National Institute for Health and Care Excellence

Guideline version (Draft)

Preventing suicide in community and custodial settings: multi-agency partnerships

[Evidence review for – multi-agency partnerships]

NICE guideline <number>

Evidence reviews

[February 2018]

Draft for Consultation

These evidence reviews were developed by Public Health Internal Guideline development team

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Multi-agency partnerships

Introduction

This review provides evidence from recent studies of suicide prevention on the topic of multi-agency partnerships for preventing suicide. The aim of this review was to determine the arrangements local partners can make for multi-agency teams to ensure they support partnership working and are are cost-effective and effective in reducing suicide.

Review question

Are local multi-agency partnerships effective and cost-effective at preventing suicide? To ensure approaches are effective at preventing suicide:

- Which agencies need to be involved?
- What skills, mix and experience of team members is needed?
- Which stakeholders need to be involved?
- At what points do key partners need to be involved?

PICO table

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

Table 1: PICO inclusion criteria for the review question of multi-agency partnerships.

Population	Whole population or subgroups
Interventions	Multi-agency partnerships for suicide prevention, including but not limited to: • Managing skills mix and team composition • Identifying and linking partners • Shared resources and intelligence
Comparator	Comparators that will be considered are • Other intervention • Status quo/do nothing/control • Time (before and after)
Outcomes	The outcomes that will be considered when assessing the impact on health are: • Suicide rates • Suicide attempts • Reporting of suicide ideation. The outcomes that will be considered when assessing help-seeking behaviour: • Service uptake (such as mental health services, helplines, GPs) Other outcomes: • Changes in knowledge, attitude and behaviour of practitioners and partners • Views and experiences of professionals and the public (service experience).

Public Health evidence

In total, 19,228 references were identified through the systematic searches. References were screened on their title and abstract and 18 references that were potentially relevant to this question were requested. We also identified 1 additional reference from citation checking so 19 references in total were requested. 12 references reporting on 11 studies were included: 7 were quantitative studies; 2 were qualitative studies and 2 were health economic studies (see Appendix E:for the evidence tables) and 7 studies were excluded. For the list of excluded studies with reasons for exclusion, see Appendix D:

Expert testimony (see Appendix H:) on multi-agency partnerships was also used.

Findings

Summary of quantitative studies included in the evidence review of multi-agency partnerships

7 quantitative studies were included. Tables 2-5 present a summary of these studies sorted by intervention.

Table 2: Garrett Lee Smith Memorial Suicide prevention programme (GLS)

Study [country]	Study Design	Population	Agencies/partners	Comparison	Outcomes
Walrath C et al (2015) [USA]	Quasi-experimental	Residents in counties where GLS implemented	• Professionals in educational institutions (i.e. schools); • Community care providers (prevention strategy; postvention services	Intervention vs control (counties with or without Garrett Lee Smith Youth Suicide Prevention programme implemented.	Suicide rate
Garraza L G; et al (2015) [USA]	Quasi-experimental	Residents in counties where GLS implemented			Suicide attempts

Table 3: Alliance against depression

Study [country]	Study Design	Population	Agencies/partners	Comparison	Outcomes
Hegerl U et al (2010) [Germany]	Quasi-experimental	Residents in Nuremberg	• Primary care (i.e. GPs) and mental health care physicians were trained to improve knowledge and care standards; • Community facilitators such as priests, teachers, police, social workers, pharmacists and media: to be trained and to disseminate knowledge about depressive disorders; • Regional self-help groups, patient associations to support for high risk people; • General public, information for the public to raise awareness	Before and after the implementation of the programme	Suicide rate
Hubner and Hegerl (2010) [Germany]	Quasi-experimental	Residents in Regensburg			Suicide rate
Szekely et al (2013) [Hungary]	Quasi-experimental	Residents in Szolnok, Hungary			Suicide rate

Table 4: Military-based suicide prevention: Air Force Suicide Prevention Programme (AFSPP)

Study [country]	Study Design	Population	Agencies/partners	Comparison	Outcomes
Knox K L et al (2010, 2003)[USA]	Quasi-experimental	Active-duty airmen	• Leadership involvement, US Air Force Chief of Staff; • Professional military education dealing with suicide thoughts; • Guideline for commanders on the use of mental health service;	Before and after the implementation of AFSPP in 1997	Suicide rate

Study [country]	Study Design	Population	Agencies/partners	Comparison	Outcomes
			• Community preventative services; • Community education and training (unit gatekeepers); • Investigation interview policy (Air Force Chief of staff); • Critical incident stress management (mental health providers, medical providers, and chaplains) • Integrated delivery system for human services prevention; • Limited patient privilege; • Behavioural health survey (commanders); • Suicide event surveillance system		

1 **Table 5: Multimodal community intervention programme**

Study [country]	Study Design	Population	Agencies/partners	Comparison	Outcomes
Ono et al (2013) [Japan]	Quasi-experimental	Residents in the area where the programme was implemented	• Local government to play a leading role in implementation of the programme; • Regional education and awareness programme to reduce stigma about suicide; • Community or organisational gatekeepers in early detection vulnerable population; • Regional public health nurses and psychiatrists to visit individuals at high risk;	Before and after the implementation of the programme	Suicide rate

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Summary of qualitative studies included in the evidence review of multi-agency partnerships

2 qualitative studies were included in this review. 1 mixed method study was rated as [-] for quality and evaluated a suicide prevention programme implemented in 4 European countries to explore the interactions between the different intervention components.. The quality of the second qualitative study was rated as [+] which identified whether organisational changes contributed to reduction in suicide rates, and explored from a staff perspective which features of organisational changes contributed to this reduction.. Table 6 presents a summary of both included studies with the themes as reported by the authors.

Table 6: Included qualitative studies

Study [country]	Study Design	Population	Intervention	Agencies/partners	Themes
Harris et al 2016 [Germany, Hungary, Ireland, Portugal]	Mixed method: interview/focus group; questionnaire	Semi-structured interviews (n = 47) and focus groups (n = 12) with local mental health stakeholders who had some 'stake' in suicide prevention, including health professionals (GPs, mental health nurses, psychologists, psychiatrists), community-based professionals (e.g. members of the police, social and community workers), mental health charities and mental health advocates.	A multi-level suicide prevention intervention	• Targeting primary care (training for primary care health professionals; helpline for GPs) • Public health campaign, involving patron, public information; flyers, leaflets, brochures; • Community facilitators' training including media guideline & workshops for journalists • Support for self-help groups; information for high risk groups; information signposting; emergency cards; online forum • Interventions related to methods of suicide or restriction of access (including disposal of unused medication properly)	**Synergistic interactions** Intervention component (A) interacted with the intervention component (B) to enhance the latter. Synergies were also detected between more than two levels of intervention. For instance, in Germany we found that the support for self-help groups for people living with or affected by depression interacted with both the public health campaign and GP training. **Catalytic interactions** These occur when single levels of intervention or indeed the whole programme, acts as a catalyst to stimulate related activity implemented by those individuals or agencies that are external to the intervention teams.
Slade and Forrester 2015 [UK]	Mixed method: questionnaire and interviews	An urban local medium secure prison. Participants were identified from staff who were employed in the prison and had knowledge of its suicide prevention practices	A multidisciplinary approach to suicide prevention	3 stage of strategy implementations: • 1978-90, no structured suicide prevention strategy or procedure; • 1991-2008, introduction of National Suicide Prevention Strategy;	• Prison climate and culture • Communication regarding high risk prisoners and active partnership working; • Mental health treatment and communication with external agencies;

Study [country]	Study Design	Population	Intervention	Agencies/partners	Themes
				• 2009-2011, introduction of Local Suicide Prevention strategy (multi-agency and cultural change)	• Debriefing staff and learning from incidents (including ongoing staff support); • Management and leadership approach; • Specialist knowledge for strategic management;

1

Economic evidence

Two economic studies met the inclusion criteria of the review. Vasiliadis et al (2015) used data from the European Nuremberg Alliance against Depression study to evaluate the cost-effectiveness of community-based suicide prevention strategies in a Canadian context. The analysis indicated that the average Incremental cost-effectiveness ratios (ICER) associated with the implementation of the programmes was $3,979 per life year saved.

Garraza et al (2016) examined the cost-effectiveness of a comprehensive community-based suicide prevention programme (the Garrett Lee Smith Memorial Suicide Prevention Programme). The analysis showed that this programme resulted in 79,379 suicide attempts averted between 2005 and 2009. Off these averted suicide attempts, 19,448 could have resulted in hospitalisation and 11,424 could have required emergency care. This was equivalent to savings of $187.8 million from averted hospitalisation and $34.1 million from averted emergency care. Given programme cost of $49.4 million, the estimated benefit-cost ratio was $4.5. The GLS programme returned $4.5 in medical cost savings for each dollar invested in its implementation.

Evidence statement

Quantitative evidence

Evidence statement 1.1-suicide rate

Evidence from five quasi-experimental studies showed a reduction in suicide rates after the implementation of multi-component suicide prevention programmes (a pooled relative risk=0.76, [95%CI 0.65 to 0.90], absolute differences range from 3.6 to 5.4 per 100,000 fewer suicides). One quasi-experimental study showed that the suicide rate among youth aged between 10 and 24 years in counties which implemented the suicide prevention programme was 1.33 fewer suicides per 100,000 than similar counties that did not implemente the programme. The committee's confidence in the evidence was moderate.

Evidence statement 1.2-suicide attempts

Evidence from one quasi-experimental study showed a statistically significant reduction in the rate of suicide attempts (4.9 fewer per 1000) among young people and adults aged between 10 and 24 years from counties that implemented the programme compared to those that had not The committee's confidence in the evidence was very low.

