APPENDIX 1. SEARCH STRATEGIES

Database: MEDLINE

1	exp Suicide, Completed/	41
2	exp *Suicide, Attempted/pc [Prevention & Control]	938
3	((suicid* or self harm* or self injur* or self hatred or self directed violence) adj2 (prevent* or control* or reduc* or manag*)).ti,ab.	9021
4	1 or 2 or 3	9657
5	(intervention* or program* or strateg* or polic* or resource* or promotion* or campaign* or modul* or activit* or project* or training or implement* or limit* or restrict* or initiative* or barrier* or helpline or hotspot*).ti,ab.	8257659
6	4 and 5	5729
7	limit 6 to (english language and humans and yr="2010 -Current")	2701
8	(child* or youth* or preteen* or pediatric* or paediatric*).ti,ab.	1560906
9	((elementary or primary or grammar or grade) adj1 school).ti,ab.	16877
10	8 or 9	1565248
11	7 not 10	2255
12	(hospital* or inpatient* or medic* ward* or emergency department*).ti,ab.	1346476
13	11 not 12	1826
14	limit 13 to (meta analysis or "systematic review")	111
15	limit 13 to (address or biography or case reports or comment or congress or consensus development conference or editorial or interactive tutorial or interview or legal case or legislation or letter or news or newspaper article or observational study, veterinary or personal narrative or portrait or video-audio media or webcast)	83
16	13 not 15	1743

Database: Embase

1	exp *suicide/pc [Prevention]	4725
2	exp *Suicide, Attempted/pc [Prevention & Control]	876
3	((suicid* or self harm* or self injur* or self hatred or self directed violence) adj2 (prevent* or control* or reduc* or manag*)).ti,ab.	10850
4	1 or 2 or 3	13816
5	(intervention* or program* or strateg* or polic* or resource* or promotion* or campaign* or modul* or activit* or project* or training or implement* or limit* or restrict* or initiative* or barrier* or helpline or hotspot*).ti,ab.	10747946
6	4 and 5	7279
7	limit 6 to (english language and humans and yr="2010 -Current")	4381
8	(child* or youth* or preteen or pediatric* or paediatric*).ti,ab.	2173177
9	((elementary or primary or grammar or grade) adj1 school).ti,ab.	22099
10	8 or 9	2179108
11	7 not 10	3556
12	(hospital* or inpatient* or medic* ward* or emergency department*).ti,ab.	2125475
13	11 not 12	2848
14	limit 13 to (books or chapter or conference abstract or conference paper or "conference review" or letter or note)	478
15	13 not 14	2370
16	limit 15 to (book or book series or conference proceeding)	7
17	15 not 16	2363
18	(case adj2 (report or descri*)).ti,ab.	636751
19	("reviews the book" or "comments on an article").ab.	103
20	18 or 19	636853
21	17 not 20	2354

Database: PsycINFO

1	*Suicide/ or *Attempted Suicide/	29386
2	(prevent* or control or reduc* or manag*).ti,ab.	1148355
3	1 and 2	10603
4	*Suicide Prevention/ or *Suicide Prevention Centers/	3919
5	((suicid* or self harm* or self injur* or self hatred or self directed violence) adj2 (prevent* or control* or reduc* or manag*)).ti,ab.	9335
6	3 or 4 or 5	15388
7	(intervention* or program* or strateg* or polic* or resource* or promotion* or campaign* or modul* or postvention* or activit* or project* or training or implement* or limit* or restrict* or initiative* or barrier* or helpline or hotspot*).ti,ab.	1988975
8	6 and 7	9156
9	(child* or youth* or preteen or pediatric* or paediatric*).ti,ab.	752753
10	((elementary or primary or grammar or grade) adj1 school).ti,ab.	33533
11	9 or 10	766815
12	8 not 11	7504
13	(hospital* or inpatient* or medic* ward* or emergency department*).ti,ab.	185108
14	12 not 13	6359
15	limit 14 to (human and english language and yr="2010-Current")	3285
16	(case adj2 (report or descri*)).ti,ab.	30537
17	15 not 16	3266
18	limit 17 to "0110 peer-reviewed journal"	2644
19	limit 18 to (chapter or "column/opinion" or dissertation or editorial or encyclopedia entry or interview or letter or obituary or poetry or publication information or reprint or review-book or review-media or review-software & other)	183
20	18 not 19	2461

Database: Sociological Abstracts
mainsubject.Exact("suicide, attempted" OR "suicide") AND ab(prevent* OR control OR reduc* OR manag*) OR ab(suicid* OR self harm* OR self injur* OR self hatred OR self directed violence) AND ab(prevent* OR control OR reduc* OR manag*) AND ab(intervention* OR program* OR strateg* OR polic* OR resource* OR promotion* OR campaign* OR modul* OR activit* OR project* OR training OR implement* OR limit* OR restrict* OR initiative* OR barrier* OR helpline OR hotspot*) NOT ab((child* OR youth* OR preteen OR pediatric* OR paediatric* OR ((elementary OR primary OR grammar OR grade) NEAR/1 school))) NOT ab(hospital* OR inpatient* OR medic* ward* OR emergency department)

Databases: Sociological Abstracts

Limited by:

Peer reviewed,

Date: From January 01 2010 to May 31 2020

Source type:

Scholarly Journals

Document type:

Article, Literature Review

Language:

English

Narrowed by:
Peer reviewed: Peer reviewed

APPENDIX 2. RISK OF BIAS TOOL FOR OBSERVATIONAL STUDIES

Appendix Table 2-1. *Modified* JBI Critical Appraisal Checklist for Quasi-Experimental Studies

Question	Yes	No	Unclear	NA
Did the study include all eligible participants or were the participants a representative sample from the population of interest? Guidance to answer the question: Population-based studies: Were all eligible members of the population included? Studies with a "sample" from the population: Is the representative sample similar to the population from which it is drawn?				
Were the participants included in any comparison similar? Guidance to answer the question: If baseline demographic data are provided, are there statistically significant differences between the groups (*eg* age, gender, risk factors)? In 1 group, pre-test/post-test studies where the participants are the same in any pre-post comparisons, the answer to this question should be 'yes'. NOTE: Selection bias is defined "as a nonrandom imbalance among treatment groups of the distribution of factors capable of influencing the end points." This definition is from the Handbook of Pharmacogenomics and Stratified Medicine 2014.				
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? Guidance to answer the question: Did 1 group get any additional suicide prevention information/intervention? For example, if a study is exploring the effect of means restriction, did the intervention group also receive any other exposure (*eg* awareness campaign)? It is acceptable for all participants to be receiving some type of intervention provided the "intervention" group is receiving an additional intervention. The intervention of interest is the additional intervention.				
Was the control group concurrent? Guidance to answer the question: Sampled and followed over the same period of time?				
For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/exposure? Guidance to answer the question: Example: the study was between 2010 and 2017 and the intervention was initiated in 2014. Were there multiple measurements prior to 2014 and then after the intervention (2010, 2011, etc. and then 2016, 2017, etc.)				
Was follow-up complete?				

Guidance to answer the question: For pre-post studies that are population-based: answer “not applicable”. For studies that have a separate comparison group and a defined cohort: was there complete information on a high percentage of participants? Make a judgement on a case-by-case basis (no set threshold).				
Were completeness of follow-up similar for study groups? Guidance to answer the question: For pre-post studies that are population-based: answer “not applicable”. For studies that have a separate comparison group and a defined cohort: Were there differences between groups with regards to loss to follow up (large loss in 1 group versus the other) or differences in length of follow-up (one group followed to study end, 1 not)?				
Were the outcomes of participants included in any comparisons measured in the same way? Guidance to answer the question: Same method (questionnaires, registries, death certificates, ICD-10 codes) used for both groups?				
Were suicide deaths and/or attempts measured in a reliable way? Guidance to answer the question: Were data collected in a way that could be repeated (*eg*, death registry vs reported in interview with neighbors)?				
Were other eligible outcomes measured in a reliable way? Guidance to answer the question: Were other outcomes assessed in the study groups (or pre/post) with the same instruments and by similar methods of assessment?				
Did the study adjust for confounding variables? Guidance to answer the question: Did the statistical methods adjust for baseline variables considered to be confounders (examples may include age, gender, race, SES, history of suicide attempt, mental health diagnoses)? If the study attempted to adjust for any confounders, then answer “yes”.				

NA=not applicable

APPENDIX 3. DEFINITIONS OF THE CDC STRATEGIES AND APPROACHES

Table 3-1. Definitions of the CDC Strategies and Approaches to Prevent Suicide Relevant for our Review *, **

Primary CDC Strategy	*Approach*	Definition from the CDC Technical Document
Strengthen economic supports	*Household financial security*	**Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
	Housing stabilization	**Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.
Create protective environments	*Reduce access to lethal means*	**Reduce access to lethal means** among persons at risk of suicide. Means of suicide such as firearms, hanging/ suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (*eg*, about 85% of people who use a firearm in a suicide attempt die from their injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes, and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access. Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of reducing access to lethal means: intervening at suicide hotspots and safe storage practices.
	Organizational policies and culture	**Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (*eg*, residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (*eg*, asking for help), skill building, positive social norms, assessment, referral and access to helping services (*eg*, mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (*eg*, depression, social isolation).
	Community-based policies to reduce alcohol use	**Community-based policies to reduce excessive alcohol use**. Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides. Policies to reduce excessive alcohol use broadly include zoning to limit the location and density of alcohol outlets, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.
Promote connectedness	*Peer norm programs*	**Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and

Primary CDC Strategy	*Approach*	Definition from the CDC Technical Document
		behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
	Community engagement activities	**Community engagement activities**. Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and group physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.
Teach coping and problem-solving skills	*Social-emotional learning programs*	**Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotional regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth address other negative influences (*eg*, substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.
	Parenting skills and family relationship approaches	**Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.
Identify and support people at risk	*Gatekeeper training*	**Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
	Crisis intervention	**Crisis intervention**. These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

CDC=Centers for Disease Control and Prevention

*Definitions are from the CDC document tilted "Preventing Suicide: A Technical Package of Policies, Programs, and Practices" published in 2017. Definitions were taken verbatim from the document except in select cases for brevity. Full citation listed in the reference list.

**For the purposes of our review, we modified the CDC framework by 1) adding a category for "public awareness and education campaigns" and a category for "screening for at-risk individuals (outside a health care setting)"; and 2) excluding the CDC strategies and approaches not relevant for our review.

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APPENDIX 5. DATA ABSTRACTION TABLES AND RISK OF BIAS ASSESSMENTS

Appendix Table 5-1. Housing Stabilization: Study Characteristics

Author, Year **Country** **Study Design** **Intervention Type** **Setting** **Funding** **Risk of Bias**	**Inclusion/Exclusion Criteria**	**Intervention** **Comparator** **Study Period** **Length of Follow-up**	**Demographics**
Montgomery 2020[12] Country: US Study Design: Observational with concurrent control Intervention Type: Housing stabilization Setting: Military Funding: US government Risk of Bias: Medium	Inclusion: Veterans screened positive for current or imminent risk of housing instability at least once using the VHA's 2-question Homelessness Screening Clinical Reminder (HSC), defined as responded negatively to the question, 'In the past 2 months, have you been living in stable housing that you own, rent, or stay in as part of a household?' or positively to the question, 'Are you worried or concerned that in the next 2 months you may NOT have stable housing that you own, rent, or stay in as part of a household?' Exclusion: NR	Intervention: Received ≥1 VHA Homeless Program services (n=93,135) Specific programs included: (1) completing an in-depth assessment for VHA Homeless Programs; (2) Domiciliary Care for Homeless Veterans and Compensated Work Therapy with transitional housing; (3) emergency housing services through the healthcare for Homeless Veterans and Safe Haven programs; (4) rapid rehousing and homelessness prevention through Supportive Services for Veteran Families; (5) permanent supportive housing through US Department of Housing and Urban Development-VA Supportive Housing; and (6) transitional housing through the Grant and Per Diem program. Comparator: Received no VHA Homeless Program services (n=76,086) Study period: October 1, 2012 and September 30, 2016 Length of follow-up: 4 years	N= 169,221 Age (years, mean): Int. 50.3 vs Com. 52.8; P<.05 Gender (% male): Int. 89.2 vs Com.90; P<.05 Race (%): White: Int. 55.7 vs, Com. 65.9; P<.05 Black: Int. 34.7 vs, Com. 23.1; P<.05 Military status:100% veterans Housing status: 100% "housing instability" Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

Com=Comparator; Int=intervention; VHA=Veterans Health Administration

Appendix Table 5-2. Housing Stabilization: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Montgomery 2020[12]	Yes	No	Unclear	Yes	NA	Yes	Yes	Yes	Yes	NA	Yes	Medium

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-3. Housing Stabilization: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths					Suicide Attempts				
	Intervention Group		Control Group		Intervention vs Control	Intervention Group		Control Group		Pre vs Post Intervention vs Control
	Pre	Post	Pre	Post		Pre	Post	Pre	Post	
Montgomery 2020[12] Observational with concurrent control		0.2% (157/ 93,135)		0.2% (140/ 76,086)	P=.45 Any VHA Homeless Program Use aHR * 0.79 (95% CI 0.62 to 1.01) With each additional VHA Homeless Program accessed aHR **		6.0% (5628/ 93,135)		2.1% (1594/ 76,086)	P<.05 Calculated RD 4% (95% CI 3.8 to 4.1)

					0.81 (95% CI 0.73 to 0.89) Accessed 1 VHA Homeless Program aHR † 0.98 (95% CI 0.74 to 1.29) Accessed 2 VHA Homeless Programs aHR † 0.91 (95% CI 0.65 to 1.28) Accessed 3 VHA Homeless Programs aHR † 0.62 (95% CI 0.40 to 0.96) Accessed ≥4 VHA Homeless Programs aHR † 0.22 (95% CI 0.11 to 0.46)					

aHR=adjusted hazard ratio; CI=confidence interval; RD=risk difference; VHA=Veterans Health Administration
* Model 1 - includes age, sex, race, Hispanic ethnicity, MST, history of suicide ideation, history of suicide attempt, ever diagnosed with depression, weighted Elixhauser medical comorbidity, Enrolment Priority Group and whether the Veteran had any VHA Homeless Program use
** Model 2 - includes age, sex, race, Hispanic ethnicity, MST, history of suicide ideation, history of suicide attempt, ever diagnosed with depression, weighted Elixhauser medical comorbidity, Enrolment Priority Group and the number of VHA Homeless Program used as a continuous variable
† Model 3 includes age, sex, race, Hispanic ethnicity, MST, history of suicide ideation, history of suicide attempt, ever diagnosed with depression, weighted Elixhauser medical comorbidity, Enrolment Priority Group and a categorical measure for whether the Veteran used 0, 1, 2, 3, or 4+ VHA Homeless Programs.

Appendix Table 5-4. Housing Stabilization: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Montgomery 2020[12] Observational with concurrent control	NR	NR	NR	NR

NR=not reported

Appendix Table 5-5. Means Restriction: Study Characteristics

Author, Year **Country** **Study Design** **Intervention Type** **Setting** **Funding** **Risk of Bias**	**Inclusion/Exclusion Criteria**	**Intervention** **Comparator** **Study Period** **Length of Follow-up**	**Demographics**
Yip 2010[13] Country: Hong Kong Study Design: Observational with concurrent control Intervention Type: Means restriction (charcoal restriction) Setting: General community Funding: Government Risk of Bias: Low	Inclusion: Two geographically adjacent districts in Hong Kong with similar demographic and socioeconomic characteristics. Tuen Mun was the intervention region and Yuen Long was the control region. Exclusion: None	Intervention: Access to charcoal was limited by removing all barbecue charcoal packs from the open shelves of major retail chains. Customers were required to ask a shop assistant for a pack, which the assistant would then retrieve from a locked container Comparator: Charcoal packs were displayed as usual Study period: July 2005 to June 2007 Length of follow-up: 1 year pre- and post-intervention periods	<u>Intervention</u> N= 502,000 people in Tuen Mun Age (years, mean): 8.8% 65+ years Gender (% male): NR Race (%): NR Military status: NR Housing status (% in public rental housing): 34.9% Socioeconomic status (median household income in Hong Kong $): 15,000 Mental health diagnoses: NR Prior suicide behavior: NR <u>Control</u> N= 534,000 people in Yuen Long Age (years, mean): 8.3% 65+ years Gender (% male): NR Race (%): NR Military status: NR Housing status (% in public rental housing): 35.1% Socioeconomic status (median household income in Hong Kong $): 14,810 Mental health diagnoses: NR Prior suicide behavior: NR

Chen 2015[14] Country: Taiwan Study Design: Observational with concurrent control Intervention Type: Means restriction (charcoal restriction) Setting: General community Funding: Government and University Risk of Bias: Medium	Inclusion: Three metropolitan cities in Taiwan that are comparable in terms of level of urbanization and access to retail stores. New Taipei City was the intervention site and Taipei City and Kaohsiung City were control sites. Exclusion: None	Intervention: New Taipei City required that all charcoal be removed from open shelves of retail stores. Customers purchasing charcoal must ask a shop assistant, who would then retrieve charcoal from a locked container. Comparator: No intervention in Taipei City and Kaohsiung City Study period: January 1, 2009 to December 31, 2013 Length of follow-up: 40-months pre- and 20-months post-intervention	<u>Intervention</u> N= 3.9 million people in New Taipei City Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR <u>Control</u> N= 2.7 million people in Taipei City; 2.7 million people in Kaohsiung City Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR
Jo 2019[15] Country: South Korea Study Design: Pre-post observational with no concurrent control Intervention Type: Means restriction (charcoal restriction) Setting: General community Funding: Government Risk of Bias: Medium	Inclusion: Data on suicides and suicides by charcoal burning in Gyeonggi Province from 2000 to 2016, released by the National Statistical Office. Exclusion: None	Intervention: Shops participating in the program changed the way they sold charcoal: they were kept out of sight, not on display, and they are taken out only when customers request them. The campaign allows sellers to ask about the use of charcoal. Comparator: Pre-intervention Study period: 2000 to 2016. During this time, a nation-wide prevention campaign was also ongoing. Length of follow-up: 2 years. The program started in 2014. It expanded from 1 district in 2014 to	N=about 13 million people in Gyeonggi Province Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

