on railway property. Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit. 231(10): 1078-87. doi:10.1177/0954409716675004	Wrong study design
Hemmer A, Meier P, Reisch T. (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. doi:https://dx.doi.org/10.1371/journal.pone.0169625	Means restriction
Hill NTM, Robinson J. (2022). Responding to Suicide Clusters in the Community: What Do Existing Suicide Cluster Response Frameworks Recommend and How Are They Implemented? International journal of environmental research and public health. 19(8). doi:https://dx.doi.org/10.3390/ijerph19084444	Wrong outcome
Ichikawa M, Inada H, Kumeji M. (2014). Reconsidering the effects of blue-light installation for prevention of railway suicides. Journal of affective disorders. 152: 183-5. doi: doi:https://dx.doi.org/10.1016/j.jad.2013.09.006	Wrong outcome
Jiang B, Shen K, Sullivan WC, et al. (2021). A natural experiment reveals impacts of built environment on suicide rate: Developing an environmental theory of suicide. The Science	Wrong location

of the total environment. 776: 145750. doi:https://dx.doi.org/10.1016/j.scitotenv.2021.145750	
John A, Hawton K, Okolie C, et al. (2018). Means restriction for the prevention of suicide: Generic protocol. Cochrane Database of Systematic Reviews. 2018(4). doi:10.1002/14651858.CD012995	Wrong publication type
Kim H, Kwon SW, Ahn YM, et al. (2019). Implementation and outcomes of suicide-prevention strategies by restricting access to lethal suicide methods in Korea. Journal of public health policy. 40(1): 91-102. doi:https://dx.doi.org/10.1057/s41271-018-0152-x	Wrong publication type
Koburger N, Mergl R, Rummel-Kluge C, et al. (2015). Celebrity suicide on the railway network: Can one case trigger international effects? Journal of affective disorders. 185: 38-46. doi:https://dx.doi.org/10.1016/j.jad.2015.06.037	No intervention
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Gofal Cymru

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