Evidence from one experimental study showed a reduction in the rate of suicide attempts after the introduction of a multimodal community intervention programme. The rate of suicide attempts decreased from 11.0 per 100,000 to 9.3 per 100,000 annually among community residents. This reduction was not statistically significant (relative risk=0.84, [95%CI 0.59 to 1.21]; absolute difference=1.7 fewer per 100,000). The committee's confidence in the evidence was very low.

Qualitative evidence

Evidence statement 1.3- the impact of multi-agency partnerships

Evidence from 2 qualitative studies showed benefits of engaging professionals such as GPs, the public, community facilitators and support groups as collaborators for implementation activities relating to suicide prevention (Harris et al 2016). In a prison setting, a multi-agency approach was considered crucial to integrate diverse partners inside and outside the prison, enabling effective communication for suicide prevention (Slade and Forrester 2015).

Expert testimony

Evidence statement 1.4- multi-agency partnership approach for suicide prevention

The expert witness presented a multi-agency-partnership approach aimed at preventing suicide. This partnership was introduced to implement the 'NO MORE' action plan- A Zero Suicide Strategy for Cheshire, Merseyside 2015-2020.

This partnership was led by Cheshire Merseyside Suicide Prevention Network Board, which consisted of representatives from different organisations including local government, public health, health service, clinical commissioning group, criminal justice service, ambulance, police and fire service. These board members worked together at the strategic level to support the implementation of the 'NO MORE' strategy and to provide guidance to operational groups on how to better prevent and respond to suicides and suicide attempts. At the operational level, the 'NO MORE' action plan was implemented based on collaborative working across all the organisations involved in order to gather intelligence through local audits, to provide bereavement support for those bereaved by suicide, and to deliver suicide prevention training in the local authorities covering community gatekeepers, primary care sectors, and mental health practitioners/specialists.

Recommendations

Multi-agency partnerships for suicide prevention in the community

1.1.1 Local authorities should work with local organisations to set up and lead a local multi-agency partnership on suicide prevention. The partnership should have clear terms of reference, governance and accountability structures, based on a shared understanding that suicide is preventable.

1.1.2 Include representatives from:

- local public health services
- clinical commissioning groups
- primary care providers
- secondary care providers

- social care services
- voluntary and other third-sector organisations
- secondary mental healthcare providers
- emergency services
- criminal justice services
- people who have attempted or been affected by suicide.

Multi-agency partnerships for suicide prevention in custodial or detention settings

1.1.3 Each custodial or detention setting should set up a multi-agency partnership that includes representatives from:

- prison healthcare staff
- prison governors
- prison staff
- emergency services
- voluntary and other third-sector organisations
- probationary and transition services
- people who have attempted or been affected by suicide.

1.1.4 Link the custodial or detention setting's partnership with relevant multi-agency partnerships in the community (see recommendation 1.1.1).

1.2.1 Multi-agency partnerships in the community or in a custodial or detention setting should develop a suicide prevention strategy. Specifically:

- Make it clear who leads on suicide prevention.
- Engage with stakeholders to share experience and knowledge.
- Map stakeholders and their suicide prevention activities.
- Oversee local suicide prevention activities, including awareness raising.
- Keep up to date with suicide prevention activities in neighbouring areas.

- Review local and national suicide data to ensure the strategy is as effective as possible.
- Assess whether initiatives successfully adopted elsewhere are appropriate locally or can be adapted to local needs.
- Work with transport companies to promote best practice when announcing delays because of a suspected suicide.
- Liaise with the media to promote best practice when reporting suicides or suspected suicides. This includes social media, broadcasting and newspapers. (For example, see the Samaritan's Media guidelines for the reporting of suicide)

1.2.2 Multi-agency partnerships in the community should help local institutions and organisations, such as schools and workplaces, prepare contingency plans to respond to a suicide.

See Public Health England's resource on Local suicide prevention planning: a practice resource.

1.3.1 Multi-agency partnerships in the community or in a custodial or detention setting should develop a plan to implement the suicide prevention strategy. Include processes to:

- Collect, analyse and interpret local data to determine local patterns of attempted suicide and suicide (see recommendations 1.4.1 and 1.4.2).
- Compare local patterns against national trends.
- Share data between stakeholders so that they can identify local characteristics and needs.

1.3.2 Implement the plan based on interpretation of routinely collected data

1.3.4 Multi-agency partnerships in a custodial or detention settings should audit the data collected (see recommendations 1.4.1 and 1.4.3) and use the results to improve the local action plan.

1.4.1 Multi-agency partnerships in the community or in a custodial or detention setting should:

- Use routinely-collected data to provide information on suicide and self-harm. This could include data on at-risk groups from sources such as Public Health England's Fingertips tool (public health profiles), the National Probation Service and the National Offender Management Service).
- Carry out periodic audits to collect and analyse local data from different sources, for example reports from local ombudsman, and coroner, prison and probation ombudsman reports.
- Assess the quality of the data from each source to ensure robust and consistent data collection.
- Gather data on method of suicide, location, seasonality, details of individual and local circumstances, demographics, occupation, and characteristics protected under the Equality Act (2010).

1.4.2 Multi-agency partnerships in the community should consider continuous and timely collection of data (rapid intelligence gathering) from police, coroners and other sources to identify suspected suicides and potential emerging suicide clusters. This intelligence could also be used to identify people who need support after such events (see recommendations 1.8.1 and 1.8.5).

1.4.3 Custodial and detention settings should collect data on sentence type, offence, length and transition periods when carrying out rapid intelligence gathering in their institutions to identify trends..

1.4.4 Ensure staff gathering and analysing this information are given appropriate support and resilience training.

Research recommendations

1. **What is the relative impact of individual components within a multi-component intervention on reducing suicide?**

Criterion	Explanation
Population	Residents in the community where the multi-agency intervention is implemented
Intervention	A multi-agency partnership suicide prevention programme
Comparator	No intervention
Outcomes	Primary outcomes to include suicide-related outcomes (Suicides, attempted suicides or suicide ideation) Secondary outcomes, to include service uptake, changes in knowledge, attitude and behaviour of practitioners and partners, views and experiences of professionals and the public (service experience).
Study design	Study designs could include experimental studies with the purpose of ascertaining the effectiveness and cost-effectiveness of a multi-agency partnership at reducing suicide rates (primary outcome). It will also be important to gain public and staff feedback as part of any study so a mixed methods approach to include qualitative elements may also be appropriate This may include observational data analysis from an RCT.
Timeframe	Studies would require sufficient follow up time to capture changes in suicide rates (ideally 12 months)

2. What can we learn from existing multi-agency partnerships aimed at preventing suicides? (case studies)

Criterion	Explanation
Population	Residents in the community where the multi-agency intervention is implemented
Intervention	Multi-agency partnership suicide prevention programme
Comparator	• Other intervention • Status quo/do nothing/control • Time (before and after)
Outcomes	Primary outcomes to include suicide-related outcomes (Suicides, attempted suicides or suicide ideation) Secondary outcomes, to include service uptake, changes in knowledge, attitude and behaviour of practitioners and partners, views and experiences of professionals and the public (service experience).
Study design	Study designs could involve case studies with the purpose of ascertaining the effectiveness of multi-agency partnerships at reducing suicide rates (primary outcome). It will also be important to gain public and staff feedback as part of any study so a mixed methods approach to include qualitative elements may also be appropriate
Timeframe	Studies would require sufficient follow up time to capture changes in suicide rates (ideally 12 months)

Rationale and impact

Why the committee made the recommendations

Impact of the recommendations on practice

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

The committee considered the relative importance of the outcomes and agreed that a change in suicide rate and suicide attempt rate were the most important outcomes when evaluating the effectiveness of multi-agency partnerships for suicide prevention. Any reduction in suicides or suicide attempts would make an important difference in saving lives.

Outcomes that explored the views and experiences of professionals and partners involving in multi-component interventions were deemed to be relevant but less important for decision making.

Other outcomes, such as suicidal ideation, service uptake and change in knowledge of professionals and partners were not reported in the included studies.

The quality of the evidence

The committee acknowledged that the evidence on the multi-agency partnerships approach for suicide prevention was limited, and, as expected, there were no randomised controlled trials in this area.

All studies were quasi-experimental study designs and all were carried out in non-UK countries. The committee noted the majority of studies reported on suicide rates, and the quality of the evidence base for this outcome was considered to be moderate. The committee had concerns around confounding factors (for example, active deployment) during study observation (Knox et al 2010), the accuracy of data recording/reporting on suicides (Ono et al 2013) and also methodological limitations of some studies (Hegerl et al 2010; Hubner-Liebemann et al 2010; Szekely et al 2013). These concerns meant that there was insufficient data to make any meaningful comparisons to conclude the effectiveness of multi-component interventions.

The committee discussed a lack of detail regarding the definition of multi-agency partnerships in the review. They noted that multi-agency partnerships could refer to different agencies joining together at a strategic level to act on the implementation of an intervention and/or different professional groups working in collaboration at an operating level to provide services. The included studies provided little information to specify the roles (personnel) and activities involved.

Two studies (Ono et al 2013; Garraza et al 2015) also reported self-reported suicide attempt rates and thus the committee considered such self-reported data may not reflect the true impact of the intervention

Benefits and harms

Evidence showed a reduction of rates of suicide and suicide attempts following the implementation of multi-component interventions.

Although limited evidence was identified in the literature review, expert testimony on a suicide prevention partnership in Cheshire & Merseyside was used to strengthen the evidence. This partnership adopted and implemented the 'NO MORE, A Zero Suicide Strategy', which was driven by a partnership on two levels as follows:

- on a strategic level, the partnership provides leadership and strategic oversight on suicide prevention activities across the area;
- on an operational level, the partnership established a suicide prevention network, provides gatekeeper training in the community and introduced preventative measures to ensure safe care for those in crisis.

Local engagement including networking and close communication with local leadership was considered a key component of partnership working. Such partnership working in the region has shown a positive impact on preventing suicide events, although this has not yet been evaluated.