		10 districts in 2015 and later to 28 in 2016.	
Sinyor 2017[16] (longer-term follow-up) Sinyor 2010[17] (shorter-term follow-up) Country: Canada Study Design: Observational with concurrent control Intervention Type: Means restriction (barrier at bridge) Setting: Suicide hotspot Funding: Foundation and University Risk of Bias: Low	Inclusion: Records at the chief coroner's office of Ontario covering all suicides in Ontario from January 1, 1993 to December 31, 2014. Exclusion: None	Intervention: Barrier was erected at Bloor Street Viaduct bridge in Toronto. The barrier is about 5 meters high and consists of thousands of thin steel rods spaced closely together and supported externally by an angled steel frame. Comparator: a) pre-intervention and b) compared with suicides at other bridges Study period: January 1, 1993 to December 31, 2014 Length of follow-up: 11 years pre- and post-intervention period.	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Law 2014[19] Country: Australia Study Design: Observational with concurrent control Intervention Type: Means restriction (barrier at bridge) Setting: Suicide hotspot Funding: Government Risk of Bias: Medium	Inclusion: The location of suicide being in the Greater Brisbane Region or Statistical Area Level 4:301-305 and cause of death by either jumping from high place or drowning. Exclusion: None	Intervention: Fencing barriers about 3.3 meters high along the sidewalk of the Gateway Bridge. After the new duplication bridge was built in 2010, the barrier was replaced with a similar 1 with a height of 3.6 meters on the original bridge. Comparator: a) pre-intervention at Gateway Bridge; b) concurrent control at Story Bridge with no physical barriers Study period: 1990 to 2012 Length of follow-up: 4-year pre- and 19-year post-intervention period	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

Perron 2013[18] Country: Canada Study Design: Observational with concurrent control Intervention Type: Means restriction (barrier at bridge) Setting: Suicide hotspots Funding: NR Risk of Bias: Medium	Inclusion: Suicide deaths among Quebec residents from the data banks of the chief coroner's office. Exclusion: Suicides (n=593) occurring during July to December 2004 when the barrier was under construction.	Intervention: Barrier on Jacques-Cartier Bridge in Québec, Canada Comparator: a) pre-intervention; b) other jump sites nearby excluding Jacques-Cartier Bridge Study period: Data collected from 1990 to December 31, 2009 Length of follow-up: 14.5 year pre- and 5-year post-intervention period	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Hemmer 2017[20] Country: Switzerland Study Design: Pre-post observational with no concurrent control Intervention Type: Means restriction (barriers or safety nets at jump sites) Setting: Suicide hotspots Funding: Government and a Psychiatric Hospital Risk of Bias: Medium	Inclusion: All jump sites in Switzerland with at least 0.5 suicides on average per year during any period of 10 years within the whole study period. From the 31 identified hotspots, 15 jump locations were included in the analysis. Exclusion: Jump sites with poor-quality data and not being within the study time period.	Intervention: Structural interventions at jumping sites. Eleven jump sites were secured by barriers and 4 by safety nets. Of the 15 jump sites, 9 sites also had a help sign. Comparator: a) pre-intervention and b) barriers vs safety nets Study period: 1990-2013 Length of follow-up: pre-intervention mean duration of 178.6 months and post-intervention of 73.4 months	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Law 2011[21] Country: Hong Kong Study Design: Observational with concurrent control	Inclusion: Information related to falls onto railway tracks from the Safety Office of the Mass Transit Railway Corporation Limited through the Transport and Housing Bureau of the Hong Kong Special Administration Region government.	Intervention: Platform screen doors at railway stations operated by Mass Transit Railway Corporation Limited - intended to restrict passengers' access to railway tracks	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR

Intervention Type: Means restriction (platform screen doors at railway stations) Setting: Suicide hotspot Funding: NR Risk of Bias: Medium	The patronage figures, the cost and the schedule of the platform screen door installation were made available from the same agency. Information on per capita gross domestic product was made available from the Census and Statistics Department of Hong Kong. Exclusion: None	Comparator: railway stations without platform screen doors at stations operated by Kowloon-Canton Railway Corporation Study period: 1997 to 2007 Length of follow-up: ~5 years. Most of the platforms were sealed in 2002 and the whole project done in 2005	Mental health diagnoses: NR Prior suicide behavior: NR
Chung 2016[22] Country: South Korea Study Design: Pre-post observational with no concurrent control Intervention Type: Means restriction (platform screen doors at railway stations) Setting: Suicide hotspots Funding: Government and Foundation Risk of Bias: Medium	Inclusion: Data on individual suicide cases that occurred between 2003 and 2012 at subway stations operated by Seoul Metro (121 total stations), which operates 50% of the subway stations in Seoul. Exclusion: None	Intervention: Platform screen doors installed at subway stations. 119 stations had full-height platform screen doors that extended completely or almost completely to the ceiling. Two stations had half-height platform screen doors (measured at 1.65 meters). Comparator: Subway stations prior to installing platform screen doors Study period: 2003 to 2012 Length of follow-up: 3 to 7 years. Screen doors started to be installed in 2005 and completed in 2009.	N= NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Ueda 2015[23] Country: Japan Study Design: Observational with concurrent control Intervention Type: Means restriction (platform screen doors at railway stations)	Inclusion: Data on suicide and accidents obtained from a major railway company in the Tokyo metropolitan area. Only incidents that occurred at stations were included in the analysis. Exclusion: Railway stations that started operating in 2008 (8.7% of all stations) because their accident	Intervention: Platform screen doors at train stations. When the study started, 19 stations had platform screen doors. They were installed at 71 stations by end of study. Among them, 73.24% were half-height platform screen doors. Comparator: Rail stations without platform screen doors and prior to	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

Setting: Suicide hotspots Funding: Government, Foundation, and life insurance company Risk of Bias: Low	and suicide records were available only for a subset of years.	them being installed. At the end of study, 97 stations did not have platform screen doors. Study period: Data collected from April 2004 to March 2014 Length of follow-up: Varied; platform screen doors were gradually installed during study period	
Matsubayashi 2013[24] Matsubayashi 2014[25] Ichikawa 2014[26] *The* 3 *articles used datasets that overlapped. To avoid double-counting, we mapped them to the same study.* Country: Japan Study Design: Observational with concurrent control Intervention Type: Means restriction (blue lights at railway platforms) Setting: Suicide hotspots Funding: Government, Foundation Risk of Bias: Medium	Inclusion: *Matsubayashi 2013 and 2014:* Data from 71 rail stations provided by a rail company. *Ichikawa 2014:* Data compiled by the Japanese Ministry of Land, Infrastructure, Transport and Tourism Exclusion: *Matsubayashi 2013 and 2014:* NR *Ichikawa 2014:* Suicide attempts within the train or by jumping out of the train	Intervention: Installation of blue light- emitting-diode lamps on railway platforms and at railway crossings as a method of deterring suicides Comparator: Railway stations without blue lights installed Study period: *Matsubayashi 2013:* 2000-2010 *Matsubayashi 2014:* 2000-2013 *Ichikawa 2014:* 2002-2012 Length of follow-up: *Matsubayashi 2013:* 1-3 years from installation to end of data collection *Matsubayashi 2014:* 1-6 years from installation to end of data collection Note: follow-up varied by platform as blue lights were installed over time. They started to be installed in 2008.	N=NR Age (years, mean):NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

NR=not reported

Appendix Table 5-6. Means Restriction: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Yip 2010[13]	Yes	Yes	Unclear	Yes	NA	NA	NA	Yes	Yes	NA	Yes	Low
Chen 2015[14]	Yes	Yes	Unclear	Yes	No	NA	NA	Yes	Yes	NA	No	Medium
Jo 2019[15]	Yes	Yes	Unclear	No	Yes	NA	NA	Yes	Yes	NA	No	Medium
Sinyor 2017[16] Sinyor 2010[17]	Yes	Unclear	Unclear	Yes	Yes	NA	NA	Yes	Yes	NA	Yes (Sinyor 2017) No (Sinyor 2010)	Low
Law 2014[19]	Yes	Unclear	Unclear	Yes	No	NA	NA	Yes	Yes	Unclear (cost)	Unclear	Medium
Perron 2013[18]	Yes	Unclear	Unclear	Yes	No	NA	NA	Yes	Yes	NA	No	Medium
Hemmer 2017[20]	Yes	Unclear	Unclear	No	No	NA	NA	Unclear	Yes	NA	No	Medium
Saeheim 2017[73]	Yes	Unclear	Unclear	No	No	NA	NA	Yes	Yes	NA	No	High
Law 2011[21]	Yes	Unclear	Unclear	Yes	No	NA	NA	Yes	Yes	Yes (cost)	Yes	Medium
Chung 2016[22]	Yes	Unclear	Unclear	No	Yes	NA	NA	Unclear	Unclear	Unclear (cost)	Yes	Medium
Ueda, 2015[23]	Yes	Unclear	Unclear	Yes	Yes	NA	NA	Yes	Yes	NA	Yes	Low

Matsubayashi 2013[24] Matsubayashi 2014[25] Ichikawa 2014[26]	Yes	Unclear	Unclear	Yes	Yes	No	NA	NA	Yes	NA	NA	Medium

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-7. Means Restriction: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design Intervention Details	**Suicide Deaths**						**Suicide Attempts**					
	Intervention Group		**Control Group**		**Pre** vs **Post**	**Intervention** vs **Control**	**Intervention Group**		**Control Group**		**Pre** vs **Post**	**Intervention** vs **Control**
	Pre	**Post**	**Pre**	**Post**			**Pre**	**Post**	**Pre**	**Post**		
Yip 2010[13] Observational with concurrent control Charcoal restriction	**charcoal suicides** 1 year: 21 suicides 4.3 per 100,000 *Men* 1 year: 16 suicides 6.6 per 100,000 *Women* 1 year: 5 suicides	**charcoal suicides** 1 year: 10 suicides 2.0 per 100,000 *Men* 1 year: 7 suicides 2.9 per 100,000 *Women* 1 year: 3 suicides	**charcoal suicides** 1 year: 16 suicides 3.0 per 100,000 *Men* 1 year: 10 suicides 3.9 per 100,000 *Women* 1 year: 6 suicides	**charcoal suicides** 1 year: 23 suicides 4.3 per 100,000 *Men* 1 year: 16 suicides 6.2 per 100,000 *Women* 1 year: 7 suicides	Intervention **Charcoal suicides** P<.05 pre vs post	**charcoal suicides** -66.9% adjusted difference on percentage change; P=.03 *Men* -72.7% adjusted difference on percent change; P=.03 *Women* -48.6% adjusted difference on percent	NR	NR	NR	NR	NR	NR

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
	2.0 per 100,000	1.2 per 100,000	2.2 per 100,000	2.6 per 100,000		change; P=.47						
Chen 2015[14] Observational with concurrent control Charcoal restriction	**charcoal suicides** N=808 6.2 per 100,000	**charcoal suicides** N=256 3.9 per 100,000	**charcoal suicides (Taipei City)** N=305 3.5 per 100,000 **charcoal suicides (Kao-hsiung City)** N=490 5.3 per 100,000	**charcoal suicides (Taipei City)** N=111 2.5 per 100,000 **charcoal suicides (Kao-hsiung City)** N=219 4.7 per 100,000	**Charcoal suicides** <u>New Taipei City</u> decrease of 37% (95% CI 17% to 50%) pre vs post Decrease of 30% (95% CI 14% to 44%) relative to Kaohsiung City Time series regression P=.001 <u>Taipei City</u> Time series regression P=.10 <u>Kaohsiung City</u> Time series regression P=.85 *Subgroups* Numerical decreases in charcoal suicides in New Taipei City were found in all age and sex groups, except men 65+ years old		NR	NR	NR	NR	NR	NR
Sinyor 2017[16] Sinyor 2010[17]	**Bloor Street Viaduct**	**Bloor Street Viaduct**	**Other bridges:**	**Other bridges:**	<u>Intervention</u>	NR	NR	NR	NR	NR	NR	NR

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Observational with concurrent control Barrier at bridge	1993-2003: 9.5 suicides observed per year	2004-2014: 0.1 suicides observed per year 2003-2007: 0 suicides observed per year	1993-2003: 10.1 suicides observed per year	2004-2014: 11.0 suicides observed per year 2003-2007: 15.3 suicides observed per year	**Bloor Street Viaduct** 2004-2014: IRR= 0.009 (95% CI, 0.0005 to 0.19) 2003-2007: IRR= 0.05 (95% CI, 0.01 to 0.31) <u>Control</u> **Other bridges** 2004-2014: IRR= 1.03 (95% CI, 0.76 to 1.40) 2003-2007: IRR= 1.64 (95% CI, 1.13 to 2.39)							

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		**Pre** vs **Post**	**Intervention** vs **Control**	Intervention Group		Control Group		**Pre** vs **Post**	**Intervention** vs **Control**
	Pre	**Post**	**Pre**	**Post**			**Pre**	**Post**	**Pre**	**Post**		
Law 2014[19] Observational with concurrent control Barrier at bridge	**Gateway Bridge** 1990-1993: 22 suicides 0.673 suicides per 100,000 persons	**Gateway Bridge** 1994-2012: 16 suicides 0.084 suicides per 100,000 persons 1994-1997: 11 suicides 0.316 suicides per 100,000 persons	**Story Bridge** 1990-1993: 15 suicides 0.459 suicides per 100,000 persons	**Story Bridge** 1994-2012: 73 suicides 0.382 suicides per 100,000 persons 1994-1997: 17 suicides 0.489 suicides per 100,000 persons	<u>Intervention</u> **Gateway Bridge** 1994-2012 vs pre: -87.5% change P=.000 1994-1997 vs pre: -53.0% change P=.041 <u>Control</u> **Story Bridge** 1994-2012 vs pre: -16.7% change P=.520 1994-1997 vs pre:	NR	NR	NR	NR	NR	NR	NR

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		**Pre** vs **Post**	**Intervention** vs **Control**	Intervention Group		Control Group		**Pre** vs **Post**	**Intervention** vs **Control**
	Pre	**Post**	**Pre**	**Post**			**Pre**	**Post**	**Pre**	**Post**		
					6.6% change P=.857							
Perron 2013[18] Observational with concurrent control Barrier at bridge	**Jacques-Cartier** 1990-2004: 0.324 suicides per 100,000 persons 10.0 annual suicides	**Jacques-Cartier** 2005-2009: 0.079 suicides per 100,000 persons 2.6 annual suicides	**Other jumping sites** 1990-2004: 0.844 suicides per 100,000 persons 26.1 annual suicides	**Other jumping sites** 2005-2009: 0.687 suicides per 100,000 persons 22.5 annual suicides	Intervention **Jacques-Cartier** IRR= 0.24 (95% CI, 0.13 to 0.43) Control **Other jumping sites** IRR= 0.82 (95% CI, 0.66 to 1.01)	NR	NR	NR	NR	NR	NR	NR
Law 2011[21] Observational with concurrent control Platform screen door at railway stations	**Mass Transit** 1997-2001: 38 suicides	**Mass Transit** 2003-2007: 8 suicides	**Kowloon-Canton** 1997-2001: 13 suicides	**Kowloon-Canton** 2003-2007: 15 suicides	Intervention **Mass Transit** -80.6% 5-year average percent change; P<.0001 vs pre Control	NR	**Mass Transit** 1997-2001: 33 non-fatal suicide falls	**Mass Transit** 2003-2007: 17 non-fatal suicide falls	**Kowloon-Canton** 1997-2001: 11 non-fatal suicide falls	**Kowloon-Canton** 2003-2007: 12 non-fatal suicide falls	Intervention **Mass Transit** -52.6% 5-year average percent change; P=.0126 Control	NR

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
					Kowloon-Canton 8.8% 5-year average percent change; P=.824 vs pre						**Kowloon-Canton** 1.5% 5-year average percent change; P=.9713	
Ueda 2015[23] Observational with concurrent control Platform screen door at railway stations	The study reported the composite outcome fatal and non-fatal suicides. Based on the reported data, we calculated that 2 suicide deaths occurred at stations with platform screen doors over 5417 station-months and 57 suicide deaths occurred at stations without platform screen doors over 14743 station-months. We did not prioritize this study in the write-up due to the difficulty of interpreting this result. This study is included in the counts in Table 2.						The study reported the composite outcome fatal and non-fatal suicides. Based on the reported data, we calculated 5 non-fatal suicide attempts at stations with platform screen doors over 5417 station-months and 80 non-fatal suicide attempts at stations without platform screen doors over 14743 station-months. We did not prioritize this study in the write-up due to the difficulty of interpreting this result. This study is included in the counts in Table 2.					
Matsubayashi 2013[24] Matsubayashi 2014[25] Ichikawa, 2014[26] Observational with concurrent control	*2014 paper:* 0.44 suicides/year	*2014 paper:* 0.19 suicides/year	*2014 paper:* Suicides/year ranged from 0.23-0.28 at nearby stations (1 to 5 stations away)	*2014 paper:* Suicides/year ranged from 0.25-0.28 at nearby stations (1 to 5 stations away)	*2014 paper:* Intervention IRR= 0.26 (95% CI, 0.13 to 0.52) *2013 paper:* Intervention	NR	*Ichikawa 2014* The authors analyzed the location and time of day when suicide attempts occurred at railway stations. This gives an estimate of how many suicide attempts are potentially preventable by blue lights (meaning the proportion of attempts that occurred at a time and place where the blue lights could be seen). This analysis does not report the effects of blue lights on attempts. Among suicide attempts at railways stations: 43% occurred within stations premises, 43% were at night, and 14% fell in both categories					

Author, Year Study Design Intervention Details	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Blue lights at railway stations					IRR= 0.17 (95% CI, 0.03 to 0.87)							

CI=confidence interval; IRR=incident rate ratio; NR=not reported; RCT=randomized controlled trial

Appendix Table 5-8. Means Restriction: Suicides Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design Intervention Details	Suicide Deaths			Suicide Attempts		
	Pre-Intervention	Post-Intervention	Pre vs Post Comparison	Pre-Intervention	Post-Intervention	Pre vs Post Comparison
Jo 2019[15] Pre-post observational with no concurrent control Charcoal restriction	**charcoal suicides** 2012: 294 suicides 2013: 286 suicides 2014: 536 suicides	**charcoal suicides** 2015: 514 suicides 2016: 433 suicides	**charcoal suicides** Multivariate time series P=.029	NR	NR	NR
Hemmer 2017[20] Pre-post observational with no concurrent control Barrier and safety nets at bridges	**all 15 jump sites** 1.47 suicides/year **structural barriers** 1.61 suicides/year **safety nets** 1.01 suicides/year	**all 15 jump sites** 0.41 suicides/year **structural barriers** 0.51 suicides/year **safety nets** 0.23 suicides/year	**all 15 jump sites** RR=0.30 (95% CI 0.17 to 0.44) 71.7% prevention **structural barriers** RR=0.34 (95% CI 0.18 to 0.64) 68.7% prevention **safety nets** RR=0.21 (95% CI 0.07 to 0.62) 77.1% prevention	NR	NR	NR

	completed safety measures 1.62 suicides/year	**completed safety measures** 0.57 suicides/year	No significant difference for safety nets vs barriers **completed safety measures** RR=0.18 (95% CI 0.10 to 0.44) 82.0% prevention			
Chung 2016[22] Pre-post observational with no concurrent control Platform screen doors at railway stations	**suicides at subway stations** 132 suicides over 8769 station-months	**suicides at subway stations** 3 total suicides over 5751 station-months All 3 suicides were at stations with half-height platform screen doors (not full-height screen doors) For 3 years with complete installation (2010-2012), there was 1 suicide	**suicides at subway stations** IRR=0.11 (95% CI 0.03 to 0.43)	NR	NR	NR