None of the included studies provided evidence on potential harms of multi-agency partnerships within suicide prevention.

Cost effectiveness and resource use

The health economic review indicated that the Incremental cost-effectiveness ratios (ICER) associated with the implementation of the programmes was on average $3,979 per life year saved. The committee noted that this economic study used effectiveness data from Garraza et al (2015) and was applied within a Canadian context. In addition, the study did not report sensitivity analysis and therefore the committee were cautious when interpreting the study results.

However the committee were cognisant of the fact the majority (95%) of local authorities are following the 2012 national suicide prevention strategy. Following the guidance from Public Health England (PHE) on Suicide prevention: developing a local action plan ,there is an increasing involvement of public health teams, clinical commissioning groups, primary and secondary care sector, voluntary organisations, criminal justice system and those affected by suicide to work in collaboration to develop and act on suicide plans to prevent suicides in the local areas. As such the resource impact would be minimal.

Other factors the committee took into account

In this review, evidence from a qualitative study (Harris et al 2016) reported enhanced benefits of engaging professionals such as GPs, the public, community facilitators and support groups as collaborators for implementation activities relating to suicide prevention.

A study carried out in a UK prison setting identified a number of factors that underpinned organisational best practice in prisons, which were considered to be supportive in preventing suicide. Members of the committee noted that some of these

listed factors, such as prison climate (regime or ethos) and culture could play an important role in promoting this multi-agency partnership approach.

The PHE 2015 report on local suicide prevention planning emphasises that no single agency is likely to be able to deliver effective suicide prevention strategies/plans on its own, and the combined knowledge, expertise and resources of organisations across different sectors is pivotal to develop community-based suicide prevention activities. This report outlines who could/should be involved in a multi-agency partnership. Such as representatives from:

- Public health
- Clinical commissioning groups
- Primary care
- Voluntary sector organisations
- Secondary mental health care
- Emergency services
- Criminal justice services
- People with lived experience

The committee endorsed this list.

Overall, the committee discussed that evidence indicated a beneficial effect of multi-component interventions with the context of a wider intervention, showing a reduction in both suicides and suicide attempts. This was supported by expert testimony and the experience of the topic experts. As such the committee recommended the use of multi-agency partnerships, ass laid out in the PHER guidance.

The committee considered that a research recommendation would be needed to examine the effectiveness of individual aspects within multi-component intervention to identify the most effective components of preventing suicides.

1 Appendices

2 Appendix A: Review protocols

Topic 1	**Local approaches to preventing suicide in community and custodial settings**
Component of protocol	Description
Review question 1	Are local multi-agency teams effective and cost effective at preventing suicide? To ensure approaches are effective at preventing suicide: a. Which agencies need to be involved? b. What skills, mix and experience of team members is needed? c. Which stakeholders need to be involved? d. At what points do key actors need to be involved?
Context and objectives	To determine the arrangements local partners can make for multi-agency teams to ensure they are effective and cost effective at preventing suicide and improving partnership working.
Participants/population	Whole population or subgroups.
Intervention(s)	Multi-agency teams for suicide prevention, including but not limited to: • Managing skills mix and team composition • Identifying and linking partners • Shared resources and intelligence
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Suicide rates • Suicide attempts • Reporting of suicide ideation

Topic 1	**Local approaches to preventing suicide in community and custodial settings**
Component of protocol	Description
	The outcomes that will be considered when assessing help-seeking behaviour: • Service uptake (such as mental health services, helplines, GPs) Other outcomes: • Changes in knowledge, attitude and behaviour of practitioners and partners • Views and experiences of professionals and the public (service experience).
Types of studies to be included	Comparative studies including: • Randomised or non-randomised controlled trials • Before and after studies • Cohort studies • Process evaluations. Qualitative studies: • Interviews • Focus groups. Economic studies: • Economic evaluations • Cost-utility (cost per QALY) • Cost benefit (i.e. Net benefit) • Cost-effectiveness (Cost per unit of effect) • Cost minimization • Cost-consequence Systematic reviews will only be included if they have a high level of external validity to our research questions. They will also be used as a source for primary evidence. Only full economic analyses will be included – papers reporting costs only will be excluded.

Topic 1	Local approaches to preventing suicide in community and custodial settings
Component of protocol	Description
	Qualitative studies which are linked to included comparative studies will be prioritised, if the volume of studies is high.

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

Appendix B: Literature search strategies

See separate document attached on the guideline consultation page.

Appendix C: References

Garraza L G, Walrath C, Goldston D B, Reid H, and McKeon R (2015) Effect of the garrett lee smith memorial suicide prevention program on suicide attempts among youths. JAMA Psychiatry 72(11), 1143-9

Godoy Garraza, Lucas , Peart Boyce, Simone , Walrath Christine, Goldston David B, and McKeon Richard (2016) An Economic Evaluation of the Garrett Lee Smith Memorial Suicide Prevention Program. Suicide & life-threatening behaviour,

Harris Fiona M, Maxwell Margaret, O'Connor Rory, Coyne James C, Arensman Ella, Coffey Claire, Koburger Nicole, Gusmao Ricardo, Costa Susana, Szekely Andras, Cserhati Zoltan, McDaid David, van Audenhove , Chantal , and Hegerl Ulrich (2016) Exploring synergistic interactions and catalysts in complex interventions: longitudinal, mixed methods case studies of an optimised multi-level suicide prevention intervention in four european countries (Ospi-Europe). BMC public health 16, 268

Hegerl Ulrich, Mergl Roland, Havers Inga, Schmidtke Armin, Lehfeld Hartmut, Niklewski Gunter, and Althaus David (2010) Sustainable effects on suicidality were found for the Nuremberg alliance against depression. European archives of psychiatry and clinical neuroscience 260(5), 401-6

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Ono Yutaka, Sakai Akio, Otsuka Kotaro, Uda Hidenori, Oyama Hirofumi, Ishizuka Naoki, Awata Shuichi, Ishida Yasushi, Iwasa Hiroto, Kamei Yuichi, Motohashi Yutaka, Nakamura Jun, Nishi Nobuyuki, Watanabe Naoki, Yotsumoto Toshihiko, and Nakagawa A (2013) Effectiveness of a multimodal community intervention program to prevent suicide and suicide attempts: A quasi-experimental study. PloS one 8, e74902

Slade K, and Forrester A (2015) Shifting the paradigm of prison suicide prevention through enhanced multi-agency integration and cultural change. Journal of Forensic Psychiatry and Psychology 26(6), 737-758

Szekely Andras, Konkoly Thege, Barna , Mergl Roland, Birkas Emma, Rozsa Sandor, Purebl Gyorgy, and Hegerl Ulrich (2013) How to decrease suicide rates in both genders? An effectiveness study of a community-based intervention (EAAD). PloS one 8(9), e75081

Vasiliadis Helen-Maria, Lesage Alain, Latimer Eric, and Seguin Monique (2015) Implementing Suicide Prevention Programs: Costs and Potential Life Years Saved in Canada. The journal of mental health policy and economics 18(3), 147-55

Walrath Christine, Garraza Lucas Godoy, Reid Hailey, et al (2015) Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. American journal of public health 105(5), 986-93

Appendix D: Excluded studies

No.	Study	Reason for exclusion
1.	Bean Gretchen, and Baber Kristine M (2011) Connect: an effective community-based youth suicide prevention program. Suicide & life-threatening behaviour 41(1), 87-97	Study intervention is not a multi-agency intervention
2.	Clifford A C, Doran C M, and Tsey K (2013) A systematic review of suicide prevention interventions targeting indigenous peoples in Australia, United States, Canada and New Zealand (Provisional abstract). BMC Public Health 13(1), 463	Systematic review, included studies checked against review protocol
3.	Gullestrup Jorgen, Lequertier Belinda, and Martin Graham (2011) MATES in construction: impact of a multimodal, community-based program for suicide prevention in the construction industry. International journal of environmental research and public health 8(11), 4180-96	Study intervention is not a multi-agency intervention
4.	Harlow Alyssa F, Bohanna India, and Clough Alan (2014) A systematic review of evaluated suicide prevention programs targeting indigenous youth. Crisis 35(5), 310-21	Systematic review, included studies checked against review protocol
5.	Marzano Lisa, Hawton Keith, Rivlin Adrienne, Smith E Naomi, Piper Mary, and Fazel Seena (2016) Prevention of Suicidal Behaviour in Prisons. Crisis , 1-12	Systematic review, included studies checked against review protocol
6.	Ono Yutaka, Awata Shuichi, Iida Hideharu, et al. (2008) A community intervention trial of multimodal suicide prevention program in Japan: a novel multimodal community intervention program to prevent suicide and suicide attempt in Japan, NOCOMIT-J. BMC public health 8, 315	This is a study protocol
7.	Stephen Platt, et al (2006) Evaluation of the first phase of Choose Life: the national strategy and action plan to prevent suicide in Scotland. , 209p.	No outcome of interest

Appendix E: Evidence tables

E.1 Quantitative studies

E.1.1 Garraza et al 2015

Garraza L G; Walrath C ; Goldston D B; Reid H ; McKeon R 2015. Effect of the garrett lee smith memorial suicide prevention program on suicide attempts among youths. JAMA Psychiatry 72 (11): 1143-9.

Study details	Research Parameters	Population / Intervention	Results
Author/year Garraza Lucas Godoy; et al 2015 **Quality score** - **Study type** Quasi-experimental study **Aim of the study** To determine whether a reduction in suicide attempts among youths occurs following the implementation of the Garrett Lee Smith Memorial Suicide Prevention Program (hereafter referred to as the GLS program) **Location and setting**	**Number of participants** 320,500 **Characteristics of population**	**Intervention / Comparison** **Intervention:** Garrett Lee Smith Youth Suicide Prevention. The GLS state and tribal grants stipulated that grantees promote or develop early intervention and prevention services aimed at reducing risk for suicidal behaviours. GLS grantees also have been encouraged to use funds for facilitating timely referrals of youth at risk for suicidal behaviours, and for improving access to services for youth from varied backgrounds. The components of GLS programme: (1) Screening programme; (2) Life skills development and wellness activities; (3) Hotlines and helplines	**Primary outcomes** The main outcome was the suicide attempt rate for each country following the implementation of GLS training sessions amongst the population aged 16-23 years between 2007 and 2010.