CI=confidence interval; IRR=incident rate ratio; NR=not reported; RCT=randomized controlled trial; RR=rate ratio

Appendix Table 5-9. Means Restriction: Secondary Outcomes

Author, Year Study Design Intervention Details	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Yip 2010[13] Observational with concurrent control Charcoal restriction	NR	NR	NR	**Intervention region: other methods** Pre-intervention: 67 suicides 13.6 per 100,000 1-year follow-up: 50 suicides 10.2 per 100,000

				Men only- Pre-intervention: 35 suicides 14.5 per 100,000 1-year follow-up: 26 suicides 10.8 per 100,000 *Women only-* Pre-intervention: 32 suicides 12.8 per 100,000 1-year follow-up: 24 suicides 9.6 per 100,000 **Control region: other methods** Pre-intervention: 51 suicides 9.6 per 100,000 1-year follow-up: 43 suicides 8.1 per 100,000 *Men only-* Pre-intervention: 28 suicides 10.8 per 100,000 1-year follow-up: 23 suicides 8.9 per 100,000 *Women only-* Pre-intervention: 23 suicides 8.5 per 100,000

				1-year follow-up: 20 suicides 7.4 per 100,000
Chen 2015[14] Observational with concurrent control Charcoal restriction	NR	NR	NR	**Intervention region: other methods** Pre-intervention: N=1598 12.3 per 100,000 Follow-up: N=783 11.9 per 100,000 Time series regression P=.68 **Control region (Taipei City): other methods** Pre-intervention: N=945 10.8 per 100,000 Follow-up: N=471 10.6 per 100,000 Time series regression P=.85 **Control region (Kaohsiung City): other methods** Pre-intervention: N=1381 14.9 per 100,000 Follow-up: N=684 14.8 per 100,000 Time series regression P=.25
Jo 2019[15]	NR	NR	NR	Besides charcoal burning, the only other suicide method that fell more

Pre-post observational with no concurrent control Charcoal restriction				than 0.5% from 2014 was hanging (53.4% to 52.4%)
Sinyor 2017[16] Sinyor 2010[17] Observational with concurrent control Barrier at bridge	NR	NR	NR	**Pre-intervention: other methods** 197.7 suicides observed per year **Post-intervention: other methods** From 2004-2014: 177.5 suicides observed per year IRR=0.84 (95% CI 0.76 to 0.93) From 2003-2007: 180.8 suicides observed per year IRR=0.86 (95% CI 0.74 to 0.99)
Law 2014[19] Observational with concurrent control Barrier at bridge	NR	NR	**Installation costs** new barriers at the Gateway Bridge in 2010 incurred a direct cost of $2.2 million	NR
Perron 2013[18] Observational with concurrent control Barrier at bridge	NR	NR	NR	NR
Hemmer 2017[20] Pre-post observational with no concurrent control Barrier and safety nets at jump sites	NR	NR	NR	NR
Law 2011[21] Observational with concurrent control	NR	NR	**Installation costs** $256.4 million USD according to railway corporation	NR

Platform screen doors at railway stations			Estimated $237,748,900 after adjustment of price and discounting **Net costs** Traditional approach: $237,748,900 USD Modified approach: $229,851,700 USD after accounting for $7,897,200 saved from loss fare revenue **Incremental cost-effectiveness ratios** Traditional approach: 77,874 USD per person-year Modified approach: 65,354 USD per person-year **Minimal useful life-years to be cost-effective** Traditional approach: 27 years Modified approach: 21 years	
Chung 2016[22] Pre-post observational with no concurrent control Platform screen doors at railway stations	NR	NR	**Installation costs** 194.06 million USD across 121 stations	NR
Ueda 2015[23] Observational with concurrent control Platform screen doors at railway stations	NR	NR	NR	NR
Matsubayashi 2013[24] Matsubayashi 2014[25] Ichikawa 2014[26]	NR	NR	NR	NR

Observational with concurrent control Blue lights at railway stations				

CI=confidence interval; IRR=incident rate ratio; NR=not reported; USD=United States Dollar

Appendix Table 5-10. Means Restriction: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design Intervention Details	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Yip 2010[13] Observational with concurrent control Charcoal restriction	Two on-site quality checks for compliance (fidelity) over the 1-year intervention period	Need to consider unintended consequences of reduced charcoal sales which may be a deterrent to widespread adoption and dissemination	NR
Chen 2015[14] Observational with concurrent control Charcoal restriction	Chain supermarkets were regularly audited for compliance (fidelity)	Authors state future studies will need to engage multiple stakeholder groups (store administrators, store employees and managers, the public) to support this initiative given its inconvenience Media influence and public awareness may influence results	While not directly linked to the intervention being tested in the study, the authors state that stores also increased use and access to pamphlets/leaflets with education and resources. In addition, store clerks were advised to monitor behaviors of people buying charcoal and provide pamphlets as needed.
Sinyor 2017[16] Sinyor 2010[17] Observational with concurrent control Barrier at bridge	NR	Media influence can potentially help or hurt immediate success of a bridge barrier designed as a suicide prevention strategy	Future study is needed to evaluate the effect of a comprehensive suicide prevention strategy that includes the barrier in addition to education, reduced stigma, and adequate resources for help.
Law 2014[19]	NR	Authors state more research is needed to evaluate cost-effectiveness to assist	NR

Observational with concurrent control Barrier at bridge		policy makers in decisions regarding the installation of barriers	
Perron 2013[18] Observational with concurrent control Barrier at bridge	NR	NR	Future study is needed to evaluate the effect of a comprehensive suicide prevention strategy that includes the barrier in addition to depression screening and access to treatment
Law 2011[21] Observational with concurrent control Platform screen doors at railway stations	NR	The studies evaluated the societal and economic outcomes of barrier placement, which was overall considered cost-effective and relevant to stakeholders Cost remains a huge barrier when asking railroad companies to extend construction across all lines/stations Effective resource allocation is an important factor in policy-makers' decisions; community acceptance (increased fares and wait times), availability of funds, and media influence need to be considered in future studies	NR
Ueda 2015[23] Observational with concurrent control Platform screen doors at railway stations	Need to consider station design and costs when deciding to install full versus half height platform screen doors	NR	NR

NR=not reported

* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

Appendix Table 5-11. Organizational Policies and Culture: Study Characteristics

Author, Year **Country** **Study Design** **Intervention Type** **Setting** **Funding** **Risk of Bias**	**Inclusion/Exclusion Criteria**	**Intervention** **Comparator** **Study Period** **Length of Follow-up**	**Demographics**
Mishara 2012[27] Country: Canada Study Design: Observational with concurrent control Intervention Type: Organizational Policies and Culture Setting: workplace (police) Funding: Government Risk of Bias: Medium	Inclusion: Program was provided to all members of the Montreal police. Data was compared with other police suicides in the Province of Quebec. Exclusion: None reported	Intervention: *Together for Life* program for Montreal police 1) Training for all units (suicide education) 2) Police resources (telephone helpline) 3) Training of supervisors and union representatives (identification of officers at risk; how to provide help) 4) Publicity campaign ("Together for Life", brochures, posters, internal news articles) Comparator: 1) Pre-intervention in Montreal police 2) Police in the rest of Quebec Study period: 1986-2008 Length of follow-up: 12 years after program and data for 11 years before program	<u>Intervention Sites</u> N=4178 (Montreal police force as of December 31, 2000) Age (years): 20-29: 27% 30-39: 43% 40-49: 21% 50-59: 8% 60+: <1% Gender (% male): 78 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: 30.5 suicides per 100,000 per year (pre-intervention Montreal police) <u>Control Sites</u> N=10,131 (police rest of Quebec as of 1986-1996) Age (years): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: 26.0 suicides per 100,000 per year (pre-intervention police rest of Quebec)

Doran 2016[30] Country: Australia Study Design: Pre-post observational with no concurrent control Intervention Type: Organizational Policies and Culture Setting: Workplace (construction) Funding: NR Risk of Bias: Medium	Inclusion: Males construction industry workers in New South Wales and Queensland Exclusion: Women, due to the small numbers of women in the construction industry and consequent confidentiality issues with reporting small sample sizes	Intervention: *Mates in Construction* program for Australian construction workers 1) General awareness training – 1 hour training session provided by accredited trainers to construction workers on site; aims are increasing awareness of suicide as a work place health and safety issue, improving knowledge of warning signs, and encouraging workers to seek support 2) Connector training – 4 hour training session; role of connector is to keep coworkers safe while connecting them to help 3) Applied suicide intervention skills training – 2-day training course to enable these individuals to identify cases and respond appropriately to calls for help Sites also receive promotional materials and access to other programs including 24/7 helpline Comparator: Pre-intervention Study period: *Queensland:* 2003-2012 *New South Wales*: 2008-2017 Length of follow-up: *Queensland:* 5 years *New South Wales:* the post data was estimated, not originally collected	N: *Queensland pre*: 708,950 *Queensland post*: 841,425 *New South Wales pre*: 1,068,500 Age (years, mean): NR Gender (% male): 100 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Knox 2010[28] Country: United States Study Design: Pre-post observational with no concurrent control	Inclusion: Quarterly suicide rates for active duty air force population from 1981 through 2007 and forecasted for 2008. Exclusion: None reported	Intervention: US Air Force Suicide Prevention Program Leadership involvement Addressing suicide prevention through professional military education Guidelines for commanders on use of mental health services Community preventive services Community education and training	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

Intervention Type: Organizational Policies and Culture Setting: Military setting Funding: Government Risk of Bias: Medium		Investigative intervention policy Trauma stress response Integrated Delivery System and Community Action Information Board Limited Privilege Suicide Prevention Program Integrated Delivery System Consultation Assessment Tool Suicide Event Surveillance System Comparator: Pre-intervention Study period: 1981-2008 Length of follow-up: 11 years after program. Data for 16 years before	
Shelef 2016[29] Country: Israel Study Design: Pre-post observational with no concurrent control Intervention Type: Organizational policies and culture Setting: Military settings Funding: NR Risk of Bias: Medium	Inclusion: Active duty mandatory service Israeli Defense Forces soldiers that served during the years 1992 to 2012. Exclusion: Subsection of the population (n=176,287) that does not represent the regular mandatory service Israeli Defense Forces soldiers.	Intervention: Israeli Defense Forces Suicide Prevention Program Reduce weapon availability Improve screening and management of suicidal soldiers Identify specific populations profiled for intervention by employing 2 indices: a) service timeline; b) subgroups with increased risk and gatekeeper groups Reduce stigma through education and integrating Mental Health Officers in army units and increasing availability of Mental Health Officers through the Human Resources Division Develop a suicide review process Comparator: Pre-intervention Study period: 1992-2012 Length of follow-up: 7 years after program. Data for 14 years before	N=1,171,359 active duty mandatory service soldiers Age (years, mean): 19 Gender (% male): 53.4% Race (%): NR Military status: All active duty. 16.9% combat duty Housing status: NR Socioeconomic status: 24.0% low, 53.8% average, 22.2% high Mental health diagnoses: 2.7% Prior suicide behavior: NR

NR=not reported

Appendix Table 5-12. Organizational Policies and Culture: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Mishara 2012[27]	Yes	Unclear	Unclear	Yes	Yes	Unclear	Unclear	Yes	Yes	NA	No	Medium
Doran 2016 [30]	Yes	Unclear	Unclear	NA	Yes	Yes	Yes	Yes	Unclear	Yes (cost)	No	Medium
Finney 2015[74]	Yes	Unclear	Unclear	No	Yes	NA	NA	Unclear	Unclear	NA	No	High
Knox 2010[28]	Yes	Unclear	Yes	NA	Yes	NA	NA	Yes	Yes	NA	No	Medium
Shelef 2016[29]	Yes	No	NA	NA	Yes	NA	NA	Yes	Yes	NA	Yes	Medium

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-13. Organizational Policies and Culture: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		

Mishara 2012[27] Observational with concurrent control	**Montreal police** 11 years before: 30.5 per 100,000 per year 14 suicides/ 4178 people	**Montreal police** 12 years after: 6.4 per 100,000 4 suicides/ 5189 people	**Rest of Quebec Police** 11 years before: 26.0 per 100,000 per year 29 suicides/ 10131 people	**Rest of Quebec Police** 12 years after: 29.0 per 100,000 32 suicides/ 9197 people	**Montreal police** Change -78.9% (95% CI -93.3 to -33.4) **Rest of Quebec Police** Change 11.4% (95% CI -33.3 to 86.2)	Pre: P=.63 Montreal vs rest of Quebec Post: P=.007 Montreal vs rest of Quebec	NR	NR	NR	NR	NR	NR

CI=confidence interval; NR=not reported; RCT=randomized controlled trial

Appendix Table 5-14. Organizational Policies and Culture: Suicides Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design	**Suicide Deaths**			**Suicide Attempts**		
	Pre-Intervention	**Post-Intervention**	**Pre** vs **Post Comparison**	**Pre-Intervention**	**Post-Intervention**	**Pre** vs **Post Comparison**
Doran 2016[30] Pre-post observational with no concurrent control	**Queensland** Rate: 29.20 per 100,000 207 suicides/ 708,950 people New South Wales was not extracted for suicide deaths because the post-intervention data was estimated	**Queensland** Rate: 26.38 per 100,000 222 suicides/ 841,425 people	**Queensland** RRR (post/pre rate)= 0.904 (95% CI 0.900 to 0.909) -9.6% change (95% CI -10.0% to -9.1%)	NR	NR	NR
Knox 2010[28]	1981-1997: 3.033 suicides per quarter per 100,000 persons	1997-2008: 2.387 suicides per quarter per 100,000 persons	-0.646 suicides per quarter per 100,000; P<.01	NR	NR	NR

Pre-post observational with no concurrent control						
Shelef 2016[29] Pre-post observational with no concurrent control	1992-2005: 24.6 suicides/year 344 total suicides *Females* 4.3 per 100,000 person-year 24 suicides/364,810 people *Males* 35.6 per 100,000 person-year 320 suicides/401,297 people	2006-2012: 12.7 suicides/year 89 total suicides *Females* 3.5 per 100,000 person-year 12 suicides/181,458 people *Males* 16.0 per 100,000 person-year 77 suicides/223,794 people	HR adjusted=0.42 (95% CI 0.33 to 0.54) *Females* HR unadjusted=0.90 (95% CI 0.45 to 1.83) *Males* HR adjusted=0.43 (95% CI 0.33-0.55)	NR	NR	NR

CI=confidence interval; HR=hazard ratio; NR=not reported; RCT=randomized controlled trial; RRR=relative risk ratio

Appendix Table 5-15. Organizational Policies and Culture: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Mishara 2012[27] Observational with concurrent control	NR	NR	NR	NR
Doran 2016[30] Pre-post observational with no concurrent control	NR	NR	**Cost of Intervention** NR; the model used $800,000 each year (Australian dollars) as cost of the program **Total Cost Savings** Impact of implementing the program in New South Wales	NR

			was estimated to save $3.66 million (Australian dollars) each year The benefit-cost ratio was estimated to be 4.6:1	
Knox 2010[28] Pre-post observational with no concurrent control	NR	NR	NR	NR
Shelef 2016[29] Pre-post observational with no concurrent control	NR	NR	NR	NR

NR=not reported

Appendix Table 5-16. Organizational Policies and Culture: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Mishara 2012[27] Observational with concurrent control	Utilizing peers to deliver the program who share a “common language”	Creating a culture that suicidal behavior is not an acceptable way to deal with a crisis	Stakeholders indicated that the training could be improved and sustained with annual refresher courses, follow-up, or memory aids

* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

Appendix Table 5-17. Social-Emotional Learning Programs: Study Characteristics

Author, Year Country Study Design Intervention Type Setting Funding Risk of Bias	Inclusion/Exclusion Criteria	Intervention Comparator Study Period Length of Follow-up	Demographics
Schilling 2016[31] Country: United States Study Design: Cluster RCT Intervention Type: Social-Emotional Learning Program Setting: High school Funding: Foundation Risk of Bias: Medium	Inclusion: 9th grade students at 16 technical high schools in Connecticut Exclusion: NR	Intervention: High schools assigned to the Signs of Suicide program. Schools received a kit of materials containing the DVD, discussion guide, screening forms, and other educational and promotional items. The goals of the program were to increase an understanding of depression and suicide, improve attitudes towards intervening with peers, and encourage youth who are contemplating suicide to seek help. Comparator: Schools assigned to wait-list control Study period: 2007-2008 and 2008-2009 school years Length of follow-up: 3 months	N=1,302 Age (years, mean): in 9th grade Gender (% male): 58 Race (%): White 60%, Hispanic 23%, Black 6% Military status: NR Housing status: NR Socioeconomic status: almost 1/3 qualified for free/reduced lunches Mental health diagnoses: NR Prior suicide behavior: 8% treated for depression/suicidal ideation, 8% ideation in past 3 months, 7% suicide plan in past 3 months, 2% attempt in past 3 months, 8% lifetime attempt
Wasserman 2015[32] (SEYLE trial) Country: Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Romania, Slovenia, Spain Study Design: Cluster RCT Intervention Type: Social-Emotional Learning Program Setting: High School	Inclusion: Public schools containing at least 40 pupils aged 15 years, had more than 2 teachers for pupils aged 15 years, and had no more than 60% of pupils of the same sex. Within the schools, all classes with pupils aged mainly 15 years were approached for participant recruitment. To avoid discrimination, all pupils in the participating classrooms, including those aged 14 to 16 years, were also approached for recruitment.	Intervention: Schools were assigned to 1 of 3 interventions. Questions, Persuade, and Refer was a gatekeeper training module targeting teachers and other school personnel to recognize the risk of suicidal behavior and motivate and help pupils seek help The Youth Aware of Mental Health Program targeted pupils and including interactive workshops,	N=5,654 adolescents (85 schools) randomized to Youth Aware of Mental Health or control group Age (years, mean): 15 Gender (% male): 42 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: 10% pupils' parents lost employment in prior year Mental health diagnoses: NR