	Intervention (n=64,000)	Control (n=109, 000)
Female	51.5%	52.3%
Age group, y		
12-17	11.4%	12.8%
18-25	15.6%	14.5%
≥16	73.0	72.8
Education		
School	18.7	18.8

	Average effect of GLS training	
	Estimate (SE)	P values
Youth 16-23y, no. of suicide attempts per 1000 youth		
GLS training session last year	-4.91(1.57)	0.03
GLAS training session ≥2y ago	-1.19 (1.87)	0.53

Counties across the USA

Length of study

2006-2009

Source of funding

The study was supported through a Substance Abuse and Mental Health Service (SAMHSA) contract to ICF Macro.

High school graduate	36.3	38.3
Some college	24.1	24.3
College graduate	21.0	18.7
Has lifetime major depressive episode	15.7%	14.8%
Has major depressive episode in past year	8.6%	8.4%

Inclusion criteria

466 counties exposed to the suicide prevention of the GLS programme at some point between 2006 and 2009.

Exclusion criteria

Not reported

(4) Gatekeeper training provides suicide risk identification training, improved identification of suicidal risk factors; increased timely referral;

(5) Direct services and traditional healing practice

(6) Policies and protocols for intervention and postvention;

(7) Assessment and referral training;

(8) Outreach & awareness

(9) Means restriction

Comparison

Counties with no Garrett Lee Smith Youth Suicide Prevention programme implemented.

Adults≥24y, no of attempts per 1000 adults		
GLS training session last year	1.96 (2.66)	0.46
GLAS training session ≥2y ago	-1.96 (2.61)	0.46

Author's conclusion

The study indicated a reduction in the rate of suicide attempts amongst youths aged 16-23 years in counties implementing GLS suicide prevention programmer compared with counties that were not targeted by GLS programmes. These results suggest the existence of an important reduction in youth suicide attempt resulting from the implementation of GLS suicide prevention programme.

Limitations identified by author
The study is non-randomised study, and there could be unaccounted differences between intervention and control counties that are influencing the results.
Information on attempts was only available for a segment of the target population, and therefore, the study did not examine the effect on the younger age group
The data on lifetime history and number of suicide attempts were not available, and as such it as not possible to determine whether the GLS programme differentially affected youths with different histories of suicidal behaviours.
The findings from current analysis did not shed light on which aspects of the GLS programme may be the most effective.
Limitations identified by review team
The GLS was implemented between 2006 and 2009 in counties across the USA and "true" effect of the intervention may be overestimated in the study

E.1.2 Hegerl U et al 2010

Hegerl Ulrich et al 2010 Sustainable effects on suicidality were found for the Nuremberg alliance against depression. European archives of psychiatry and clinical neuroscience 260 (5)

Study details	Research Parameters	Population / Intervention	Results
Author/year Hegerl U et al 2010 **Quality** + **Study type** Quasi-experimental **Aim of the study** The aim of this study is to analyse whether or not the reduction in suicidality observed duringa2-year intervention is sustainable in the follow-up year. **Location and setting** Nuremberg and Wuerzburg both are located in the southern part of Germany, **Length of study** 2-year intervention 2001-2002, and follow up to 2006 **Source of funding** Not reported	**Inclusion criteria** The intervention region Nuremberg had 488,400 inhabitants before the intervention in 2000 and 493,500 at the end of 2003 which is a small Increase in inhabitants of 1.04%.The control region Wuerzburg is smaller than Nuremberg and is surrounded by a rural area. It had 287,000 inhabitants in 2000 and 292,500 in 2003, with a similar increase of 1.92% from 2000 to 2003. **Exclusion criteria** Not reported **Method of analysis** Owing to the relative low base rate of completed suicides and correspondingly high yearly fluctuation of the member, differences in suicide rates cannot be expected to be detectable for a town with a population of 500,000 inhabitants. Assessed raw data on attempted suicides were added to the data on completed suicides as provided by the Bavarian State Office for Statistics and Data Processing. Confirmatory tests concerning the	**Participant numbers** The intervention region Nuremberg had 488,400 inhabitants before the intervention in 2000 and 493,500 at the end of 2003. The control region Wuerzburg is smaller than Nuremberg and is surrounded by a rural area. It had 287,000 inhabitants in 2000 and 292,500 in 2003 **Participant characteristics** Intervention and control region differ in unemployment rate and percentage of migrant population. These differences were considered as tolerable because the aim of the study is not to compare the based rate but changes in suicidality. **Intervention** A 2-year intervention program had been performed in Nuremberg (years2001–2002). Interventions took place at four levels. (1)Primary care physicians were sensitized and trained to improve knowledge and care standards.	**Primary outcomes** Suicide acts A significant reduction in suicidal acts that had been observed during the 2-year intervention (-24.0%) was also found for the follow-up yea: the number of suicidal acts (attempted + completed suicides) in the intervention region (Nuremberg) decreased from 620 at baseline to 419 (-32.4%) during the first year of follow-up. Based on figure 3 reported in the study, the number of suicide at Nuremberg in 2000 was around 100, and the study reported 88 suicide in 2003. In the control region (Wuerzburg), the number of suicidal acts changed from 183 at baseline to 173(-5.5%) during the first year of follow-up. Confirmatory tests revealed a significant reduction in suicidal acts in Nurem-berg when compared with the control region (2000vs. 2003: v2 = 7.42; df = 1; P = 0.0065; two-sided test). Attempted suicides Attempted suicides in the intervention region decreased from 520 at baseline to 331(-36.2%) in the first year of follow-up. In the control region, Wuerzburg, the number of attempted suicides increased from 125 at baseline to 131 (?4.8%) in the same time interval. The difference was significant (v2 = 12.05, df = 1; P = 0.0005; two-sided test). Completed suicides A number of registered completed suicides in the four follow-up years at Nuremberg (2003:88;2004:87;2005: 68; 2006:72) were inside of the 95%CI computed for the completed suicides at Nuremberg in 12 years before onset of the NAD. In the first intervention year (2001), the lowest suicide number ever recorded in Nuremberg was observed and an even lower number was observed in the follow-up year 2005. **Author's conclusions** The study demonstrates sustainable suicide

	outcome criterion of differences in changes for invention versus control region when compared with the baseline data were carried out using chi-square analysis or Fisher's extract test, where appropriate.	2)Media and public: a professional public relation campaign was implemented. A media guide was handed out to local media informing about the so-called 'Werthereffect''(imitation suicide). (3)Around 2,000 community facilitators, such as teachers, priests, policemen and geriatric caregivers were trained. 4)Depressed persons, suicide attempters and their families were supported. Establishment of self-help groups was encouraged and assisted.	Preventive effects of a four-level community-based intervention to reduce suicidality and supports the cost-effectiveness of the intervention.
Limitations identified by author It should be mentioned that less intense interventions were still going on in Nuremberg during the follow-up year. **Limitations identified by review team** The data on completed suicide in control region reported in the study. Accuracy of data recording on suicide events			

E.1.3 Hubner-Liebemann et al 2010

Hubner-Liebermann Bettina et al 2010 Reducing suicides through an alliance against depression? General Hospital Psychiatry 32(5)			
Study details	**Research Parameters**	**Population / Intervention**	**Results**

Author/year

Hubner-Liebermann Bettina et al 2010

Quality score

+

Study type

Quasi-experimental

Aim of the study

To evaluate the effect of Regensburg Alliance against depression on reducing suicide rate

Location and setting

Regensburg, Germany

Length of study

10 years study period, 1998 to 2007

Source of funding

Not reported

Number of participants

Residents in Regensburg, with a population of 150,000

Participant characteristics

Not reported

Inclusion criteria

Residents in Regensburg

Exclusion criteria

Not reported

Intervention / Comparison

Intervention:

The intervention program in Regensburg used the four- level approach from the Nuremberg pilot.

1.To improve cooperation with general practitioners, teaching videos and patient videos, information brochures, and screening sheets (WHO-5) were distributed; eight continuing medical education (CME) events with more than 350 participants were conducted in collaboration with the regional confederation of doctors; also a conference attended by more than 100 participants was held on the topic of depression

2.An educational campaign for the general public included the information materials developed in the pilot (posters, flyers, information brochures, information videos, CD-ROM or DVD, cinema advertising) and some 35 public lectures, as well as annual action days with about 150 participants each. Depression was the topic of television, radio, and newspaper/magazine reports. In cooperation with the local newspaper, a low-threshold telephone initiative was used to publicize the topic.

3. So-called multipliers were involved in more than 30 training workshops for secondary school teachers, lay helpers, carers for elderly people, police personnel, practice assistants, pharmacists, and professional fire brigades. A media guide for reporting suicide was agreed with the regional press

Primary outcomes

The mean rate of suicide for the city of Regensburg during the 1998 and 2007 was 16.9 per 100,000.

Suicide rate per 100,000 in the city of Regensburg

	City of Regensburg	County district of Regensburg
1998	21	19
1999	13	7
2000	19	14
2001	30	12
2002	24	16
2003	13	13
2004	7	9
2005	16	11
2006	12	14
2007	14	11

Author's conclusion

The results show that only the suicide rate in Regensburg fell significantly during the intervention period. An intensive community-based campaign could be effective in lowering suicide rates.