Funding: Government Risk of Bias: Low	Exclusion: All pupils who reported suicide attempts ever, or severe ideation in the past 2 weeks before the baseline assessment, and those with missing data regarding these 2 variables were not included in the final analysis.	educational posters, and lectures about mental health At-risk pupils were referred for professional screening based on responses to the baseline questionnaire Comparator: Control group was exposed to educational posters displayed in their classrooms Study period: November 1, 2009-December 14, 2010 Length of follow-up: 12 months	Prior suicide behavior: Pupils with prior suicide attempt or severe suicide ideation were excluded from analysis
Milner 2019[33] Country: Australia Study Design: RCT Intervention Type: Social-Emotional Learning Program Setting: Workplace (construction) Funding: Foundation Risk of Bias: Medium	Inclusion: Adult men workers in the construction industry consecutively accessing services from Incolink (social welfare trustee company that provides support to unemployed members of the construction industry) between 30 May 2016 and 4 April 2017 who owned a smartphone with Internet connectivity and adequate data download capacity Exclusion: <18 years of age with inadequate English	Intervention: Contact+Connect; an electronic intervention designed to reduce stigma against mental health problems delivered to participants' smart phones. One text message was delivered per week for 6 weeks, containing links to resources. Comparator: Wait-list (received the intervention materials in full at the conclusion of the intervention period) Study period: NR (around 2016-2017) Length of follow-up: 6 weeks	N=682 randomized Age (years, mean): Aged 18-29 11% Aged 30-39 23% Aged 40-49 32.5% Aged 50-59 24% Aged 60+ 9% Gender (% male): 100% Race (%): NR Military status: NR Housing status: NR Socioeconomic status: Unemployed 77% Mental health diagnoses: NR Prior suicide behavior: Attempted suicide 1.4% Communicated suicide 1.7%
Rogers 2018[62] Country: United States Study Design: RCT Intervention Type: Social-Emotional Learning Program	Inclusion: aged 18 to 69, recruited from undergraduate psychology student research pools (n= 114) and the surrounding community (n= 152). Exclusion: NR	Intervention: Psychoeducation; Participants browsed the National Suicide Prevention Lifeline. This website provides information about suicide statistics, risk factors, and resources related to prevention.	N=266 randomized Age (years, mean): 26 Gender (% male): 35 Race (%): 67% White, 20% Black, 14% Hispanic, 6% Asian, 4% Native American, 2% other Military status: NR Housing status: NR

Setting: University research pools and surrounding community Funding: Government, foundation Risk of Bias: Medium		Intervention: Interpersonal exposure; Participants browsed the Live Through This project website. This website contains photographed portraits of suicide attempters and detailed firsthand accounts, personal stories, and interviews about their lives and suicidal history. Comparator: Participants browsed the National Diabetes Education site Study period: NR Length of follow-up: 1 month	Socioeconomic status: 11% income <$10,000, 18% income $10,000 to <$25,000, 15% income $25,000 to <$40,000, 17% income $40,000 to <$75,000, 15% income $75,000 to <$100,000, 12% income $100,000 to <$150,000, 11% income ≥$150,000 Mental health diagnoses: NR Prior suicide behavior: 38% lifetime suicide ideation, 12% lifetime suicide plan, 9% lifetime suicide attempt
Taylor-Rodgers 2014[61] Country: Australia Study Design: RCT Intervention Type: Social-Emotional Learning Program Setting: Recruited on University campus and social media Funding: Government Risk of Bias: Medium	Inclusion: Age 18-25 years. Exclusion: NR	Intervention: Online psychoeducation on depression, anxiety, and suicide with vignettes of young people experiencing mental health problems. Program lasted 3 weeks. Comparator: Online attention-matched control information (emailed links to webpages on dental hygiene, common household medications and nutrition facts). Study period: NR Length of follow-up: 4 weeks	N=67 randomized Age (years, mean): 22 Gender (% male): 25 Race (%): 78% White, 16% Asian, 6% other Military status: NR Housing status: NR Socioeconomic status: NR; 9% no university, 82% bachelor's degree, 9% post-graduate education Mental health diagnoses: NR Prior suicide behavior: NR
Voss 2013[63] Country: United States Study Design: Pre-post observational with no concurrent control Intervention Type: Social-Emotional Learning Program	Inclusion: attendance at a publicly funded addiction treatment agency in Washington State Exclusion: 1) imminently suicidal patients or those who planned or attempted suicide within the past 3 months 2) patients with cognitive or language barriers judged severe enough to impede participation	Intervention: *Preventing Addiction Related Suicide* is a group-based program implemented by counselors in the intensive outpatient program for addiction treatment. The session took place over a single 2-3 hour session consisting of didactive material and discussion. The program provides participants with an overview of factors related to suicide risk and	N=78 Age (years, mean): 35 Gender (% male): 64 Race (%): Caucasian (44%), African American (26%), Asian (8%), American Indian/Alaskan Native (5%), >1 race (6%), did not report race (8%) Military status: NR Housing status: NR

Setting: Intensive outpatient program for addiction treatment Funding: Government (National Institute on Drug Abuse) Risk of Bias: Medium		steps 1 can take to address current suicide risk in oneself or others. Comparator: Pre-intervention Study period: months and years of data collection were not reported Length of follow-up: immediately after the program and 1 month later	Socioeconomic status: NR Mental health diagnoses: all participants were part of an addiction treatment program Prior suicide behavior: several participants reported prior suicide attempts

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe trial

Appendix Table 5-18. Social-Emotional Learning Programs: Risk of bias – Cluster RCTs

Author, Year	Sequence Generation	Allocation Concealment	Recruitment Bias	Baseline Imbalance	Blinded Outcome Assessment	Incomplete Cluster Data	Incomplete Outcome Data	Selective Outcome Reporting	Overall Risk of Bias
Schilling 2016[31]	Unclear (NR)	Unclear (NR)	Low (students participating prior to being randomized)	High (race/ ethnicity and gender)	Unclear (NR)	Low	High (28% in the control arm and 10% in the intervention arm not available for post-test)	Low	Medium
Wasserman 2015[32] (SEYLE)	Low (random number generator)	Unclear (NR)	Low (recruitment prior to being randomized)	Low	Unclear (NR)	Low	Moderate (19% not available at the 12-month follow-up)	Low	Medium

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe trial

Appendix Table 5-19. Social-Emotional Learning Programs: Risk of Bias – RCTs

Author, Year	Random sequence generation	Allocation concealment	Blinding of participants, personnel, and outcome assessors	Incomplete outcome data	Selective outcome reporting	Other sources of bias	Overall Risk of Bias
Milner 2019[33]	Low (Adequate)	Low	Low	Medium	Low	-	Medium
Rogers 2018[62]	Unclear	Unclear	High	Low	Low	Low	Medium
Taylor-Rodgers 2014[61]	Low	Unclear	Low	Medium (16% lost to follow-up. All subjects were analyzed.)	Unclear	Low	Medium
Han 2018[75]	Low	Low	Low	High	Low	Low	High
Dueweke 2017[76]	Low	High	Unclear	Low	Low	Low	High

RCT=randomized controlled trial

Appendix Table 5-20. Social-Emotional Learning Programs: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Voss 2013[63]	Yes	Yes	NA	NA	Yes	Yes	NA	Yes	NA	Yes	No	Medium
Freedenthal 2010[77]	Yes	No	Unclear	Yes	NA	No	Yes	Yes	No	NA	No	High
Gravesteinj 2011[78]	Yes	No	Yes	Yes	No	NA	NA	Yes	No	No	Unclear	High
Kennedy 2020[79]	Unclear	Yes	Yes	No	No	No	NA	Yes	NA	Yes	No	High

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-21. Social-Emotional Learning Programs: Suicide Deaths and Attempts from RCTs

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Schilling 2016[31] Cluster RCT	NR	NR	NR	NR	NR	NR	Past 3 months: 1.8% (13/719) Lifetime: 7.7% (56/719)	Past 3 months: 1.7% (11/650) Lifetime: 8.3% (54/650)	Past 3 months: 2.5% (14/553) Lifetime: 9.4% (52/553)	Past 3 months: 5.0% (20/396) Lifetime: 14.9% (59/396)	NR	Past 3 months: P<.05 Lifetime: P<.05
Wasserman 2015[32] (SEYLE) Cluster RCT	No completed suicides were reported for any study participants				NR	NR	NA (only looked at incident suicide behavior)	3 months: 0.88% (19/ 2166) 12 months: 0.70% (14/ 1987)	NA (only looked at incident suicide behavior)	3 months: 1.14% (27/ 2366) 12 months: 1.51% (34/ 2256)	NR	3 months: OR=0.78 (95% CI 0.42 to 1.44) 12 months: OR=0.45 (95% CI 0.24 to 0.85) No effect modification by sex (interaction test P=.27) and age (interaction test P=.89)

Milner 2019[33] RCT	NR	NR	NR	NR	NR	NR	Suicide attempts was measured using a Likert-scale from strongly agree to strongly disagree to the question "Have you tried to kill yourself in the past 6 months?" (asked at baseline) and "…since joining the project?" (asked at post-intervention). <u>Intervention over time</u> MD from baseline unadjusted = 0.04 (95% CI -0.10 to 0.18) MD from baseline adjusted = 0.06 (95% CI -0.09 to 0.20) <u>Control over time</u> MD from baseline unadjusted = 0.03 (95% CI -0.08 to 0.14) MD from baseline adjusted = 0.02 (95% CI -0.10 to 0.14) <u>Intervention vs control</u> MD intervention vs control unadjusted = 0.01 (95% CI -0.16 to 0.19) MD intervention vs control adjusted = 0.04 (95% CI -0.15 to 0.22)					
Rogers 2018[62] RCT	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Taylor-Rodgers 2014[61] RCT	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

CI=confidence interval; MD=mean difference; NA=not applicable; NR=not reported; OR=odds ratio; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe trial

Appendix Table 5-22. Social-Emotional Learning Programs: Suicides Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design	Suicide Deaths			Suicide Attempts		
	Pre-Intervention	Post-Intervention	Pre vs Post Comparison	Pre-Intervention	Post-Intervention	Pre vs Post Comparison
Voss 2013[63] Pre-post observational with no concurrent control	NR	NR	NR	NR	NR	NR

NR=not reported; RCT=randomized controlled trial

Appendix Table 5-23. Social-Emotional Learning Programs: Secondary Outcomes

Author, Year Study Design Intervention Type	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Schilling 2016[31] Cluster RCT	NR	NR	NR	NR
Wasserman 2015[32] (SEYLE) Cluster RCT	NR	NR	NR	NR
Milner 2019[33] RCT	NR	NR	NR	NR
Rogers 2018[62] RCT	**Stigma of Suicide Scale Score (SD), n** *Psychoeducation arm* Pre: 62.0 (22.0), n=90 Post: 57.5 (22.8), n=90 1 month: 60.3 (22.6), n=80 *Exposure arm* Pre: 65.6 (23.7), n=86 Post: 60.6 (23.5), n=86 1 month: 63.3 (22.9), n=76	NR	NR	NR

	Control arm Pre: 61.5 (23.0), n=90 Post: 60.2 (25.1), n=90 1 month: 67.7 (25.6), n=82 The 2 interventions resulted in a significantly greater decrease in stigma of suicide compared with the control at all timepoints (T1-T3 P<.001)			
Taylor-Rodgers 2014[61] RCT	**Stigma of Suicide Scale** **Score (SD), n** *Psychoeducation* Pre: 2.8 (0.4), n=34 *Control* Pre: 2.8 (0.3), n=33 Difference between psycho-intervention and control at post-test was non-statistically significant (P=.619). N= 56 participants with post-test survey data	NR	NR	NR
Voss 2013[63] Pre-post observational with no concurrent control	**Stigma and Bias Towards Suicides Acts or Persons** **Score (SE)** Pre: 19.29 (0.44) Post: 15.57 (0.57) 1-month: 17.26 (0.60) N=64 participants with follow-up Better attitudes towards suicidal acts or persons immediately following the session (P=.000) and 1-month post (P=.0001) compared to prior to the session	NR	NR	NR

NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; SEYLE=Saving and Empowering Young Lives in Europe trial

Appendix Table 5-24. Social-Emotional Learning Programs: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Schilling 2016[31] Cluster RCT	School counselors and social work staff completed a 1-day training prior to administering the program.	Program was implemented as part of routine health	Recommended “booster” programs for longer-term follow-up.

	Schools received a kit of materials containing the DVD (dramatizations of reactions to a young person who is depressed and suicidal, along with real world interviews and experiences), discussion guide, screening forms and other educational/promotional items. They also received a procedure manual for program implementation and potential solutions to anticipated barriers.	class curriculum received by all students.	Recommended integrating adjunct elements into the program that address risk factors such as alcohol abuse, anger recognition & management, and violence reduction.
Wasserman 2015[32] (SEYLE) Cluster RCT	Local teams were trained in the study methods and a steering group monitored adherence (process assessments and quality control—though limited detail given). The program required students to be active participants (role play). Procedure manual was provided to all sites.	Embedded into classroom-based curriculum (5 hours in 4 weeks).	Recommended evaluation of booster activities and combination of different interventions.

RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe trial
* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

Appendix Table 5-25. Gatekeeper Training: Study Characteristics

Author, Year **Country** **Study Design** **Intervention Type** **Setting** **Funding** **Risk of Bias**	**Inclusion/Exclusion Criteria**	**Intervention** **Comparator** **Study Period** **Length of Follow-up**	**Demographics**
Wasserman 2015[32] (SEYLE trial) Country: Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Romania, Slovenia, Spain Study Design: Cluster RCT	Inclusion: Public schools containing at least 40 pupils aged 15 years, had more than 2 teachers for pupils aged 15 years, and had no more than 60% of pupils of the same sex. Within the schools, all classes with pupils aged mainly 15 years were approached for participant recruitment. To avoid discrimination, all pupils in the participating classrooms, including those aged 14 to 16 years, were also approached for recruitment.	Intervention: Schools were assigned to 1 of 3 interventions. Questions, Persuade, and Refer was a gatekeeper training module targeting teachers and other school personnel to recognize the risk of suicidal behavior and motivate and help pupils seek help The Youth Aware of Mental Health Program targeted pupils and including interactive	N=5,625 adolescents (80 schools) randomized to gatekeeper or control Age (years, median): 15 Gender (% male):41 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: 10% pupils had parents that lost employment in previous year Mental health diagnoses: NR Prior suicide behavior: Pupils with prior suicide attempt or severe suicide ideation were excluded

Intervention Type: Gatekeeper training Setting: School Funding: Government Risk of Bias: Low	Exclusion: All pupils who reported suicide attempts ever, or severe ideation in the past 2 weeks before the baseline assessment, and those with missing data regarding these 2 variables were not included in the final analysis.	workshops, educational posters, and lectures about mental health At-risk pupils were referred for professional screening based on responses to the baseline questionnaire Comparator: Control group was exposed to educational posters displayed in their classrooms Study period: November 1, 2009-December 14, 2010 Length of follow-up: 12 months	
Sareen 2013[34] Country: Canada Study Design: RCT Intervention Type: Gatekeeper training Setting: Community (First nations) Funding: Government Risk of Bias: Medium	Inclusion: Members of the Swampy Cree tribal communities who were currently residing on the reserves Exclusion: <16 years of age, prior training in SafeTALK (a briefer version of suicide awareness training) or Applied Suicide Intervention Skills Training, being an elected official in a First Nations community, living off reserve, and an inability to read or write English.	Intervention: Applied Suicide Intervention Skills Training, A 2-day intensive, interactive and practice-dominated workshop aimed at enabling people to recognize risk and learn how to intervene immediately to prevent suicide. Comparator: Resilience Retreat, a 2-day retreat that was divided into cultural teachings and activities, sharing circles, small group discussions, and storytelling. Study period: years NR (sample recruited from 2010-2011) Length of follow-up: 6 months	N=55 Age (years, mean): NR Aged 16-21 44% Aged 22-44 33% Aged 45+ 22% Gender (% male): 40% Race (%): First nations (Cree) 100% Military status: NR Housing status: NR Socioeconomic status: Working full or part time 25% Unemployed/social assistance 45% Educational attainment grade 9 or lower: 40% Mental health diagnoses: NR Prior suicide behavior: NR
Garraza 2019[37] (long-term suicides) Walrath 2015[35] (short-term suicides)	Inclusion: Counties exposed to the suicide prevention efforts of the Garrett Lee Smith program at some point between 2006 and 2009 (intervention counties) and counties that shared key characteristics but were	Intervention: *Garrett Lee Smith Suicide Prevention Program*-gatekeeper training is a core part of the program. Intervention group was defined as a county	<u>Baseline Characteristics After Matching as Reported in Garraza 2019</u> N=80,300 youths; 231,200 adults N=481 exposed countries; 851 unexposed counties

Garraza 2015[36] (suicide attempts) Garraza 2018[72] (cost-benefit) Country: United States Study Design: Observational with concurrent control Intervention Type: Gatekeeper training Setting: General community (activities took place in multiple settings) Funding: Government Risk of Bias: Low *Note: All 4 articles evaluated the Garrett Lee Smith program. They used overlapping datasets and time periods. We considered them to be the same single study to avoid double-counting data. We used Garraza 2019 to extract long-term suicide deaths, Garraza 2015 for suicide attempts, and Garraza 2018 for cost-benefit analysis.*	not exposed to these suicide prevention efforts (control counties). For suicide mortality, the authors explicitly stated that counties had to have more than 3,000 youths (aged 10-24) to be included as smaller counties had large variability of youth suicide mortality rates. Exclusion: Nothing additional	conducting a Garrett Lee Smith-funded gatekeeper training event targeting youths/young adults. Though, the program is usually implemented in concert with other prevention strategies. Comparator: 1) Counties that did not implement the Garrett Lee Smith Program 2) Adult populations who were not the target of the program Study period: Initially exposed to the program between 2006 and 2009 Length of follow-up: 4 years for suicide deaths outcome; ≥2 years for attempts	Age (years, mean): NR Gender (% male): only reported in the initial analysis in Walrath 2015, 49% male Race (%): 85% White; 10% Black/African American; 6% Hispanic; 2% American Indian/Alaskan Native Military status: NR Housing status: NR Socioeconomic status: 5% unemployment rate; 14% poverty rate; ~$39,000 median household income; 17% uninsured rate Mental health diagnoses: NR Prior suicide behavior: youth suicide rate 8.5 per 100,000; adult rate 17.6/100,00 <u>Baseline Characteristics After Matching as Reported in Garraza 2015</u> N=141,000 persons N=466 intervention counties; 1161 control Age (years, mean): 12% 12-17 years; 15% 18-25 years; 73% ≥26 years Gender (% male): 48% Race (%): 81% Non-Hispanic White; 9% Non-Hispanic African American; 2% Non-Hispanic American Indian or Alaskan Native; <1% Non-Hispanic Native Hawaiian and other Pacific Islander; 1% Non-Hispanic Asian; 1% Non-Hispanic multiracial/multiethnic; 5% Hispanic Military status: NR Housing status: NR Socioeconomic status: 23% family income <20000; 38% between 20,000 and 49,999; 18% between 50,000 and 74,999; 21% 75,000 or more 50% employed full-time; 14% employed part-time; 4% unemployed; 32% other (*eg*, not in labor force) 85% have health insurance