		4.Two self-help groups and quite a few psychoeducational groups for relatives were set up for those affected by depression and their families. An email address was established to enable those affected and their families to contact the Regensburg Alliance Against Depression directly. Instead of an emergency card for crisis situations, flyers gave information on local crisis services and the psychiatric hospital, which is available 24/7 **Comparison:** Regensburg started in early 2003, comparison made period (1998-2002) before the implementation of the programme and period (2003-2007) after the implementation	
Limitations identified by author Owing to the design as a naturalistic intervention study, it was neither possible to randomize nor blind; therefore confounding factors might contribute to the findings The results have to be interpreted carefully because of the statistical problem of small numbers and the associated high fluctuations **Limitations identified by review team** As a multi-level intervention, the effect of individual component on suicide rate is difficult to conclude.			

E.1.4 Knox et al 2010/2003

Knox Kerry L; et al 2010. The US Air Force suicide prevention program: implications for public health policy. 100 (12): 2457-63 (study 1) **Knox Kerry L; Litts David A; Talcott Wayne G; Feig Jill Catalano; Caine Eric D 2003 Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: Cohort study. BMJ 327: 1376-78. (study 2)**			
Study details	**Research Parameters**	**Population / Intervention**	**Results**
Author/year Knox K et al 2010 Knox K et al 2003	**Number of participants** a cohort of 5 260 292 active duty US Air Force personnel (study 2) **Participant characteristics**	**Intervention / Comparison** **Intervention :** A population oriented risk reduction approach that focused on reducing	**Primary outcomes** Relative risk of suicide and related outcomes, relative risks (RR) as the ratio of the outcome of interest in the group exposed to the intervention after it was fully implemented (1997-2007) to

Quality score

+

Study type

Cohort study with quasi-experimental design

Aim of the study

To evaluate the impact of the US Air Force suicide prevention programme in reducing suicide.

Location and setting

US Air Force, USA

Length of study

1990-2007

Before the intervention: 1990-1996

After the intervention: 1997-2007

Source of funding

The project was supported by National Institute of Mental Health Grant.

The study found no significant changes in sex, race, or age distribution in the cohort (study 2)

Inclusion criteria

Active duty US Air Force personnel

Exclusion criteria

Not reported

modifiable risk factors and enhancing factors considered protective. "Initiatives" were developed that targeted strengthening social support, promoting development of effective coping skills, and changing policies and norms so as to encourage effective help seeking behaviours

Comparison:

Before-after the intervention

the outcome of interest in the group not exposed to the intervention (1990-6).

Rate of suicide in US Air Force, 1990-2002

	Suicide per 100,000 (95%CI)
1990	10.0 (7.3 to 12.7)
1991	13.0 (9.8 to 16.2)
1992	13.8 (10.4 to 17.2)
1993	13.1 (9.7 to 16.5)
1994	16.4 (12.5 to 20.3)
1995	15.8 (11.9 to 19.7)
1996	12.4 (8.9 to 15.9)
1997 (programme implemented)	12.1 (8.6 to 15.6)
1998	9.4 (6.3 to 12.6)
1999	5.6 (3.1 to 8.1)
2000	9.4 (6.2 to 12.7)
2001	10.4 (7.0 to 13.8)
2002	8.3 (5.3 to 11.3)
2003	8.01 (4.3 to 11.7)
2004	15.1 (12.3 to 17.9)
2005	8.1 (4.9 to 11.3)
2006	11.6 (9.4 to 13.9)

			2007 | 10.8 (8.4 to 13.2) Note: suicide rates between 1990 and 2002 were reported in Knox et al 2003, and suicide rates between 2003 and 2007 were calculated based on figure 1 reported in Knox et al 2010. Comparison of the effects of risk for suicide and related adverse outcomes in US Air Force before (1990-6) and after implementation of programme (1997-2002) Suicide: Relative risk (95%CI) 0.67 (0.57 to 0.80); Risk reduction 33% Homicide: 0.48 (0.33 to 0.74); 51% Accidental death: 0.82 (0.73 to 0.93); 18% Severe family violence: 0.46 (0.43 to 0.51); 54% Moderate family violence: 0.70 (0.69 to 0.73); 30%) Mild family violence: 1.18 (1.16 to 1.20); +18% **Author's conclusion** A 33% relative risk reduction was observed for suicide after the intervention. A systemic intervention aimed at changing social norms about seeking help and incorporating training in suicide prevention has a considerable impact on promotion of mental health. The impact on adverse outcomes in addition to suicide strengthens the conclusion that the programme was responsible for these reductions in risk.
Limitations identified by author Generalisation of study population			

Limitations identified by review team
Data used in the study were routinely collected for other purposes, including anonymised data collected in mortality databases for death due to all causes.
Although the programme was begun in 1996, it did not attain full implementation until 1997. Therefore, conservatively, any effects in 1996 were attributed to the time period before the intervention.

E.1.5 Ono et al 2013

Ono Y utaka, Sakai Akio, Otsuka Kotaro, Uda Hidenori, Oyama Hirofumi, Ishizuka Naoki, Awata Shuichi, Ishida Yasushi, Iwasa Hiroto, Kamei Yuichi, Motohashi Yutaka, Nakamura Jun, Nishi Nobuyuki, Watanabe Naoki, Yotsumoto Toshihiko, and Nakagawa A. 2013. "Effectiveness of a multimodal community intervention program to prevent suicide and suicide attempts: A quasi-experimental study". PloS one 8:e74902.

Study details

Author/year

Ono et al, 2013

Quality score

+

Study type

Quasi-experimental

Aim of the study

To examine the effectiveness of a community-based multimodal

intervention for suicide prevention in rural areas where the

Research Parameters

Inclusion criteria

We set two areas, rural areas and highly populated areas, as the study targets.

The participants in the rural areas were the inhabitants living in four matched pairs of intervention groups and control groups (consisting of 17 communities);

In highly populated areas, two neighbouring communities were designated as the intervention and control groups, respectively. The participants in the highly

populated areas were the inhabitants living in three matched pairs of intervention group and control group (consisting of six communities)

Population / Intervention

Participant numbers

	Rural areas		Highly populated areas	
	Int	Control	Int	control
no. areas	7	10	3	3
No. people	291,459	339,674	615,586	704,341

Participant characteristics

	Rural areas		Highly populated areas	
	Int	Control	Int	control
% of male	47	47	50	49
% under 25	16	16	17	17

Results

Primary outcomes

Incidence rate of combined suicide including completed suicide and suicide attempts

	Rural areas		Highly populated areas	
	Int	Control	Int	control
2006 (1-6m) (no.)	62.4 (n=91)	81.8 (n=139)	53.9 (n=166)	55.9 (n=197)
2006 (7-12)	67.6 (n=98)	52.7 (=89)	65.5 (n=202)	59.0 (n=208)
2007 (1-6)	61.6 (89)	61.3 (n=103)	53.0 (n=164)	58.9 (n=208)
2007 (7-12)	45.9 (n=66)	61.8 (n=103)	49.6 (n=154)	53.7 (n=190)

In the rural areas, the overall median adherence of the intervention was significantly higher. The RR of the composite outcome in the intervention group decreased 7% compared with that of the control group. Subgroup analyses demonstrated heterogeneous effects among subpopulations: the RR of the composite outcome in the

suicide rate was high, with a non-randomised comparative

intervention trial using parallel prevention-as-usual control

Location and setting

Japan

Length of study

3.5 years

Source of funding

This work is supported by Ministry of Health, Labour, and Welfare of Japan.

Exclusion criteria

Not reported

Method of analysis

In the primary analysis, we compared the rate ratios (RRs) of incidence of the composite outcome as adjusted by covariates for the effect of the intervention.

% aged 25-64	55	53	66	64

Intervention

A community-based multimodal intervention for suicide prevention:

Leadership involvement was an important factor for the effective implementation of long-term programs by creating society commitment at multiple levels and establishing community support networks.

Education and awareness programs aimed to reduce the stigmatisation of mental illness and suicide. The programs also aimed at improving the recognition of suicide risk and facilitating help-seeking and access to mental health services through improved understanding of the causes and risk factors for suicidal behaviour.

Training programs targeting gatekeepers and care providers aimed to facilitate their roles in early detection within potentially vulnerable populations and to increase preventive functions. The screening programs aimed to identify at-risk individuals in the community and direct them to treatment.

In addition, the program recommended that the local health authorities provide appropriate care for suicide survivors to support their grief work, if necessary.

intervention group was significantly lower in males (RR = 0.77, 95% CI 0.59–0.998, p = 0.0485) and the RR of suicide attempts was significantly lower in males (RR = 0.39, 95% CI 0.22–0.68, p = 0.001) and the elderly (RR = 0.35, 95% CI 0.17–0.71, p = 0.004). The intervention had no effect on the RR of the composite outcome in the highly populated areas

Completed suicide

	Number	Population
Before		
2003	136	593844
2004	154	590320
2005	108	586056
Average	133	590073
After		
2007	97	576158
2008	93	570152
2009	115	565853
Average	102	570721

Suicide attempt

	Number	Population
Before		
2003	83	593844
2004	42	590320
2005	71	586056

			<table><tr><td>Average</td><td>65</td><td>590073</td></tr><tr><td>After</td><td></td><td></td></tr><tr><td>2007</td><td>58</td><td>576158</td></tr><tr><td>2008</td><td>51</td><td>570152</td></tr><tr><td>2009</td><td>50</td><td>565853</td></tr><tr><td>Average</td><td>53</td><td>570721</td></tr></table> **Author's conclusions** Our findings suggest that this community-based multimodal intervention for suicide prevention could be implemented in rural areas, but not in highly populated areas.
Limitations identified by author There are several limitations of the present study. 1) The study was not a randomised trial. Therefore, we used a matched pair design and a model adjusted for possible confounding factors in the analysis. However, some unmeasured and residual confounders may still persist. We need to perform randomised trials confirming our insights. 2) The study participants, investigators and the reporters of events were not blind to the intervention. Although the outcomes were systematically collected from official records, the study might have some misclassification bias. 3) Adherence to the intervention was limited. The adherence would be improved by investing sufficient budgets and resources. **Limitations identified by review team** Non-randomised trial study design. Health related profiles of population in target areas were unclear, potential factors associated with suicide were not clear.			