			Mental health diagnoses: 15% lifetime major depressive episode; 8% past year major depressive episode Prior suicide behavior: ~10 attempts per 1000 youths aged 16-23 years; ~6 attempts per 1000 adults aged ≥24 years

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-26. Gatekeeper Training: Risk of bias – Cluster RCTs

Author, Year	Sequence Generation	Allocation Concealment	Recruitment Bias	Baseline Imbalance	Blinded Outcome Assessment	Incomplete Cluster Data	Incomplete Outcome Data	Selective Outcome Reporting	Overall Risk of Bias
Wasserman 2015[32] (SEYLE)	Low (random number generator)	Unclear (NR)	Low (recruitment prior to randomization	Low	Unclear (NR)	Low	Moderate (19% not available at the 12-month follow-up period)	Low	Medium

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-27. Gatekeeper Training: Risk of Bias – RCTs

Author, Year	Random sequence generation	Allocation concealment	Blinding of participants, personnel, and outcome assessors	Incomplete outcome data	Selective outcome reporting	Other sources of bias	Overall Risk of Bias
Sareen 2013[34]	Low (Adequate)	Unclear	Unclear	Low	Low	-	Medium

RCT=randomized controlled trial

Appendix Table 5-28. Gatekeeper Training: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Garraza 2019[37] Walrath 2015[35] Garraza 2015[36] Garraza 2018[72]	Yes	Yes	Unclear	Yes	NA	NA	NA	Yes	Yes (deaths) Unclear (attempts)	Yes (cost)	Yes	Low
Smith Osborne 2017[80]	Unclear	No	No	NA	No	NA	NA	Unclear	Unclear	Yes	Yes	High

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=Not applicable; RCT=randomized controlled trial

Appendix Table 5-29. Gatekeeper Training: Suicide Deaths and Suicide Attempts Outcomes from RCTs

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Wasserman 2015[32] (SEYLE) Cluster RCT	No completed suicides were reported for any study participants				NR	NR	NA; only looked at incident suicide attempt	3 months: 0.68% (15/ 2209) 12 months: 1.11% (22/ 1978)	NA; only looked at incident suicide attempt	3 months: 1.14% (27/ 2366) 12 months: 1.51% (34/ 2256)	NR	3 months: OR=0.62 (95% CI 0.32 to 1.18) 12 months: OR=0.70 (95% CI 0.39 to 1.25)

												No effect modification by sex (interaction test P=.27) and age (interaction test P=.89)
Sareen 2013[34] RCT	NR	6 months: 0% (0/31)	NR	6 months: 0% (0/24)	NR	P=1.0	lifetime attempt: 19% (6/31)	6 months: 0% (0/28)	lifetime attempt: 25% (6/24)	6 months: 0% (0/22)	NR	P=1.0

CI=confidence interval; NA=not applicable; NR=not reported; OR=odds ratio; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-30. Gatekeeper Training: Suicide Deaths and Suicide Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Garraza 2019[37] Walrath 2015[35] Garraza 2015[36] Garraza 2018[72] Observational with concurrent control	**Suicides among youths 10-24 years old as reported in Garraza 2019** *Reported as difference per 100,000 between intervention and control* At 1 year: -0.893 (SE=0.408; P=.029) At 2 years: -1.095 (SE=0.422; P=.010) At 3 years: -0.431 (SE=0.481; P=.370) At 4 years: -0.324 (SE=0.477; P=.498) **Suicides among youths in rural counties as reported in Garraza 2019** *Reported as difference per 100,000 between intervention and control* At 1 year: -0.803 (SE=0.768; P=.296) At 2 years: -2.936 (SE=0.807; P<.001) At 3 years: -0.671 (SE=0.836; P=0.422) At 4 years: -1.016 (SE=0.791; P=.199)						**Attempts among youths 16-23 years old as reported in Garraza 2015** *Reported as difference per 1,000 between intervention and control* At 1 year: -4.91 (SE=1.57; P=.003) At ≥2 years: -1.19 (SE=1.87; P=.53) **Attempts among youths 16-19 years old as reported in Garraza 2015** *Reported as difference per 1,000 between intervention and control* At 1 year: -4.46 (SE=2.14; P=.042) At ≥2 years: -2.70 (SE=2.98; P=.369) **Attempts among youths 20-23 years old as reported in Garraza 2015** *Reported as difference per 1,000 between intervention and control* At 1 year: -5.68 (SE=2.46; P=.025) At ≥2 years: 3.09 (SE=3.63; P=.399)					

SE=standard error; RCT=randomized controlled trial

Appendix Table 5-31. Gatekeeper Training: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Wasserman 2015[32] (SEYLE) Cluster RCT	NR	NR	NR	NR
Sareen 2013[34] RCT	NR	NR	NR	NR
Garraza 2019[37] Walrath 2015[35] Garraza 2015[36] Garraza 2018[72] Observational with concurrent control	NR	NR	**As reported in Garraza 2018** Cost savings from averted hospitalizations $187.8 million (95% CI, 67.1 to 308.5) Cost savings from averted emergency department visits $34.1 million (95% CI, 8.7 to 59.9) Total medical cost savings $222.1 million (95% CI, 78.7 to 365.4) Total Garrett Lee Smith program costs $49.4 million Benefit-cost ratio $4.5 (95% CI, 1.6 to 7.4)	NR

CI=confidence interval; NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-32. Gatekeeper Training: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Wasserman 2015[32] (SEYLE) Cluster RCT	Local teams were trained in the study methods and a steering group monitored adherence (process assessments and quality control—though limited detail given). Power point presentations and booklet were distributed to all trainees.	Embedded into school setting.	Recommended evaluation of booster activities and combination of different interventions.

RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe
* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

Appendix Table 5-33. Crisis Intervention: Study Characteristics

Author, Year Country Study Design Intervention Type Setting Funding Risk of Bias	Inclusion/Exclusion Criteria	Intervention Comparator Study Period Length of Follow-up	Demographics
Stacks 2015[38] Country: United States Study Design: Pre-post observational with no concurrent control Intervention Type: Crisis intervention Setting: Suicide hotspot Funding: NR Risk of Bias: Medium	Inclusion: Yearly suicide counts at Skyway Bridge from the period 1954 (the year the bridge opened) through 2012. Exclusion: Year 1999 was omitted from the analysis because the phones were installed in 1999.	Intervention: Phones were installed on the Skyway Bridge in St. Petersburg, Florida – with direct links to a crisis center counselor Comparator: Pre-intervention Study period: 1954-2013 Length of follow-up: ~13 years. Crisis phones were installed in July, 1999	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

NR=not reported

Appendix Table 5-34. Crisis Intervention: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Stacks 2015[38]	Yes	Unclear	Unclear	No	Yes	NA	NA	Unclear	Yes	NA	Unclear	Medium

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-35. Crisis Intervention: Suicide Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design	Suicide Deaths			Suicide Attempts		
	Pre-Intervention	Post-Intervention	Pre vs Post Comparison	Pre-Intervention	Post-Intervention	Pre vs Post Comparison
Stacks 2015[38] Pre-post observational with no concurrent control	1986-1998: 48 suicides	2000-2012: 106 suicides	2000-2012: +4.46 suicides/year vs 1986-1998; P<.001 +2.73 suicides/year vs 1986-1998 when adjusting for Florida suicide rate; P<.05 2000-2001: -5.0 suicides/year vs 1997-1998; not statistically significant	NR	NR	NR

NR=not reported; RCT=randomized controlled trial

Appendix Table 5-36. Crisis Intervention: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Stacks 2015[38] Pre-post observational with no concurrent control	NR	NR	NR	NR

NR=not reported

Appendix Table 5-37. Public Awareness and Education Campaigns: Study Characteristics

Author, Year Country Study Design Intervention Type Setting Funding Risk of Bias	Inclusion/Exclusion Criteria	Intervention Comparator Study Period Length of Follow-up	Demographics
Matsubayashi 2014[40] Country: Japan	Inclusion: Resident of Nagoya Japan. Exclusion: NR	Intervention: Public awareness campaign as part of a city-wide suicide prevention program in the city of Nagoya Japan. Promotional materials that were aimed to stimulate public awareness	N=2.3 million (population of Nagoya) Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR

Study Design: Pre-post observational with no concurrent control Intervention Type: Public awareness and education campaign Setting: Community Funding: Foundation Risk of Bias: Low		of depression and promote care- seeking behavior were distributed to residents during 2010-2012. Materials were handed out to pedestrians on city streets and commuters in train stations. Comparator: None Study period: 2010-2012; intervention effects measured at 5 months	Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: 448 people died by suicide in 2010, rate of 20.3. per 100,000
Till 2013[39] Country: Austria Study Design: Observational with concurrent control Intervention Type: Public awareness and education campaign Setting: Community Funding: NR Risk of Bias: Medium	Inclusion: Resident of the Styria region of Austria Exclusion: NR	Intervention: Suicide awareness campaign in the Austrian federal state of Styria to increase help-seeking behavior in the population via a telephone counseling service providing support 24/7 for all people in all kinds of crises, including individuals at risk for suicide. Comparator: Federal state of Upper Austria with its own telephone crisis service was used as the control region Study period: January to June 2011 Length of follow-up: 3 months pre-intervention and 3 months post	N=2.6 million in both study and control areas in 2011 Age (years, mean): 20% age 0-18, 58% age 19-60, 22% age 61+ Gender (% male): 49% Race (%): NR Military status: NR Housing status: NR Socioeconomic status: Unemployment rates 4-6.3% Mental health diagnoses: NR Prior suicide behavior: 17.5 suicides per 100,000 in study area; 15.1 suicides per 100,000 in control area

NR=not reported

Appendix Table 5-38. Public Awareness and Education Campaigns: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Till 2013[39]	Yes	Yes	Unclear	Yes	NA	Yes	Yes	NA	Unclear	NA	No	Medium
Matsubayashi 2014[40]	Yes	Yes	Yes	NA	Yes	NA	NA	Yes	Yes	NA	Unclear	Low

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=Not applicable; RCT=randomized controlled trial

Appendix Table 5-39. Public Awareness and Education Campaigns: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Till 2013[39] Observational with concurrent control	3 months before campaign: 52	3 months after campaign: 69	3 months before campaign: 67	3 months after campaign: 68	Intervention +32.6% Control +1.4%	P=.28	NR	NR	NR	NR	NR	NR

NR=not reported; RCT=randomized controlled trial

Appendix Table 5-40. Public Awareness and Education Campaigns: Suicide Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design Intervention Type	Suicide Deaths			Suicide Attempts		
	Pre-Intervention	Post-Intervention	Pre vs Post Comparison	Pre-Intervention	Post-Intervention	Pre vs Post Comparison
Matsubayashi 2014[40] Pre-post observational with no concurrent control	Reference = months with no campaign activity	Notes: Men: The effect of the campaign lasts for 4 months, but not more than 5 months Women: The only statistically significant reduction in the number of suicides was observed in the second month during the post-distribution period.	Ward with a campaign 0 months earlier 0 month: IRR= ~1.005 (95% CI 0.99 to 1.02) *Estimated from figure* Ward with a campaign 2 months earlier: IRR = 0.971 (95% CI 0.957 to 0.985) Ward with a campaign 5 months earlier: IRR = ~0.995 (95% CI 0.97 to 1.02) *Estimated from figure*	NR	NR	NR

CI=confidence interval; IRR=incident rate ratio; NR=not reported; RCT=randomized controlled trial

Appendix Table 5-41. Public Awareness and Education Campaigns: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Till 2013[39] Observational with concurrent control	NR	NR	NR	NR
Matsubayashi 2014[40] Pre-post observational with no concurrent control	NR	NR	NR	NR

NR=not reported

Appendix Table 5-42. Screening for At-Risk: Study Characteristics

Author, Year Country Study Design Intervention Type Setting Funding Risk of Bias	Inclusion/Exclusion Criteria	Intervention Comparator Study Period Length of Follow-up	Demographics
Wasserman 2015[32] (SEYLE trial) Country: Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Romania, Slovenia, Spain Study Design: Cluster RCT Intervention Type: screening for at-risk (not in clinic setting) Setting: School Funding: Government Risk of Bias: Low	Inclusion: Public schools containing at least 40 pupils aged 15 years, had more than 2 teachers for pupils aged 15 years, and had no more than 60% of pupils of the same sex. Within the schools, all classes with pupils aged mainly 15 years were approached for participant recruitment. To avoid discrimination, all pupils in the participating classrooms, including those aged 14 to 16 years, were also approached for recruitment. Exclusion: All pupils who reported suicide attempts ever, or severe ideation in the past 2 weeks before the baseline assessment, and those with missing data regarding these 2 variables were not included in the final analysis.	Intervention: Schools were assigned to 1 of 3 interventions. Questions, Persuade, and Refer was a gatekeeper training module targeting teachers and other school personnel to recognize the risk of suicidal behavior and motivate and help pupils seek help. The Youth Aware of Mental Health Program targeted pupils and including interactive workshops, educational posters, and lectures about mental health. At-risk pupils were referred for professional screening based on responses to the baseline questionnaire Comparator: Control group was exposed to educational posters displayed in their classrooms Study period: November 1, 2009- December 14, 2010 Length of follow-up: 12 months	N=5,697 adolescents (83 schools) randomized to screening or control group Age (years, median): 15 Gender (% male): 43 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: 10% pupils had parents that lost employment in previous year Mental health diagnoses: NR Prior suicide behavior: Pupils with prior suicide attempt or severe suicide ideation were excluded
Dezso 2018[43] Country: Europe Study Design: Observational with concurrent control	Inclusion: All arrivals to Berlin remand prison between March and May 2016 Exclusion: transport prisoners, detainees admitted prior to the study period but who were temporarily transferred to the	Intervention: Suicide screening instrument administered to arriving prisoners. Comparator: Prisoners arriving pre-screening instrument Study period: Participants in the intervention group entered the detention facility from March-May 2016.	N=1,510 Age (years, mean): 35 Gender (% male): 100 Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR

Intervention Type: Screening for at-risk (not in clinic setting) Setting: Prison/detention facility Funding: NR Risk of Bias: Medium	prison hospital for health reasons.	Participants in the control group entered the facility December-February 2016. Length of follow-up: 6 months Note: the control group consisted of prisons who entered the detention facility in the 3 months prior to the screening intervention. We considered the study to have a "concurrent control" because the follow-up period overlapped between intervention and control.	Mental health diagnoses: NR Prior suicide behavior: NR
Oyama 2017[42] Country: Japan Study Design: Observational with concurrent control Intervention Type: Screening for at-risk (not in clinic setting) Setting: General community (rural areas/older adults) Funding: Government Risk of Bias: Medium	Inclusion: Residents of the Aomori Prefecture in northern Japan aged 40-64 years Exclusion: recently received a depression intervention	Intervention: Standardized work plan autonomously conducted by municipalities. Municipalities distributed public information leaflets and newsletters designed to publicize information about depression as a risk factor for suicide, explain about depression screening and treatment options, and reduce the stigma of mental illness. Depression screener mailed to all residents aged 36–64 years in districts with a history of high suicide rates. Anyone with a Self-Rating Depression Scale score of ≥48 was contacted in the second screening stage consisting of a telephone interview based on the major depressive episodes module. Interviewers summarized the results, and the psychiatrist treating the 5 municipalities rated these results for severity of depressive episode. Written feedback was mailed to all respondents, and those diagnosed with any depressive episode were contacted by health professionals and provided with a referral to a psychiatrist and support to help them continue treatment, including information about the importance of doing so. Comparator: Municipalities without intervention Study period: 2009-2012 Length of follow-up: 8 years	N=12,682 participants who were first stage screened in the intervention area Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Oyama 2016[41] Country: Japan	Inclusion: Japanese adult residents of the Aomori Prefecture in northern Japan, age ≥65 years and were	Intervention: Self-administered screening questionnaire administered to municipalities with high prevalence of depressive symptoms. Identified participants followed-up via telephone interview and referred for treatment.	N=24,312 Age (years, mean): NR Gender (% male): NR Race (%): NR

Study Design: Observational with concurrent control Intervention Type: Screening for at-risk (not in clinic setting) Setting: General community (rural areas/older adults) Funding: Government, foundation, university Risk of Bias: Medium	exposed to potential long-term effects of the initial 4-year intervention, ending in 2010. Exclusion: NR	Educational component provided information on depression symptoms treatment through workshops and newsletters at community centers. Comparator: Municipalities without intervention, usual care consisted of health check-ups Study period: 1999-2010 (intervention period 2005-2006) Length of follow-up: 4 years	Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-43. Screening for At-Risk: Risk of bias – Cluster RCTs

Author, Year	Sequence Generation	Allocation Concealment	Recruitment Bias	Baseline Imbalance	Blinded Outcome Assessment	Incomplete Cluster Data	Incomplete Outcome Data	Selective Outcome Reporting	Overall Risk of Bias
Wasserman 2015[32] (SEYLE)	Low (random number generator)	Unclear (NR)	Low (recruitment prior to randomization	Low	Unclear (NR)	Low	Moderate (19% not available at the follow-up period)	Low	Medium

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-44. Screening for At-Risk: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Dezso 2018[43]	Yes	Yes	Yes	No	NA	Yes	Yes	Yes	NA	Yes	No	Medium
Oyama 2017[42]	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes	NA	Yes	Medium
Oyama 2016[41]	Yes	Yes	Yes	No	NA	Yes	Yes	Yes	Yes	NA	Yes	Medium