E.1.6 Szekely et al 2013

Szekely Andras et al 2013 How to decrease suicide rates in both genders? An effectiveness study of a community-based intervention (EAAD) PloS one 8(9)			
Study details	**Research Parameters**	**Population / Intervention**	**Results**

Author/year

Szekely Andras et al 2013

Quality score

+

Study type

Quasi-experimental

Aim of the study

To evaluate the effectiveness of a regional community-based four-level suicide prevention programme on suicide rates.

Location and setting

Szolnok, Hungary

Length of study

6 years study period, 2002 to 2007

Source of funding

The European Alliance Against Depression programme was funded within the Public Health Programme of the European Commission. This study received funding from OSPI-Europe as part of the European

Number of participants

Residents in city of Szolnok, with a population of 76,881 in 2004

Participant characteristics

Of 76,881 inhabitants in 2004, 36,314 men and 40,567 women. The population was essentially stable during the intervention. The unemployment rate was 5.9% in 2004, 6.5% in 2005 and 6.0% in 2006.

Inclusion criteria

Residents in city of Szolnok

Exclusion criteria

Not reported

Intervention / Comparison

Intervention:

The 4-level intervention concept of the European Alliance Against Depression (EAAD).

Level 1: Co-operation with general practitioners. Interactive workshops using educational packages were developed and offered to GPs. To improve detection of patients with depression, GPs were encouraged to use the shortened Beck Depression Inventory in their practices. To improve treatment utilization, the collaboration between the psychiatric outpatient service and the GPs was strengthened by organizing education programs, panel and roundtable discussions, and setting up an online information centre.

Level 2: Public relations campaign. The programme started with an opening conference at the town hall for helping professionals and for media workers. 10,000 leaflets and 250 posters were disseminated in Szolnok during the intervention and two publications were released and disseminated on the subject entitled Together against Depression and Depression among children and adolescents. After the campaign kick-off, press conference, and press release there were 49 subsequent appearances in the media (including TV, radio interviews, articles in local and national newspapers). Twenty-four of these were during the three week period directly after the press conference but there were also several replays later.

Primary outcomes

Suicide mortality and population data for Hungary and Szolnok were obtained from the Hungarian Central Statistical Office.

Suicide rate per 100,000 in the city of Regensburg

	Number of suicide	Suicide rate per 100,000
2002	25	32.42
2003	21	27.35
2004	23	30.08
2005	10	13.15
2006	11	14.55
2007	9	11.96

Author's conclusion

For the duration of the programme and the follow-up year, suicide rates in Szolnok were significantly lower than the average of the previous three years (p = .0076). The suicide rate thus went down from 30.1 per 100,000 in 2004 to 13.2 in 2005 (256.1 %), 14.6 in 2006 (251.4 %) and 12.0 in 2007 (260.1 %). These results seem to provide further support for the effectiveness of the EAAD concept.

Community's Seventh Framework Program.		Level 3: Community facilitators. In view of the important role of community facilitators, educational workshops were arranged for teachers, district nurses, hotline workers, counsellors, clerics, nurses, policemen, pharmacists and others. These professionals might be influential in depressed and suicidal persons' decisions to access care. Special educational packages were developed for these community facilitators on the following topics: epidemiology, recognition and treatment of suicide risk and depression, depression and anxiety, depression in young and old individuals, the role of different helping professionals in suicide prevention, and suicide risk recognition. During the intervention, 230 community facilitators were trained. There was also close cooperation with the media to promote preventive activities. Media guidelines were handed out recommending how to report on suicides, and how not to report on them in order to avoid imitation suicides. Level 4: High risk groups and self-help. An ''emergency card'' was produced with an emergency hotline telephone number. The emergency cards were attached to the leaflets with information on facilities such as telephone emergency services, professionals, psychiatrists and relevant local charitable organisations. The leaflets with emergency cards were distributed among the patients of the local psychiatry. A local information data network was built up required for facilitating fast communication on the subject. In addition, educational materials were provided to support the local non-stop telephone emergency services. Head of this latter	

		organization was also involved in the EAAD core group. **Comparison:** The first phase of the EAAD project (2005-2006) set up the programme. Suicide rates of the years before the intervention (2002, 2003, 2004) were compared to those during and after the intervention	
Limitations identified by author The magnitudes of the effects are numerically correct, but have to be interpreted with caution in view of the small sample sizes. Also, such community-based interventions, although controlled for general trends in suicide rates in the whole population and in a control city, do not provide proof for efficacy with the same evidence level as a randomized controlled study. Besides random fluctuations, there are too many factors which are hard to control. **Limitations identified by review team** As a multi-level intervention, it is not possible to draw conclusions as to which elements of the four-level intervention might have been the most relevant to the reduction of the number of suicide			

E.1.7 Walrath et al 2015

Walrath Christine ; Garraza Lucas Godoy; Reid Hailey ; Goldston David B; McKeon Richard 2015 Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. American journal of public health 105 (5): 986-93.

Study details	Research Parameters	Population / Intervention	Results
Author/year Walrath Christine ; Garraza Lucas Godoy; Reid Hailey ; Goldston David B; McKeon Richard 2015 **Quality score** - **Study type** Quasi-experimental study **Aim of the study**	**Number of participants** 320,500 **Characteristics of population** Mean intervention group (n=479(Mean control group (n=1616) Suicide rate by age (per 100,000)	**Intervention / Comparison** **Intervention:** Garrett Lee Smith Youth Suicide Prevention. The GLS state and tribal grants stipulated that grantees promote or develop early intervention and prevention services aimed at reducing risk for suicidal behaviours. GLS grantees also have been encouraged to use funds for facilitating timely referrals of youth at risk for suicidal behaviours, and	**Primary outcomes** The main outcome of interest was the county's suicide mortality rate the year after the implementation of GLS training sessions amongst the population aged 10-24 years between 2007 and 2010. Secondary analyses focused on suicide rate by age groups 10 to 18 years and 19 to 24 years. Mortality information is collected by state registries and provided to the National Vital Statistics System, It includes cause of death and demographic descriptors indicated on death certificates.

To examine the effect of Garrett Lee Smith (GLS) program on the reduction in youth suicide mortality occurred between 2007 and 2010

Location and setting

Counties across the USA

Length of study

2007-2010

Source of funding

The study was supported through a SAMHSA contract to ICF Macro.

10-18y	4.9	4.3
19-24y	15.7	15.6
≥25y	17.4	16.5
Total population, in 1000s	208.7	111.8
Population by age, %		
10-18y	13.1	13.3
19-24y	8.8	8.3
≥25y	64.9	65.2

Inclusion criteria

All counties with a population of at least 3000 youths aged between 10 and 24 years were considered for inclusion.

Exclusion criteria

Not reported

for improving access to services for youth from varied backgrounds.

Comparison

Counties with no Garrett Lee Smith Youth Suicide Prevention programme implemented.

	Average effect of GLS training	
	Estimate (SE)	P values
Suicide rate10-24 age group		
GLS training session last year	-1.33 (0.49)	0.0160
GLAS training session ≥2y ago	0.39 (0.71)	0.5911
Suicide rate10-18 age group		
GLS training session last year	-0.73 (0.44)	0.1188
GLAS training session ≥2y ago	0.01 (0.53)	0.9865
Suicide rate19-24 age group		
GLS training session last year	-2.16 (1.27)	0.1090
GLAS training session ≥2y ago	1.17 (1.76)	0.5162
Suicide ≥25y age group		
GLS training session last year	0.62 (0.58)	0.3010
GLAS training session ≥2y ago	0.03 (0.52)	0.9684

			Author's conclusion The study observed a reduction in the rate of suicide mortality amongst youths in counties implementing GLS suicide prevention programmer compared with counties that were not targeted by GLS programmes. These results suggest the existence of an important reduction in youth suicide rate resulting from the implementation of GLS suicide prevention programme.
Limitations identified by author The study did not address related question regarding the nature of the intervention, such as specific types of training session or gatekeeper that may have been more effective and the specific components of the GLS programme beyond the training sessions that contributed to the results. An increase in early identifications and referrals of youth at risk was not directly examined or distinguished from alternative mechanisms through which other programme components may have contributed to the results. **Limitations identified by review team** The GLS was implemented between 2006 and 2009 in counties across the USA, and the year 2010 was the latest for which mortality information was available. Therefore, "true" effect of the intervention may be overestimated.			

E.2 Qualitative studies

E.2.1 Harries et al 2016

<table>
<tr><td>Full citation</td><td colspan="3">Harris Fiona M, et al. 2016. "Exploring synergistic interactions and catalysts in complex interventions: longitudinal, mixed methods case studies of an optimised multi-level suicide prevention intervention in four european countries (Ospi-Europe)". BMC public health 16:268</td></tr>
<tr><td>Study details</td><td>Research Parameters</td><td>Population / Intervention</td><td>Results</td></tr>
<tr><td>Author/year
Harris et al 2016

Quality score -

Study type
Longitudinal, mixed methods case study

Aim of the study</td><td>Inclusion criteria

Exclusion criteria

Method of analysis

A realist evaluation approach informed the process evaluation,</td><td>Participant numbers

Participant characteristics

Table 1 Data Collection
<table>
<tr><td></td><td>Interviews</td><td>Focus groups</td><td>Q's</td></tr>
<tr><td>Germany</td><td>14</td><td>4</td><td>5</td></tr>
<tr><td>Hungary</td><td>10</td><td>4</td><td>5</td></tr>
<tr><td>Ireland</td><td>13</td><td>3</td><td>5</td></tr>
<tr><td>Portugal</td><td>10</td><td>1</td><td>5</td></tr>
</table></td><td>Primary outcomes
Cross-country comparison of intervention activity
<table>
<tr><td>Intervention</td><td>Germany</td><td>Hungary</td><td>Ireland</td><td>Portugal</td></tr>
<tr><td>Media coverage of OSPI (reports newspapers, tv, online, radio</td><td>64 items/reports</td><td>13 items/reports</td><td>20 items/reports</td><td>4 items/reports</td></tr>
</table></td></tr>
</table>

Draws on the process evaluation data of a suicide prevention programme implemented in four European countries to illustrate the synergistic interactions between intervention
levels in a complex programme, and to present our method for exploring these

Location and setting
4 countries – Germany, Hungary, Ireland and Portugal

Length of study
Four waves of qualitative and quantitative data were collected at six monthly intervals (January 2010 – December 2011).