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-45. Screening for At-Risk: Suicide Deaths and Attempts from RCTs

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Wasserman 2015[32] (SEYLE) Cluster RCT	No completed suicides were reported for any study participants				NR	NR	NA (only looked at incident suicide behavior)	3 months: 1.23% (27/ 2203) 12 months: 1.02% (20/ 1961)	NA (only looked at incident suicide behavior)	3 months: 1.14% (27/ 2366) 12 months: 1.51% (34/ 2256)	NR	3 months: OR=1.10 (95% CI 0.61 to 1.97) 12 months: OR=0.65 (95% CI 0.36 to 1.18) No effect modification by sex (interaction test

									P=.27) and age (interaction test P=.89)

CI=confidence interval; NA=not applicable; NR=not reported; OR=odds ratio; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-46. Screening for At-Risk: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Dezso 2018[43] Observational with concurrent control	No suicides were reported during the 6-month study period in either the intervention or control groups. Note: the control group consisted of prisons who entered the detention facility in the 3 months prior to the screening intervention. We considered the study to have a "concurrent control" because the follow-up period overlapped between intervention and control.						NR	NR	NR	NR	NR	NR
Oyama 2017[42] Observational with concurrent control	2005-2008: rate 64.9 per 100,000 105 suicides	2009-2012: Rate 37.0 per 100,000 59 suicides	**Control areas** 2005-2008: rate 57.9 per 100,000 114 suicides **Country** 2005-2008: rate 33.4 per 100,000 56,943 suicides	**Control areas** 2009-2012: rate 53.8 per 100,000 103 suicides **Country** 2009-2012: rate 30.2 per 100,000 51,759 suicides	Intervention IRR adj = 0.57 (95% CI 0.41 to 0.78) Control IRR adj = 0.93 (95% CI 0.70 to 1.23) Country IRR adj = 0.93 (95% CI 0.82 to 1.06)	Ratio of IRR adj = 1.63 (95% CI 1.06 to 2.48) in control with intervention as reference	NR	NR	NR	NR	NR	NR
Oyama 2016[41]	1999-2004:	2005-2010:	1999-2004:	2005-2010:	Intervention	Ratio of IRR adj = 1.83	NR	NR	NR	NR	NR	NR

Observational with concurrent control	range of rates 42.8 to 49.2 per 100,000 per year 63 suicides *Men* 32 suicides *Women* 31 suicides	range of rates 23.1 to 28.8 per 100,000 per year 37 suicides *Men* 26 suicides *Women* 11 suicides	range of rates: 39.9 to 41.9 per 100,000 per year 59 suicides *Men* 37 suicides *Women* 22 suicides	range of rates: 35.4 to 47.6 per 100,000 per year 65 suicides *Men* 40 suicides *Women* 25 suicides	IRR adj = 0.52 (95% CI 0.33 to 0.83) <u>Control</u> IRR adj = 0.93 (95% CI 0.69 to 1.26)	(95% CI 1.08 to 3.09) in control with intervention as reference *Men* Ratio of IRR adj = 1.29 (95% CI 0.76 to 2.19) *Women* Ratio of IRR adj = 3.10 (95% CI 1.10 to 8.73)						

CI=confidence interval; IRR=incident rate ratio; NR=not reported; RCT=randomized controlled trial

Appendix Table 5-47. Screening for At-Risk: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Wasserman 2015[32] (SEYLE) Cluster RCT	NR	NR	NR	NR
Dezso 2018[43] Observational with concurrent control	NR	NR	NR	NR
Oyama 2017[42] Observational with concurrent control	NR	NR	NR	NR
Oyama 2016[41] Observational with concurrent control	NR	NR	NR	NR

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe

Appendix Table 5-48. Screening for At-Risk: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Wasserman 2015[32] (SEYLE) Cluster RCT	Local teams were trained in the study methods and a steering group monitored adherence (process assessments and quality control—though limited detail given).	Embedded into school setting.	Recommended/suggested screening would be more acceptable to stakeholders if completed with concurrent activities to reduce stigma of mental health issues. Recommended evaluation of booster activities and combination of different interventions.
Oyama 2017[42] Observational with concurrent control	Each intervention cluster (municipality) was given a standardized work plan Dissemination of public information (leaflets and newsletter) on depression as a risk factor for suicide, depression screening, and treatment options. This was done to improve receptiveness to depression screening which was the main element of the intervention.	NR	Recommended exploring the long-term effect of personal contact alone without the screening procedure
Oyama 2016[41] Observational with concurrent control	Educational component was used first to enhance receptiveness to screening.	NR	NR

NR=not reported; RCT=randomized controlled trial; SEYLE=Saving and Empowering Young Lives in Europe
* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

Appendix Table 5-49. Multi-Strategy Programs: Study Characteristics

Author, Year Country Study Design Intervention Type Setting Funding Risk of Bias	Inclusion/Exclusion Criteria	Intervention Comparator Study Period Length of Follow-up	Demographics
Collings 2018[44] Country: New Zealand	Inclusion: The pool of 20 potential District Health Boards ranged	Intervention: Multi-level intervention in 4 District Health Boards	N=NR Age (years, median): NR Gender (% male): NR

Study Design: Cluster RCT Intervention Type: Multi-strategy Setting: General community Funding: Government Risk of Bias: Medium	from 31,000 to 481,00 people. Prior to randomization, District Health Boards were matched on a variety of demographic factors including age-standardized suicide rates, socioeconomic deprivation, population size, and number of full-time-equivalent general practitioners. Four pairs (8 total) were selected. Exclusion: NR	Adapted Question, Persuade, and Refer program module was accessible online. Provided training in recognition of suicide factors and how to encourage help Workshops on mental health issues were delivered and tailored to local needs. Workshops hosted by community health organizations Community based interventions involving advocacy and information. Included workshops to media on safe reporting Distribution of print material and information on web-based resources Comparator: Practice as usual Study period: June 1, 2010 to June 1, 2012. The preceding 6 months was used for baseline data Length of follow-up: 25 months	Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Hegerl 2019[45] (suicides and attempts) Harris 2016[71] (implementation) Country: Germany, Hungary, Portugal, Ireland Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: Community Funding: Government Risk of Bias: Medium *Both articles evaluated the European Alliance Against Depression that was implemented in Germany,*	Inclusion: Regions in 4 selected countries (Germany, Hungary, Portugal, Ireland) with at least 150,000 inhabitants, regional interest in hosting the intervention, and no previous suicide prevention or depression awareness program in the region Exclusion: NR	Intervention: Multi-level intervention based on the 4-level *European Alliance Against Depression* Primary care training Public awareness campaign Community facilitator training Support for self-help groups Plus, efforts to restrict access to lethal means by local identification and security inspection of areas where suicides occur Note: some variation in intervention between countries Comparator: No intervention (in regions matched on population) Study period: Unclear; reported baseline population data for 2008 Length of follow-up: 2 years	N= Populations in the intervention and control regions in 2008: Germany: 745,516 Hungary: 339,264 Ireland: 426,197 Portugal: 338,213 Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

Hungary, Portugal, and Ireland. We used the Hegerl 2019 article to extract baseline characteristics and suicide outcomes. We used the Harris 2016 article to extract additional information about implementation.			
Hegerl 2010[46] Country: Germany Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: Community Funding: Government Risk of Bias: Medium	Inclusion: Nuremberg and Wuerzburg regions of Germany Exclusion: NR	Intervention: 4-level *Nuremberg Alliance Against Depression* 1) training primary care physicians 2) media and public campaign 3) training of community facilitators 4) support for depressed persons, suicide attempters and their families (self-help groups, emergency cards) Note: Intensive intervention stopped at the end of the 2nd year (2002), with 'minor' interventions in follow-up year Comparator: No intervention in the control region (Wuerzburg) Study period: 2000-2003 Length of follow-up: 1 year	N= Populations in the intervention and control region in 2000: Nuremberg: 488,400 Wuerzburg: 287,000 Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status= unemployment rate in 2000: Nuremburg: 10.1% Wuerzburg: 5.6% Mental health diagnoses: NR Prior suicide behavior: NR
Hübner-Liebermann 2010[48] Country: Germany Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: Community Funding: NR	Inclusion: Populations of a) city of Regensburg, b) county district of Regensburg, c) county district of Neumarkt, and d) Germany Exclusion: NR	Intervention: 4-Level *Regensburg Alliance Against Depression* 1) General Practitioner cooperation 2) Education for general public 3) Training workshops for secondary teachers, lay helpers, carers for elderly, police personnel, and other professionals; media guide 4) Self-help groups and groups for relatives of those affected by depression; flyers with crisis service and hospital resources Comparator: No intervention in control regions (2 county districts)	N= Populations in the intervention and control region: City of Regensburg: 150,000 Country district Regensburg: 180,000 Country district Neumarkt: 130,000 Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR

Risk of Bias: Medium		Study period: 1998-2007 Length of follow-up: 4 years. Intervention started in 2003	Prior suicide behavior: 24 per 100,000 (2002, year before intervention)
Székely 2013[47] Country: Hungary Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: Community Funding: Government Risk of Bias: Low	Inclusion: Southern and eastern regions of Hungary (cities of Szolnok and Szeged) and all of Hungary Exclusion: None reported	Intervention: 4-Level *European alliance Against Depression* 1) Cooperation with general practitioners 2) Public relations campaign 3) Training community facilitators 4) Support high-risk groups/self-help (emergency cards with hotline number; educational materials to support telephone emergency services) Comparator: No intervention in a control city (Szeged) Study period: 2002-2007 Length of follow-up: 3 years (included 2 years during intervention phase)	N= Populations in the intervention and control region in 2004: Szolnok: 76,881 Szeged: 162,586 Age (years, mean): NR Gender (% male): Szolnok: 47% Szeged: 46% Race (%): NR Military status: NR Housing status: NR Socioeconomic status: unemployment rate in 2004: Szolnok: 5.9% Szeged: 4.7% Mental health diagnoses: NR Prior suicide behavior: NR
Ono 2013[49] Country: Japan Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: General community (rural and highly population areas) Funding: Local government and local health authorities Risk of Bias: Low	Inclusion: The entire population in 2 rural areas and 2 highly populated areas near metropolitan cities. Exclusion: NR	Intervention: Community-based multi-modal intervention, including Leadership involvement: a) publicizing messages from the mayor and officials b) establishment of regional committee to promote organization-wide awareness c) formalization of roles to promote pathways to build social support networks Education and Awareness to reduce stigma and improve recognition of suicide risk and facilitate help seeking a) public health events, posters, websites, placards, leaflets b) regional educational opportunities Gatekeeper training: community leaders, priests, telephone hotlines, social services, youth workers, geriatric care providers, policy, physicians, pharmacists, school employees	<u>Rural</u> N=Population in 2006: Intervention: 291,459 Control: 339,674 Age (years, mean): NR Intervention: 16% under 25, 55% 25-64, 29% 65 and over Control: 16% under 25, 53% 25-64, 31% 65 and over Gender (% male): Intervention: 47% Control: 47% Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR

		Supporting individuals at high risk a) home visits by regional public health nurses and psychiatrists b) regional social gatherings c) Screening to identify at-risk individuals d) support for self-help activities for high risk groups Comparator: Suicide prevention activities as usual Study period: 2003-2009 Length of follow-up: Pre- and post-intervention periods both 3.5 years	<u>Highly Populated</u> N=Population in 2006: Intervention: 615,586 Control: 704,341 Age (years, mean): NR Intervention: 17% under 25, 66% 25-64, 17% 65 and over Control: 17% under 25, 64% 25-64, 19% 65 and over Gender (% male): Intervention: 50% Control: 49% Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Kato 2019[51] (overall and subgroups by sex) Okada 2020[59] (subgroups by age) Country: Japan Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: Government Risk of Bias: Medium	Inclusion: Suicide rates obtained from the Ministry of Health, Labour, and Welfare and the Statistics Bureau of the Ministry of Internal Affairs and Communications of Japan Exclusion: NR	Intervention: *Emergency Fund to Enhance Community-Based Suicide Countermeasures*. Components included: personal consultation support, telephone consultation, development program for leaders/listeners, enlightenment program to enhance social support for high risk persons, and an intervention model program. Comparator: years prior to emergency funds Study period: 2009-2018, though the funding period was 2009 and 2014 Length of follow-up: 9 years	N= Mean population of 2.7 million across the 47 prefectures in Japan Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Lee 2018[52] Country: South Korea	Inclusion: Suicide deaths coded as X60-X84 according to the	Intervention: National Suicide Prevention Program (*eg*, high risk group-oriented monitoring	N=48,485,314 population of South Korea in 2004 Age (years): NR

Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: University Risk of Bias: Low	ICD-10 code from Statistic Korea Exclusion: NR	and prevention, general population mass media campaign) Comparator: pre-intervention Study period: 1993-2016 Length of follow-up: ~13 years after the 1st program. ~8 years for the 2nd program	Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Lai 2019[50] Country: Hong Kong Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: General community Funding: University, government Risk of Bias: Medium	Inclusion: Housing estate in North district intervention site Exclusion: NR	Intervention: A multi-strategy intervention in a high-risk housing estate in the North District universal programs: mental health events, mental health materials, limit access to suicide means; selective programs: training workshops for gatekeepers, training for volunteers; indicated programs: referral systems, psychosocial services, resource kits Comparator: Three other housing estates in the North District Study period: 2006-2015 Length of follow-up: ~4 years. The program started July 1st, 2011	N=NR Age (years, mean): NR Study site: 6% <15 years, 18% 15-24, 28% 25-44, 40% 45-64, 8% ≥65 Control site 1: 24% <15 years, 15% 15-24, 29% 25-44, 24% 45-64, 7% ≥65 Control site 2: 8% <15 years, 22% 15-24, 24% 25-44, 35% 45-64, 11% ≥65 Control site 3: 7% <15 years, 27% 15-24, 21% 25-44, 36% 45-64, 9% ≥65 Gender (% male): Study site: 49% Control site 1: 48% male Control site 2: 51% male Control site 3: 46% male Race (%): NR Military status: NR Housing status: NR Socioeconomic status: Median monthly income (US$): Study site: 2,421 Control site 1: 1,245 Control Site 2: 2,060 Control site 3: 1,792 Mental health diagnoses: NR Prior suicide behavior: NR

Nakanishi 2020[58] Country: Japan Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: Government Risk of Bias: Medium	Inclusion: Suicide data obtained from death certificates from the Ministry of Health, Labour, and Welfare Exclusion: NR	Intervention: *Suicide Prevention Act* 1. Research on prevalence, risk, and protective factors for suicide 2. Assessment and management of suicidal behaviors 3. Assessment and management of mental and substance use disorders 4. Follow up and community support 5. Crisis hotlines 6. Gatekeeper training, 7. Intervention for vulnerable groups 8. Restriction to suicide means 9. Increased public awareness and responsible media reporting 10. Access to health care and policies to reduce harmful use of alcohol Comparator: years before and after the Suicide Prevention Act Study period: Data from 1996-2016 (divided into intervals surrounding a recession, suicide prevention act, and an earthquake) Length of follow-up: Trend measured for the 5 years after the intervention	N=NR (only reported among completed suicides) Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Nakanishi 2015[53] Country: Japan Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: Government Risk of Bias: Medium	Inclusion: Japanese local authorities in their position as of April 30, 2013 Exclusion: NR	Intervention: Five components possible including 1) face to face counseling, 2) tele counseling, 3) training of community service providers, 4) public awareness campaigns, and 5) trauma informed policies and practices. Each local authority voluntarily determines the components of the suicide prevention program to be implemented in their prefecture; this national initiative and funding was launched in 2009. Comparator: time since 2009 Study period: 2009-2012 Length of follow-up: 3 years	N=range 24,320-175,157 (reported by intervention category) Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: annual per capita income range 1.1-1.2 million yen (reported by intervention type) Mental health diagnoses: NR Prior suicide behavior: NR

Law 2019[54] Country: Hong Kong Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: NR Risk of Bias: Medium	Inclusion: NR Exclusion: NR	Intervention: Centre for Suicide Research and Prevention applied a multi-component approach based after WHO recommendations including: 1) surveillance, 2) identifying risks and protective factors, 3) develop and evaluate interventions, and 4) implement. Comparator: before the Centre was established Study period: 1997-2016 Length of follow-up: ~14 years. The Centre was established in 2002	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Lung 2017[55] Country: Taiwan Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: General community Funding: None Risk of Bias: Low	Inclusion: 9 urban and 14 rural areas in Taiwan Exclusion: None reported	Intervention: Taiwan Suicide Prevention Center provides integrated platform for suicide prevention and control, assists county and city health bureaus and mental health network hospitals, and related suicide prevention instruments (prevention strategies, care materials, suicide risk assessment, gatekeeper training, standardizing reporting and aftercare delivery, organizing community support networks) Note: 1st phase: 2005-2008; 2nd phase: 2009-2013 Comparator: Pre-intervention Study period: 1991-2013 Length of follow-up: ~9 years after 1st phase. ~5 years after 2nd program	N=NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Page 2011[60] Country: Australia	Inclusion: Prevention programs/ activities clearly related to the immediate area in	Intervention: National Youth Suicide Prevention Strategy (139 local areas) 1) Community and professional education activities	N=Population catchment approximately 2.3 million Age (years, median): NR, people were aged 20-34 years Gender (% male): NR

Study Design: Observational with concurrent control Intervention Type: Multi-strategy Setting: General community Funding: NR Risk of Bias: Medium	which the organization was based. Exclusion: Prevention programs/activities that targeted a broader region or where it was unclear as to which geographic area the program related were not included in the primary analyses.	2) Crisis, early intervention, treatment and referral support 3) Counseling and personal development initiatives 4) Health promotion initiatives Note: exact prevention strategies may have varied by local area Comparator: Local areas with no prevention activity (774 local areas) Study period: Period implementation (1995-1998) and the period after implementation (1999-2002). Suicide data for 1992-1994 was used to establish suicide rate prior to implementation Length of follow-up: up to 8 years	Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR Mental health diagnoses: NR Prior suicide behavior: NR
Ross 2020[56] (longer-term follow-up) Lockley 2014[57] (shorter-term follow-up) Country: Australia Study Design: Pre-post observational with no concurrent control Intervention Type: Multi-strategy Setting: Suicide hotspot Funding: Government and local councils Risk of Bias: Medium	Inclusion: Data from the National Coronial Information System for closed cases by the coroner where a suicide occurred for 2000-2016 within postcode 2030. Also, data on cases that occurred within Gap Park Masterplan area. Exclusion: None	Intervention: Multi-strategy at Gap Park in Sydney, Australia. Means restriction: construction of 130-centimeter fencing along the cliff-tops. Encourage help-seeking: installation of 2 crisis telephones and 2 signs to encourage help-seeking. Increase likelihood of intervention by a third party: installation of cameras to record footage and assist in real-time and landscaping work to increase the probability that people would be present Comparator: Pre-intervention Study period: 2000-2016 Length of follow-up: 10-year pre-intervention, 2-year implementation period, 5-year post-intervention	N= NR Age (years, mean): NR Gender (% male): NR Race (%): NR Military status: NR Housing status: NR Socioeconomic status: NR (employment status only reported among completed suicides) Mental health diagnoses: NR Prior suicide behavior: NR

ICD-10 International Classification of Diseases; NR=not reported; RCT=randomized controlled trial; WHO=World Health Organization

Appendix Table 5-50. Multi-Strategy Programs: Risk of bias – Cluster RCTs

Author, Year	Sequence Generation	Allocation Concealment	Recruitment Bias	Baseline Imbalance	Blinded Outcome Assessment	Incomplete Cluster Data	Incomplete Outcome Data	Selective Outcome Reporting	Overall Risk of Bias
Collings 2018[44]	Low (computer-generated)	Low (independent statistician)	Low (recruitment prior to randomization)	Unclear (reported matching on a variety of demographic factors)	Low (suicide the only outcome, data obtained from coroner services)	Low	Unclear (no information)	Low	Low

RCT=randomized controlled trial

Appendix Table 5-51. Multi-Strategy Programs: Risk of Bias – Non-RCTs *

Author, Year	Did the study include all eligible participants or were the participants a representative sample from the population of interest?	Were the participants included in any comparison similar?	Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	Was the control group concurrent?	For pre-post studies, were there multiple measurements of the outcome both pre and post the intervention/ exposure?	Was follow-up complete?	Was completeness of follow-up similar for study groups?	Were the outcomes of participants included in any comparisons measured in the same way?	Were suicide deaths and/or attempts measured in a reliable way?	Were other eligible outcomes measured in a reliable way?	Did the study adjust for confounding variables?	Overall Risk of Bias
Hegerl 2019[45] Harris 2016[71]	Yes	Unclear	Unclear	Yes	NA	Yes	Yes	Yes	No (for attempts)	NA	Unclear	Medium
Hegerl 2010[46]	Yes	Unclear	Unclear	Yes	No	Yes	Yes	Yes	Unclear (attempts)	NA	No	Medium
Hübner-Liebermann 2010[48]	Yes	Unclear	Unclear	Yes	Yes	Unclear	Unclear	Unclear	Unclear	NA	No	Medium
Székely 2013[47]	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Low
Ono 2013[49]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Low

Kato 2019[51] Okada 2020[59]	Yes	Unclear	Unclear	No	Yes	Unclear	Unclear	Yes	Yes	NA	Yes	Medium
Lee 2018[52]	Yes	Yes	Unclear	NA	Yes	NA	Unclear	Yes	Yes	NA	Yes	Low
Lai 2019[50]	Yes	Yes	Yes	Yes	Yes	NA	Unclear	Yes	Yes	NA	No	Medium
Nakanishi 2020[58]	Yes	Yes	Unclear	No	Yes	NA	NA	Yes	Yes	NA	Yes	Medium
Nakanishi 2015[53]	Yes	Unclear	Unclear	Yes	NA	NA	NA	Yes	Yes	NA	Yes	Medium
Law 2019[54]	Yes	Unclear	Unclear	No	Yes	NA	NA	NA	Yes	NA	No	Medium
Lung 2017[55]	Yes	Unclear	Unclear	Yes	Yes	NA	NA	Yes	Yes	NA	Yes	Low
Page 2011[60]	Yes	Yes	Unclear	Yes	No	NA	NA	Yes	Yes	NA	Yes	Medium
Ross 2020[56] Lockley 2014[57]	Yes	Unclear	Unclear	No	Yes	NA	NA	Yes	Yes	Unclear (costs)	No	Medium
Wang 2013[81]	Unclear	No	Unclear	No	No	Yes	Yes	Yes	Unclear	NA	No	High
King 2011[82]	Unclear	Yes	NA	No	No	No	NA	Yes	Unclear	NA	No	High
Nakanishi 2017[83]	Yes	No	Unclear	Yes	NA	Unclear	Unclear	Yes	Yes	NA	Yes	High
Pirrucello 2010[84]	Unclear	Unclear	Unclear	NA	No	NA	Unclear	Yes	Unclear	No	No	High
Matsubayashi 2011[85]	Yes	No	Unclear	No	NA	NA	NA	Yes	Unclear	NA	No	High

*Modification of the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies
NA=not applicable; RCT=randomized controlled trial

Appendix Table 5-52. Multi-Strategy Programs: Suicide Deaths and Attempts from RCTs

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Collings 2018[44] Cluster RCT	**District A** Baseline: 13 deaths **District B** Baseline: 11 deaths **District C** Baseline: 10 deaths **District D** Baseline: 6 deaths	**District A** 25 months: 33 deaths **District B** 25 months: 53 deaths **District C** 25 months: 64 deaths **District D** 25 months: 46 deaths	**District A** Baseline: 13 deaths **District B** Baseline: 21 deaths **District C** Baseline: 11 deaths **District D** Baseline: 24 deaths	**District A** 25 months: 61 deaths **District B** 25 months: 68 deaths **District C** 25 months: 49 deaths **District D** 25 months: 111 deaths	Intervention Rate ratio = 1.17 (95% CI 0.84 to 1.65) Control Rate ratio = 1.01 (95% CI 0.77 to 1.31)	Intervention effect ratio = 1.18 (95% CI 0.51 to 2.70)	NR	NR	NR	NR	NR	NR

CI=confidence interval; NR=not reported; RCT=randomized controlled trial

Appendix Table 5-53. Multi-Strategy Programs: Suicide Deaths and Attempts from Non-RCTs with Concurrent Control

Author, Year Study Design	Suicide Deaths						Suicide Attempts					
	Intervention Group		Control Group		Pre vs Post	Intervention vs Control	Intervention Group		Control Group		Pre vs Post	Intervention vs Control
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Hegerl 2019[45] Harris 2016[71] Observational with concurrent control	**All regions** 138 suicides	**All regions** 2 years: Mean (SD) 163 (13) suicides	**All regions** 88 suicides	**All regions** 2 years: Mean (SD) 112 (4) suicides	Intervention +18.1% from baseline Control +27.3% from baseline	OR= 0.93 (95% CI 0.65 to 1.33)	**All regions** 1,643 attempts	**All regions** 2-years: Mean (SD) 1,545 (178) attempts	**All regions** 1,195 attempts	**All regions** 2-years: Mean (SD) 1,128 (112) attempts	Intervention -6.0% from baseline Control -5.6% from baseline	OR= 1.00 (95% CI 0.90 to 1.11)
Hegerl 2010[46] Observational with concurrent control	**Nurem-berg** 100 suicides	**Nurem-berg** Follow-up year: 88 suicides	**Wuerz-burg** 58 suicides	**Wuerz-burg** Follow-up year: 42 suicides	NR	NR	**Nurem-berg** 520 attempts	**Nurem-berg** Follow-up year: 331 attempts	**Wuerz-burg** 125 attempts	**Wuerz-burg** Follow-up year: 131 attempts	Intervention baseline -36.2% from baseline Control +4.8% from baseline	P=.0005 vs control during same time period
Székely 2013[47] Observational with concurrent control	**Szolnok** 2002-2004: 30.0 per 100,000 *Men* 45.5 per 100,000 *Women* 16.3 per 100,000	**Szolnok** 2005-2007: 13.2 per 100,000 *Men* 18.0 per 100,000 *Women* 9.1 per 100,000	**Szeged** 2002-2004: 26.2 per 100,000 *Men* 41.3 per 100,000 *Women* 13.3 per 100,000	**Szeged** 2005-2007: 26.7 per 100,000 *Men* 43.5 per 100,000 *Women* 12.4 per 100,000	Intervention -55.9% mean change Cohen's d: 8.30 *Men* -60.5% Cohen's d: 5.53 *Women* -44.3%	NR	NR	NR	NR	NR	NR	NR

			All of Hungary 2002-2004: 27.6 per 100,000 *Men* 44.6 per 100,000 *Women* 12.2 per 100,000	**All of Hungary** 2005-2007: 24.9 per 100,000 *Men* 40.2 per 100,000 *Women* 11.1 per 100,000	Cohen's d: 3.19 <u>Control</u> **Szeged** +2% Cohen's d: 0.15 *Men* +5.4% Cohen's d: 0.31 *Women* -6.3% Cohen's d: 0.28 **All of Hungary** -9.6% Cohen's d: 3.72 *Men* -9.9% Cohen's d: 2.94 *Women* -8.7% Cohen's d: 4.78							
Hübner-Liebermann 2010[48] Observational with	**City of Regens-burg** 1998: 21 per 100,000	**City of Regens-burg** 2004: 7 per 100,000	**County of Regens-burg** 1998: 19 per 100,000	**County of Regens-burg** 2004: 9 per 100,000	**City of Regens-burg** *Males* Significant change in male	NR	NR	NR	NR	NR	NR	NR

concurrent control	2003: 13 per 100,000	2007: 14 per 100,000	2003: 13 per 100,000 **County of Neumarkt** 1998: 10 per 100,000 2003: 7 per 100,000 **Germany overall** 1998: 14 per 100,000 2003: 14 per 100,000	2007: 11 per 100,000 **County of Neumarkt** 2004: 9 per 100,000 2007: 13 per 100,000 **Germany overall** 2004: 13 per 100,000 2007: 11 per 100,000	suicide rate; P<=.001 *Females* No change in female suicide rate; P=.28							
Ono 2013[49] Observational with concurrent control	**Rural** 46.6 per 100,000 **Highly populate** 22.8 per 100,000 Note: rates calc by review team	**Rural** 38.2 per 100,000 **Highly populate** 23.2 per 100,000	**Rural** 40.6 per 100,000 **Highly populate** 26.0 per 100,000	**Rural** 38.8 per 100,000 **Highly populate** 24.8 per 100,000	NR	**Rural** 3.5 years RR 1.09 (95% CI 0.82 to 1.45) *Females* RR 1.44 (95% CI 0.85 to 2.43) RRs for other subgroups only in graph; not significantly different	**Rural** 24.8 per 100,000 **Highly populat e** 24.0 per 100,000 Note: rates calc by review team	**Rural** 18.8 per 100,000 **Highly populate** 29.0 per 100,000	**Rural** 26.0 per 100,000 **Highly populat e** 26.6per 100,000	**Rural** 23.8 per 100,000 **Highly populat e** 32.8 per 100,000	NR	**Rural** 3.5 years RR 0.86 (95% CI 0.55 to 1.36) *Females* RR 1.56 (95% CI 0.80 to 3.04) *Males* RR 0.39 (95% CI 0.22 to 0.68) *<25 years*

						Highly populate RRs only in graph. Not significantly different except decrease in females						RR 0.74 (95% CI 0.24 to 2.31) *25-65 years* RR only in graph. Not significantly different *>65 years* RR 0.35 (95% CI 0.17 to 0.71) **Highly Populate** RRs only in graph. Not significantly different except decrease in males and increase in females
Lai 2019[50] Observational with concurrent control	**Intervention Site** 2006-2010: 16 suicides	**Intervention Site** 2012-2015: 11 suicides Note: program started in July 2011	**Control Site 1** 2006-2010: 3 suicides **Control Site 2** 2006-2010: 5 suicides **Control Site 3**	**Control Site 1** 2012-2015: 6 suicides **Control Site 2** 2012-2015: 6 suicides **Control Site 3**	**Intervention Site** Trend from 2010-2015: P>.001 **Control Site 1** Trend from 2010-2015: P=.172 **Control Site 2**	NR	NR	NR	NR	NR	NR	NR

			2006-2010: 3 suicides	2012-2015: 3 suicides	Trend from 2010-2015: P=1 **Control Site 3** Trend from 2010-2015: P=.325							
Page 2011[60] Observational with concurrent control	Baseline 1992-1994: *Men* 32.7 per 100,000 *Women* 4.4 per 100,000 Period of activity 1995-1998: *Men* 37.4 per 100,000 *Women* 7.7 per 100,000	1999-2002: *Men* 33.7 per 100,000 *Women* 8.1 per 100,000 <u>Change in rates over 1999-2002</u> *Men* 12.5% (95% CI, -22.5 to -1.3) *Women* 8.1% (95% CI, -14.3 to 36.4)	Baseline 1992-1994: *Men* 33.3 per 100,000 *Women* 6.0 per 100,000 Period of activity 1995-1998: *Men* 39.4 per 100,000 *Women* 6.4 per 100,000	1999-2002: *Men* 35.2 per 100,000 *Women* 7.2 per 100,000 <u>Change in rates over 1999-2002</u> *Men* -7.9% (95% CI, -15.9 to 0.7) *Women* 11.5% (95% CI, -9.3 to 37.1)	1995-1998: *Men* RR adjusted 0.95 (95% CI, 0.85 to 1.06) 1999-2002: RR adjusted 0.96 (95% CI, 0.86 to 1.07) 1995-1998: *Women* RR adjusted 1.20 (95% CI, 0.94 to 1.52) 1999-2002: RR adjusted 1.12 (95% CI, 0.90 to 1.40)	<u>Difference in change in rates 1999-2002:</u> *Men* P=.541 *Women* P=.770	NR	NR	NR	NR	NR	NR

CI=confidence interval; NR=not reported; OR=odds ratio; RCT=randomized controlled trial; RR=rate ratios (for Ono 2013 study) and relative risk (for Page 2011 study); SD=standard deviation

Appendix Table 5-54. Multi-Strategy Programs: Suicide Deaths and Attempts from Non-RCTs with No Concurrent Control

Author, Year Study Design	Suicide Deaths			Suicide Attempts		
	Pre-Intervention	**Post-Intervention**	**Pre** vs **Post Comparison**	**Pre-Intervention**	**Post-Intervention**	**Pre** vs **Post Comparison**
Kato 2019[51] Okada 2020[59] Pre-post observational with no concurrent control	2009: 25.7 suicides per 100,000	2018: 16.5 suicides per 100,000	**As reported in the Kato 2019 article** Time dependent reduction trends on all persons (mean ±SD): -1.15 ±0.26 Change from 2009 to 2018: P<.05 for all prefectures Decreases associated with enlightenment program and development of leader and listener *Males* Time dependent reduction trends (mean ±SD): -1.74 ±0.43 Change from 2009 to 2018: P<.05 for all prefectures Decreases associated with enlightenment program and intervention model. Increase associated with personal consultation program *Females* Time dependent reduction trends (mean ±SD): -0.61 ±0.18 Change from 2009 to 2018: P<.05 in all but 2 prefectures	NR	NR	NR

			Decrease associated with development of leader and listener **As reported in the Okada 2020 article** *Age 20-29* Decrease with telephone consultation support and enlightenment program. Increase with development program of leaders and listeners *Age 30-39* Decrease with intervention model program and enlightenment program *Age 40-49* No differences *Age 50-59* Decrease with enlightenment program. Increase with personal consultation program *Age 60-69* Decrease with intervention model program and enlightenment program. Increase with personal consultation program *Age 70-79* Decrease with enlightenment program and telephone consultation *Age 80+* Decrease with personal consultation program,			

			enlightenment program, and intervention model program			
Lee 2018[52] Pre-post observational with no concurrent control	1993-2003 14.9 per 100,000 (calculated by investigators) *Males* 1993-2010: +5.0% annually (95% CI, 3.6 to 6.4%) *Females* 1993-2009: +7.5% annually (95% CI, 6.3 to 8.7%)	2004-2016 27.2 per 100,000 (calculated by investigators) **1st strategy** 2004-2008 24.2 per 100,000 (calculated by investigators) **2nd Strategy** 2009-2016 28.8 per 100,000 (calculated by investigators) *Males* 2011-2016: -4.3% annually (95% CI, -9.8, 1.6%) *Females* 2010-2016: -6.1% annually (95% CI, -9.1 to -3.0%)	**1st strategy** Suicide rate from 1993-2010 increased by 5.6% annually (95% CI, 4.4 to 6.9%) **2nd strategy** Suicide rate from 2010 to 2016 decreased by 5.5% annually (95% CI, -10.3 to -0.5%)	NR	NR	NR
Nakanishi 2020[58] Pre-post observational with no concurrent control	1998-2006 (economic recession) Trend -0.0007 (95% CI, -0.002 to 0.0008) *Male*	2006-2011 (Post Suicide Prevention Act) Trend -0.001 (95% CI, -0.003 to 0.001) *Male*	Trend Difference (Suicide Prevention Act) -0.0004 (95% CI, -0.003 to 0.002) *Male* -0.001 (95% CI, -0.005 to 0.004)	NR	NR	NR

	Trend -0.0007 (95% CI, -0.003 to 0.001) *Female* Trend -0.001 (95% CI, -0.002 to 0.000) *Age ≤19 years* Trend -0.0003 (95% CI, -0.001 to 0.0002) *Age 20-39 years* Trend 0.002 (95% CI, 0.001 to 0.004) *Age 40-59 years* Trend -0.001 (95% CI, -0.004 to 0.001) *Age ≤60 years* Trend -0.002 (95% CI, -0.003 to -0.002)	Trend -0.002 (95% CI, -0.006 to 0.002) *Female* Trend -0.001 (95%CI -0.002 to -0.000) *Age ≤19 years* Trend -0.0004 (95% CI, -0.001 to -0.0001) *Age 20-39 years* Trend 0.001 (95% CI, -0.002 to 0.004) *Age 40-59 years* Trend -0.004 (95% CI, -0.008 to 0.001) *Age ≤60 years* Trend -0.002 (95% CI, -0.002 to -0.001)	*Female* 0.00008 (95%CI -0.001 to 0.001) *Age ≤19 years* -0.0001 (95% CI, -0.001 to 0.001) *Age 20-39 years* -0.001 (95% CI, -0.005 to 0.002) *Age 40-59 years* -0.091 (95% CI, -0.268 to 0.085) *Age ≤60 years* 0.001 (95% CI, -0.0001 to 0.002)			
Nakanishi 2015[53] Pre-post observational with no	The number of suicide cases was not significantly different between the categories of implementation of suicide-prevention programs			NR	NR	NR

concurrent control						
Law 2019[54] Pre-post observational with no concurrent control	1997: 10.2 per 100,000 persons 2002: 13.4 per 100,000 persons Notes: rates were age-standardized	2003: 14.7 per 100,000 persons 2009 (6-year follow-up): 10.3 per 100,000 persons 2016 (13-year follow-up): 8.9 per 100,000 persons	NR	NR	NR	NR
Lung 2017[55] Pre-post observational with no concurrent control	*Age 15-25 years* 2004: 6 per 100,000 persons *Age 24-44 years* 2004: 18 per 100,000 persons *Age 45-64 years* 2004: 22 per 100,000 persons	*Age 15-24 years* 2008: 6 per 100,000 persons 2013: 5 per 100,000 persons *Age 24-44 years* 2008: 21.5 per 100,000 persons 2013: 15 per 100,000 persons *Age 45-64 years* 2008: 24 per 100,000 persons 2013: 19.5 per 100,000 persons *Age 65+ years* 2008:	NR	NR	NR	NR