Source of funding
Not reported

which drew on mixed methods, longitudinal case studies. Data collection consisted of 47 semi-structured interviews, 12 focus groups, one workshop, field noted observations of six programme meetings and 20 questionnaires (delivered at six month intervals to each of the four intervention sites). Analysis drew on the framework approach, facilitated by the use of QSR NVivo (v10). Qualitative approach to exploring synergistic interactions (QuaSIC) also developed a matrix of hypothesised synergies that were explored within one workshop and two waves of data collection

Interviews and focus groups were conducted with professionals who had some 'stake' in suicide prevention, including health professionals (GPs, mental health nurses, psychologists, psychiatrists), community-based professionals (e.g. members of the police, social and community

Observations at implementation meetings	6 meeting field notes
Synergistic effects workshop	1 (work package leads & intervention site researchers
Total data collection	47 interviews, 12 focus groups, 6 meetings observations/field notes, 1 workshop

Intervention
OSPI-Europe has five levels of interventions targeting suicide prevention. These include training for primary care (level one) and community-based (level three) professionals; a public health campaign (level two); support for patients and families (level four) and reducing access to lethal means (level five)

Public info events (inc public launch ceremony)	46	10	2	9

Synergistic interactions
Within the public information campaign (level 2) in both Ireland and Germany there was evidence that by inviting members of the press to attend the public launch event to advertise the initiation of OSPI activities, media interest was developed at an early stage, which in turn enhanced subsequent press coverage. Field notes recorded that in Ireland, a good relationship established with journalists attending the public launch of OSPI. Initial media interest also prompted journalists to register for training in appropriate reporting of suicidal acts (Level 3, community facilitator training) and editors became more receptive to cascading media guidelines for responsible reporting. Thus the level 2 intervention (A) interacted with the level 3 intervention (B) to enhance the latter.

Feedback from the German self-help group/volunteers also illustrates evidence of a synergistic interaction between Level 4 (support for patients and families) and Level 1 (training for GP's). One member of a volunteer group recruited her GP to primary care training through her enthusiastic dissemination of OSPI activities during a consultation. Respondent: I know that my GP, to whom I always bring the self-help magazine and also the [OSPI] flyers, was very happy and open about the offer of training for GPs. Actually, she got to know about these activities from me. Researcher: Do you know if she participated in a training session? Respondent: Yes, yes, at one of the very first

Catalytic impacts from interventions
The OSPI team in Portugal found that initiating suicide prevention training and rolling out the public awareness campaign in their intervention region stimulated complimentary activities developed by professionals with a shared interest in suicide prevention. Subsequent to OSPI

	workers), mental health charities and mental health advocates. The questionnaires were designed to track progress with implementation (e.g in terms of content and intensity) in each of the four countries and were completed by one researcher at each of the four intervention sites. Interviews and focus groups were recorded, transcribed verbatim and translated (where necessary) into English. Thematic analysis was used.		suicide prevention and awareness training with health and community professionals, a local psychiatrist took the initiative to provide similar training within his hospital. In a qualitative interview, he revealed that OSPI had had the effect of putting suicide prevention 'on the radar'. Thus the additional training initiated by professionals external to the OSPI team added value to the shared goal of suicide prevention. Similarly, in Hungary the public awareness campaign (in particular the social marketing spots in local cinemas) stimulated local interest in suicide prevention, highlighted the need for more mental health infrastructure and acted as a catalyst for local action and increased investment/ resource. This led to the planned development of a new mental health drop in centre in the intervention region. In Hungary, a focus group participant revealed how involvement in OSPI activities helped improve communication between professional groups: 'the OSPI programme gave a great impetus for psychiatrists and GPs to get together. This contact has been established, and psychiatrists and GPs now talk to each other' **Author's conclusions** Identified the importance of exploring synergistic and catalytic interactions in complex, multi-level interventions using the QuaSIC approach. Synergies can occur both within and across levels as multiple activities are often required to implement different levels of activity. Either the whole programme of activity or single levels of intervention can act as a catalyst to generate unanticipated, additional effects that may also affect outputs/ outcomes. Future research should also explore potential negative synergies and how to mediate or minimise these.
Limitations identified by author The QuaSIC approach cannot provide a measure of effect, based as it is on qualitative methods Did not consider the possibility that rather than just creating synergies there may in fact be adverse consequences that arise from complex interventions that reduce their overall effectiveness Longer term follow up is required to determine what positive and/or negative synergies may arise from sustaining new programmes in a landscape where some interventions may already be in place. There are also potential impacts on other health promotion programmes, such as initiatives to promote mental health that should be considered, particularly if these are subsequently viewed as lower priorities for support. **Limitations identified by review team** Review team agree with the limitations found by the Author			

E.2.2 Slade and Forrester 2015

Full citation	**Slade K and Forrester A. 2015. "Shifting the paradigm of prison suicide prevention through enhanced multi-agency integration and cultural change". Journal of Forensic Psychiatry and Psychology 26(6):737-758.**		
Study details	**Research Parameters**	**Population / Intervention**	**Results**
Author/year Slade K and Forrester A 2015 **Quality score +** **Study type** Mixed method. A questionnaire was developed based on key changes that occurred in the prison. Seven staff members undertook semi-structured interviews to expand upon the context and implementation of changes identified as most relevant in the questionnaire. **Aim of the study** This paper seeks to fill gaps in the existing literature by evaluating how one urban local prison in London managed to prevent self-inflicted deaths(SIDs)for over three years. **Location and setting** An urban local medium secure prison **Length of study** Covers the period April2008–December 2011	**Inclusion criteria** Prison staff Staff from health, prison and psychology department who were employed during the relevant period but not actively involved in suicide prevention. **Exclusion criteria** Not applicable **Method of analysis** Thematic analysis was used as a method for identifying, analysing and reporting patterns within data. It involved transcription, thorough reading to increase familiarisations, and data reduction through coding. After these joint themes had been identified, the process of triangulation allowed information from this wide range of sources to be reviewed together to facilitate a multi-source approach to the analysis of themes.	**Participant numbers** Prison staff Staff from health, prison and psychology department who were employed during the relevant period but not actively involved in suicide prevention. **Participant characteristics** Not reported **Intervention** Stage 1: 1978-1990 No structured suicide prevention strategy or procedure Stage 2: 1991-2008 Introduction of National Suicide Prevention Strategy Stage 3: 2009-2011 Introduction of local suicide prevention strategy (multi-agency and cultural change)	**Primary outcomes** Key changes that occurred in the prison contributed to suicide reduction Dedicated safer custody team Knowledge/experience of safer custody team Changes to the induction process for prisoners A change of culture/attitude of prison towards suicide prevention Introduction of complex cases meeting Death in Custody Action plans and local investigations IDTS introduction Daily Constant Supervision review Additional safer cell on reception wing Additional prisoner workshops and workplaces Staff training on foundation ACCT process ACCT Case Manager staff training Healthcare staff training on ACCT process Weekly ACCT checks by Governor grade with feedback Weekly ACCT checks by safer custody team Improved staff confidence in Senior Management

Source of funding Not reported			The factors identified to be relevant and supportive of suicide reduction: Prison climate Screening Communication Regarding high risk prisoner Debriefing staff and learning from incidents Mental health treatment Post-intake screening Written procedures Management and leadership approach Specialist Knowledge **Author's conclusions** The results endorsed a number of factors which have already been internationally identified as best practice, along with some local innovation factors. Two further pivotal factors emerged through analysis, and they are the key to service improvements. These factors: senior management support for cultural change and cross-professional collaborative working – indicate that positive leadership and multi-agency integration are vital ingredients.
Limitations identified by author The absence of a developed literature in this area is consequent upon difficulties in evaluating a rare event in an applied setting, especially in which suicide prevent is not the main focus of business. Although it is possible that that staff employed in the study prison's suicide prevention processes had an overly positive view of the work that had been implemented, the study does demonstrate a significantly reduced suicide rate over a sustained period of time. There are inherent limitations when attempting to generalise from a small sample, or a single site and further limitations arise when attempting to infer casual mechanisms from the perceptions of staff. **Limitations identified by review team** Only 32 staff completed questionnaire and 7 undertook interviews. No perspectives from partners working with prison staff.			