	Age 65+ years 2004: 36.5 per 100,000 persons Note: data estimated from plots	36.5 per 100,000 persons 2013: 32 per 100,000 persons				
Ross 2020[56] Lockley 2014[57] Pre-post observational with no concurrent control	**At Gap Park** 2000-2009: 41 suicides *Males* 22 suicides *Females* 19 suicides	**At Gap Park** 2012-2016 post-intervention: 24 suicides *Males* 16 suicides *Females* 8 suicides 2010-2011 during implementation: 21 suicides *Males* 10 suicides *Females* 11 suicides	**At Gap Park** 2000-2016: APC = 5.41% (95% CI, -0.38 to 11.53) *Males* 2000-2016: APC = 6.23% (95% CI, -0.41 to 13.30) *Females* 2000-2010: APC = 16.64% (95% CI, 8.18 to 25.76) 2010-2016: APC = -21.27% (95% CI, -33.14 to -7.30)	NR	NR	NR

APC=annual percentage change; CI=confidence interval; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Appendix Table 5-55. Multi-Strategy Programs: Secondary Outcomes

Author, Year Study Design	Stigma Towards Suicide	Caregiver Burden	Cost	Substitution (Alternative Method)
Collings 2018[44] Cluster RCT	NR	NR	NR	NR
Hegerl 2019[45] Harris 2016[71]	NR	NR	NR	NR

Observational with concurrent control				
Hegerl 2010[46] Observational with concurrent control	NR	NR	NR	NR
Hübner-Liebermann 2010[48] Observational with concurrent control	NR	NR	NR	NR
Székely 2013[47] Observational with concurrent control	NR	NR	NR	NR
Ono 2013[49] Observational with concurrent control	NR	NR	NR	NR
Kato 2019[51] Okada 2020[59] Pre-post observational with no concurrent control	NR	NR	NR	NR
Lee 2018[52] Pre-post observational with no concurrent control	NR	NR	NR	NR
Lai 2019[50] Observational with concurrent control	NR	NR	NR	NR
Nakanishi 2020[58]	NR	NR	NR	NR

Pre-post observational with no concurrent control				
Nakanishi 2015[53] Pre-post observational with no concurrent control	NR	NR	NR	NR
Law 2019[54] Pre-post observational with no concurrent control	NR	NR	NR	NR
Lung 2017[55] Pre-post observational with no concurrent control	NR	NR	NR	NR
Page 2011[60] Observational with concurrent control	NR	NR	$76 million in Australian dollars total funds for prevention programs and activities . *Effect of level of funding on suicide rates noted*	NR
Ross 2020[56] Lockley 2014[57] Pre-post observational with no concurrent control	NR	NR	Woollahra Council contributed $700,000 of its own funds. <u>Timeline of funding</u> January 2009: Woollahra Council received $248,000 which is allocated to camera installation December 2009: $91,000 allocated under Round 2 of an infrastructure program July 2010: $277 million pledged to initiatives to prevent suicide including at the Gap in Sydney August 2010: If elected, Liberal-National Coalition will provide $2.1 to complete the Gap Masterplan	NR

			September 2010: Labor Government will provide $1.1 million to Woollahra Municipal Council for infrastructure November 2010: $91,000 allocated under Round 3 of an infrastructure program June 2012: Successful application for $477,869 for Phase 3 of Masterplan	

NR=not reported; RCT=randomized controlled trial

Appendix Table 5-56. Multi-Strategy Programs: Strategies to Deliver, Sustain, and Improve the Quality of Intervention *

Author, Year Study Design	Strategies to Deliver the Intervention	Strategies to Sustain the Intervention	Strategies to Improve the Quality of the Intervention
Hegerl 2019[45] Harris 2016[71] Observational with concurrent control	**As reported in Hegerl 2019** Employ a multi-strategy approach Engage a broad range of stakeholders Conduct qualitative interviews/focus groups with stakeholders throughout the implementation process to identify barriers and facilitators to implementation and contextual factors influencing implementation Conduct workshops to optimize implementation approach (fidelity) Tailor strategies for engagement and implementation to specific region context/needs Engage local champions for healthcare provider adoption **As reported in Harris 2016** Employ a multi-strategy approach Invite media to public launch event to engage early in the process for subsequent coverage	**As reported in Hegerl 2019** Provide stakeholder workshops at the end of the intervention period to reflect on sustainability and explore lessons learned Provide training for healthcare providers that is accredited for Continuing Medical Education credits Employ the train the trainer model for community facilitators Develop local collaborative networks with individuals or organizational with a shared goal of reducing suicidal behavior **As reported in Harris 2016** Support community volunteers (initial members of self-help groups) in taking ownership of public campaigns (provide materials for distribution, give	**As reported in Hegerl 2019** Simultaneous implementation with a public mental health awareness campaign **As reported in Harris 2016** Explore the value of external activities that are stimulated by association with the suicide prevention program (*eg*, broad

	Engage volunteers to support the implementation capacity and dissemination	opportunities to speak at public events, listen to their ideas for dissemination) Use the program activities to create an impetus and environment for different stakeholder groups to communicate and work towards a common goal of reducing suicides	training may prompt systems or facilities to start their own training programs on suicide prevention due to greater awareness)
Hegerl 2010[46] Observational with concurrent control	NR	Follow-up year to the 2-year resource intensive intervention consisted of low-resource interventions including a depression day to increase awareness, self-help activities, and lectures about depressive disorders	NR
Hübner-Liebermann 2010[48] Observational with concurrent control	Employ a multi-strategy approach Engage and collaborate with local media Conduct training workshops for community facilitators Distribute educational materials in multiple formats/medias to the public	Provide training for healthcare providers that is accredited for Continuing Medical Education credits	NR
Székely 2013[47] Observational with concurrent control	Provide interactive educational packages included panel/roundtable discussions and an online information center were provided to general practitioners Distribute educational materials in multiple formats/medias to the public Engage and collaborate with local media Conduct training workshops for community facilitators Create of a local information data network to facilitate fast communication regarding high-risk persons	NR	Future research should assess health behavior (*eg*, alcohol and psychoactive agent use)

NR=not reported

* We abstracted this information from studies that found an intervention to be effective (defined as yielding at least low certainty evidence on reducing suicide deaths or attempts).

APPENDIX 6. PEER REVIEW COMMENTS/AUTHOR RESPONSES

Appendix Table 6-1. Peer Reviewer Comments and Author Responses

Question Text	Reviewer Number	Comment	Author Response
Are the objectives, scope, and methods for this review clearly described?	1	Yes	Thank you.
	3	Yes	
	4	Yes	
	5	Yes	
	6	Yes	
	7	Yes	
	8	Yes	
	9	Yes	
Is there any indication of bias in our synthesis of the evidence?	1	No	Thank you.
	3	No	
	4	No	
	5	No	
	6	No	
	7	No	
	8	No	
	9	No	
Are there any published or unpublished studies that we may have overlooked?	1	Yes - 2020 National Veteran Suicide Prevention Annual Report - i think this was just disseminated	We revised the introduction to use the 2020 National Veteran Suicide Prevention Annual Report when citing statistics.
	3	No	Thank you.
	4	No	Thank you.
	5	Yes - Garraza, L. G., Kuiper, N., Goldston, D., McKeon, R., & Walrath, C. (2019). Long-term impact of the Garrett Lee Smith Youth Suicide Prevention Program on youth suicide mortality, 2006–2015. Journal of Child	We incorporated the articles about the Garrett Lee Smith program (specifically Garraza 2019 for long-term suicide deaths, Walrath 2015 for short-term suicide deaths, Garraza 2015 for suicide attempts, and Garraza 2018 for cost-benefit analysis).

		Psychology and Psychiatry, 60(10), 1142–1147. https://doi.org/10.1111/jcpp.13058	
	6	No	Thank you.
	7	No	Thank you.
	8	Yes - The review seems to miss most of the Garrett Lee Smith manuscripts. Several are listed in the document to be included. Others are: Godoy Garraza, L., Kuiper, N., Goldston, D., McKeon, R., & Walrath, C. (2019). Long-term impact of the Garrett Lee Smith Youth Suicide Prevention Program on youth suicide mortality, 2006–2015. Journal of child psychology and psychiatry, 60(10), 1142-1147. Godoy Garraza, L., Peart Boyce, S., Walrath, C., Goldston, D. B., & McKeon, R. (2018). An economic evaluation of the Garrett Lee Smith memorial suicide prevention program. Suicide and Life-Threatening Behavior, 48(1), 3-11. Other areas that are missing that surprise me are school based programs including Sources of Strength and SOS. A community approach that is not mentioned is Zero Suicide. In terms of means, it is surprising nothing on blister packaging versus bulk packaging of psychiatric/other medications was not in the search.	We incorporated the articles about the Garrett Lee Smith program (specifically Garraza 2019 for long-term suicide deaths, Walrath 2015 for short-term suicide deaths, Garraza 2015 for suicide attempts, and Garraza 2018 for cost-benefit analysis). Regarding school-based programs, we included the Signs of Suicide (SOS) program. It was categorized as a social-emotional learning program. We also included the SEYLE trial in Europe which had 3 arms and were categorized as a social-emotional learning program, gatekeeper training, and screening, respectively. We identified additional school-based programs that we rated as high risk of bias and thus not included in the analysis. Examples of these were the Yellow Ribbon program (categorized as a social-emotional learning program), the Skills for Life program (categorized as a social-emotional learning program), and the Surviving the Teens program (categorized as multi-strategy). Our search did not identify any studies for Sources of Strength. We excluded Zero Suicide because this intervention takes place in a healthcare system. Our search did not identify any eligible studies on blister packaging versus bulk packaging.
	9	No	Thank you.
Additional suggestions or comments can be provided below. If applicable,	1	Misc but in the Intro line 23 there is a sentence saying... "use of suicide prevention coordinators" which might be revised to something like installing and supporting; the word "use" seemed somehow less than accurate. in terms of references, i mention above the newly released 2020 report.	We revised the wording on line 23. We revised the introduction to use the 2020 National Veteran Suicide Prevention Annual Report when citing statistics.

please indicate the page and line numbers from the draft report.		p 2 line 53, "reduce" might read better to revise to "reduction of..." Assessment of bias and grading system are highly appreciated. Notes about Mates in Construction cost vs savings - is the huge payoff true? that seems immense IF i am reading it correctly. I am quite taken with the conclusion of what seems not to be working: public awareness campaigns, crisis hotlines, and gatekeeper - makes 1 pause about	We revised the wording on line 53. For Mates in Construction, the $4.60 benefit-cost ratio is true, as reported. We added information about the assumptions used in the model.
	3		
	4	Very minor comment: page 9, line 36-37 may be missing a word or phrase?	We revised the wording on line 36-37.
	5	Very useful and important study. page 2, line 16. Missing a period.	We added a period on line 16.
	6	The statistics in the introduction regarding the proportion of veterans in the general population and their contribution to US suicide deaths is wrong (line 17). I looked at your citation - the VA suicide data report which cites different statistics … please check again and revise.	We revised the statistics on line 17. We also updated them with the data in the 2020 National Veteran Suicide Prevention Annual Report.
	7	This review conveys a wealth of information regarding the effectiveness of community-based and public health strategies to prevent suicide. This review appears to have been well-executed, with sound methods. The content is comprehensive, and the conclusions both succinct and nuanced. One question concerned the categorization of interventions under specific strategies vs as multi-component interventions. The interventions listed under “Organizational Policies and Culture” (p. 26-27) appear to be somewhat similar to the multi-component interventions in that they involve multiple components (*eg*, telephone hotline, gatekeeper training, education, screening, lethal means reduction), but are distinct in that the setting of the intervention is the workplace and/or the population is more circumscribed. Although	We added rationale about categorizing interventions as Organizational Policies and Culture. Per the CDC framework, comprehensive suicide prevention programs targeting “closed communities” such as a workplace or military were categorized under Organizational Policies and Culture, acknowledging that these programs often were multi-component. Thus, the setting influenced how we categorized them. The SEYLE trial in European high schools had 4 different arms (3 intervention arms and 1 control arm). This allowed us to analyze the specific effects of each intervention. We revised the introduction to use the 2020 National Veteran Suicide Prevention Annual Report when citing statistics.

		this is indeed discussed later (p. 57-58), it would be helpful to understand the decision process by which interventions were categorized into a specific strategy/approach (creating protective environments), as opposed to “multiple strategies” (with workplace as the setting). On a somewhat related note, the SEYLE study was included under 3 different intervention strategies. Did SEYLE parse out the different intervention strategies (social-emotional learning, gatekeeper training, and screening) and evaluate them separately? If not, this seems like it would be more appropriately classified as a multi-component intervention, particularly given the findings and conclusions about the multi-component interventions. P. 1 (executive summary, introduction): The authors may wish to update this section to reflect the latest VA Suicide Data Report (reference 2), which was released in late 2020. P. 1, lines 26-27 discusses the potential import of community-based approaches for reducing suicide among non-VHA Veterans, which appears to have been an important factor for the current undertaking. Briefly revisiting this in the Conclusion section may thus be useful. P. 3, lines 11-12: Suggest stating the rationale for excluding studies on safe reporting and messaging about suicide (since this can be community-based or population-based). P. 16: I agree with the decision to focus on suicide attempts and deaths, but readers might be interested in understanding why suicidal ideation was not an outcome of interest for KQ1. P. 27, line 16: Minor point - does “contract” here refer to	We re-visited the idea that community approaches are potentially important for reducing suicide among non-VHA Veterans in the discussion. We added rationale why we excluded safe reporting and messaging about suicide. That intervention is a part of the CDC strategy of “Lessen harms and prevent future risk.” These interventions take place after a suicide has occurred. This was not the focus of our review. We added rationale for excluding suicide ideation. A 2016 publication by Klonsky et al. in Annual Review of Clinical Psychology stipulates that “the progression from ideation to suicide attempts are distinct phenomena with distinct explanations and predictors.” The point about a “no suicide contract” is well-acknowledged. However, the primary study does not further specify what they mean by “contract.” We added to the discussion that since suicides are rare, it is important for future studies to have adequate follow-up and sample sizes.

		a “no suicide contract”? If so, it would be worth specifying that, as these have actually been shown to be ineffective and potentially harmful. The current findings regarding multi-component interventions are particularly important given recent community-based initiatives in the U.S., such as the Mayor’s and Governor’s Challenges. It may be worth noting some of the inherent challenges to studying the effectiveness of community-based interventions for suicide, such as low base rates of suicide and ethical considerations.	
	8	The authors do not make it clear why stigma related to suicide 1 of the outcome measures. I would suggest the addition of some introductory material on why this is important. Given the timeframe of the review, earlier studies of strategies like the Columbia Suicide Screening Scale might be missed, A brief review of findings from studies before 2010 might be useful for the reader. p. 22- SA, SD not included as abbreviations p. 41- Garrett Lee Smith papers are most likely gatekeeper training and not coping and problem solving	Stigma associated with suicide can have negative effects. As expressed by a Centre for Suicide Prevention in Canada, “Many victims suffer from very real psychological scars inflicted by the hurt and shame of attempting suicide or knowing someone who has died by suicide” (accessed at: https://www.suicideinfo.ca /resource/suicideandstigma/ on February 1st, 2021). We posited that an unintended consequence of any suicide prevention intervention could be an increase in suicide-related stigma. After reviewing the literature, we did not find evidence of that. We summarized findings from a prior ESP Report about suicide prevention that was published in 2009. This helps inform readers about findings before our search date. Abbreviations for SD and SA are placed as footnotes under Table 1 and 3. We categorized the Garrett Lee Smith program as gatekeeper training.
	9	This represents a lot of work and an excellent compilation and synthesis. Four comments presented in order of priority:	Tables 1 and 3 are the same. The executive summary is a stand-alone feature of the report.

		Tables 1 and 3 look identical. In the Discussion, you bring up that "the methodological quality on the effectiveness of suicide prevention strategies is limited." It would be helpful to discuss why that might be the case. What would it take to actually have a community-based intervention that would be of high methodological quality? For things like a public awareness campaign, it may be very hard to think of a feasible and fundable way design a study that would meet such criteria. Similarly, the Future Research section suggests "using RCT trial designs" but for many community-based intervention strategies, I'm not sure that a RCT design can (or even should) be used. No "peer norm" interventions were found. I wanted to confirm if you checked that the socio-emotional interventions did not include a "peer norm" component. In particular, the Signs of Suicide (US) intervention involves discussion of peer interaction so I'm wondering if this was part of it. Fine to mention the caveat that the Australian intervention costs were likely in Australian dollars, but can you report the costs in USD based on that assumption?	We revised the "Future Research" section to provide realistic suggestions. RCTs may not be feasible for all community or population-based interventions. However, RCTs in organizational workplaces, schools, or other closed communities could be conducted (example: SEYLE trial in European high schools). In the absence of RCTs, observational studies with concurrent control groups, adequate adjustment for confounding, large sample sizes, and adequate follow-up should be conducted. We categorized the interventions according to their primary approach. The Signs of Suicide program consisted of a video and guided discussion. The aim was to increase knowledge and improve attitudes, encourage help-seeking, reduce stigma, engage parents and school staff as partners in prevention, and encourage schools to develop partnerships to support mental health. We categorized this as a social-emotional learning program. We left the cost in question in Australian dollars as this was the context of the study.

CDC=Centers for Disease Control and Prevention; ESP=Evidence Synthesis Program; KQ=Key Question; RCT=Randomized Controlled Trial; SEYLE=Saving and Empowering Young Lives in Europe; SOS=Signs of Suicide; US=United States; USD=United States dollar; VA=Department of Veterans Affairs; VHA=Veterans Health Administration