E.3 Economic evidence

E.3.1 Garraza et al 2016

Bibliographic details	Intervention and Comparison	Data sources	Time horizon & Method	Results	Authors' discussion
Full citation Garraza et al 2016 **Ref Id** **Economic study type** Cost benefit **Country(ies) where the study was done** USA **Perspective & Cost Year** Perspective not stated: cost saving to the health care service Cost year is 2005-2009	**Study dates** The analytical period covered the initial implementation of the program from 2006 to 2009 (including setup costs during 2005) and the results obtained during the period from 2007 to 2010. **Intervention** Garrett Lee Smith Youth Suicide Prevention. The GLS state and tribal grants stipulated that grantees promote or develop early intervention and prevention services aimed at reducing	**Source of effectiveness data** Decrease in suicide rate following the implementation of GLS (per 1,000 youth) (Garraza et al 2015) **Source of cost data** Program Costs. Program costs included the amounts of federal funds directly spent by the 58 grantees during 2005–2009 as well as the expenditures on technical assistance Information on the amount spent by grantees was provided by SAMHSA and is based on the Annual Federal Financial Report submitted annually by each grantee. **Other data sources e.g. transition probabilities** Only a portion of the averted suicide attempts would have required medical attention,	**Time horizon and discount rate** A discount rate of 3% was used to obtain the present value of benefits and costs accrued at varying points during the period (the discount rate is closely related to the interest rate and reflects the value placed on immediate vs. delayed preference for the use of resources). **Method of eliciting health valuations (if applicable)** . **Modelling approach** A cost–benefit analysis of	**Cost of the intervention** • In total, the GLS program awarded 46 GLS state grants (in 38 states) and 12 tribal grants (in 8 tribes) estimated at $49.4 million. • The cost of technical assistance went down from 50%, 23%, and 12% in the initial 3 years to close to 9% of the federal program cost during 2008 to 2009. **Effectiveness per patient per alternative** • Of the 79,379 averted suicide attempts, an estimated 19,448 attempts would have resulted in a hospital stay, and 11,424 attempts would have required an ED visit without subsequent hospitalization. • This equates to discounted cost savings of $187.8 million from averted hospitalizations and $34.1 million from averted ED visits, or total medical cost savings of $222.1 million (95% CI: $78.7 million, $365.4 million). **Incremental cost-effectiveness** Mean ICER Probabilistic ICER (95% CI) • .	**Limitations** • The estimates of reductions in rates of attempts were not derived from randomized controlled trials. • The estimates of averted health expenditures were derived from secondary sources, rather than health cost data collected in the context of the GLS program. • The previous evaluation of the GLS program did not show a reduction in suicide attempt or suicide mortality rates extending after the first year following GLS prevention activities. **Conclusion(s)** • It has been recognized that preventing suicidal behaviour requires

Bibliographic details	Intervention and Comparison	Data sources	Time horizon & Method	Results	Authors' discussion
Source of funding Substance Abuse and Mental Health Services Administration US Department of Health and Human Services.	risk for suicidal behaviours. GLS grantees also have been encouraged to use funds for facilitating timely referrals of youth at risk for suicidal behaviours, and for improving access to services for youth from varied backgrounds. **Comparison(s)** .	and among them, only a subset would have led to hospitalization. We used data gathered by the National Survey on Drug Use and Health (NSDUH) between 2008 and 2011 among individuals aged 18 to 25 to approximate these proportions. NSDUH respondents reporting a suicide attempt in the previous 12 months were then asked whether they subsequently received medical attention from a doctor or other health professional for the attempt. Those who reported requiring medical attention were further asked whether they stayed in a hospital overnight or longer because of the attempt. During this period, 39% of the youth who attempted suicide required medical attention, and 63% of those requiring medical attention were hospitalized. The NSDUH does not provide estimates for the proportion of attempts requiring an emergency department (ED) visit but not subsequent hospitalization. We used the ratio of 0.6 ED visits not resulting in hospitalization (i.e., "treat and	the GLS program, we compared the cost savings (or benefits) to the health care system arising from averted nonfatal attempts with the total GLS program costs. GLS benefits and costs were monetized and expressed in 2010 dollars to adjust for inflation.	**Other reporting of results** Given program costs of $49.4 million, the estimated benefit–cost ratio equals $4.50 (95% CI: $1.59, $7.40). In other words, the GLS program returned $4.50 in medical cost savings for each dollar invested in its implementation (benefit-cost ratio). **Uncertainty** • The benefit–cost ratio was most sensitive to changes in the average inpatient hospitalization cost. The benefit–cost ratio ranged from $3.65 to $5.09 (for estimated hospitalization costs ranging from $8,478 to $12,611). • The benefit–cost ratio was relatively invariant to assumptions regarding the percentage of suicide attempts that required an ED visit but not hospitalization, ranging from $4.24 to $4.77 for estimated rates ranging from 9% to 14%. • Further, to reach the breakeven point; that is, where benefits equal costs, the cost of hospitalization would have had to be as low as $877 or, alternatively, the percentage of attempts requiring hospitalization as low as 2%.	sustained program intervention. • The results of this analysis suggest that such sustained investment may be paid back many times over via savings to the broader health system.

Bibliographic details	Intervention and Comparison	Data sources	Time horizon & Method	Results	Authors' discussion
		released") to each hospitalization due to self harm during 2007–2010 from the Web based Injury Statistics Query and Reporting System Nonfatal Injury Reports.			

E.3.2 Vasiliadis et al 2015

Bibliographic details	Intervention and Comparison	Data sources	Time horizon & Method	Results	Authors' discussion
Full citation Vasiliadis et al 2015 **Ref Id** **Economic study type** Modelling study. Cost-effectiveness. (authors call this a prospective value implementation study)	**Study dates** 2007 (status quo data from 2007) **Intervention** Transferring the results of the European Nuremberg Alliance against Depression (NAD) trial with the addition of 4 community-based suicide prevention strategies:	**Source of effectiveness data** Not specified **Source of cost data** • Costing of resources based on guidelines for economic evaluations*. Also interviews with key decision makers in ministry of health, social services, regional health agencies, community suicide prevention and crisis intervention programs)	**Time horizon and discount rate** • Not specified • Discounted at 3% per year **Method of eliciting health valuations (if applicable)** NA **Modelling approach** Both human capital approach (HCA) and friction cost method	**Cost per patient per alternative** • Total cost of implementing the programmes in Quebec was $23,982,293 annually • Using FCM: average cost of a death by suicide $34,572 (range $13,170 to $141,277). • Using HCA: average cost of a suicide was $593,927 (range $473,569 to $716,985). **Effectiveness per patient per alternative** • Considering effects of NAD programme, expected reduction in suicide attempts of 27% (95% CI 18% to 36%) and suicides by 16% (95% CI 11% to 25%). Potential impact of the NAD program	**Limitations** • Authors state that data came from many varied sources. Results may not be generalizable. The two models used present very different results. It is not possible to attribute portions of the results to portions of the programme, which is multicomponent. • Sources of effectiveness data

<table>
<tr>
<th>Bibliographic details</th>
<th>Intervention and Comparison</th>
<th>Data sources</th>
<th>Time horizon & Method</th>
<th>Results</th>
<th>Authors' discussion</th>
</tr>
<tr>
<td>Country(ies) where the study was done

Canada

Perspective & Cost Year

Health care system and societal perspective

Costs are in 2010 Canadian Dollars

Source of funding

Quebec Health Research Fund</td>
<td>- Training of family physicians in the detection and treatment of depression
- Population campaign aimed at increasing awareness about depression
- Training of community leaders among first responders (i.e. teachers, shelters, social workers, therapists, pharmacists, police)
- Follow-up of individuals who attempted suicide

Comparison(s)

Status quo</td>
<td>• Salary data from Statistics Canada
• Patient data from the databases from Quebec's health insurance plan (RAMQ) and ministry of health and social services (MHSS)

Costs considered included: increased costs of treatment of depression (as detection increases).

Costs of suicide considered: therapy for bereaved individuals, hospitalisation and emergency department visits; ambulatory visits' physician fees and outpatient medications. Also investigation costs, funeral costs. Indirect costs included loss of years of life, loss of productivity, short term disability related to depression, presenteeism and absenteeism.</td>
<td>(FCM) approaches were used to model cost of suicide annually, In a sensitivity analysis, these were found to greatly influence the cost of a suicide</td>
<td>
<table>
<tr><th></th><th>Status quo 2007</th><th colspan="3">Events after reduction.</th></tr>
<tr><th></th><th></th><th>Average reduction</th><th>Lower limit reduction</th><th>Higher limit reduction</th></tr>
<tr><td>Suicide attempts</td><td>6823</td><td>4981</td><td>5595</td><td>4367</td></tr>
<tr><td>Adult suicides</td><td>1069</td><td>898</td><td>951</td><td>802</td></tr>
<tr><td>Person life years lost (discounted at 3%)</td><td>21,296</td><td>17,432</td><td>19,166</td><td>16,308</td></tr>
</table>
Incremental cost-effectiveness

<u>Mean ICER</u>
Using FCM:
• ICER using FCM showed costs of $55,123 per 1 averted suicide

Using HCA and future healthcare costs:
• ICER using HCA showed cost savings of $3,979 per life year saved.

<u>Probabilistic ICER (95% CI)</u>

• Not specified

Uncertainty

FCM Sensitivity Analysis (one-way):

<table>
<tr><th></th><th>Cost per averted suicide</th></tr>
<tr><td>Main calculation</td><td>$55,123</td></tr>
</table>
</td>
<td>not specified: authors state that they used "recent data in the literature on the effectiveness of the NAD trial in Europe".

Conclusion(s)

• Cost effectiveness results depend on the model used.
• If considering HCA model, intervention programme is cost saving per life year saved (average of $3,979 per life year)
• If considering FCM model, averting one suicide incurs costs of $55,123 on average
• Sensitivity analysis (varying impact of the programme on depression treatment, on suicide attempts</td>
</tr>
</table>

<table>
<tr><th>Bibliographic details</th><th>Intervention and Comparison</th><th>Data sources</th><th>Time horizon & Method</th><th>Results</th><th>Authors' discussion</th></tr>
<tr>
<td></td>
<td></td>
<td>Other data sources e.g. transition probabilities

Patient data from the databases from Quebec's health insurance plan (RAMQ) and ministry of health and social services (MHSS)</td>
<td></td>
<td>
<table>
<tr><td>Reducing population of depression successfully treated from 7% to 1% additional</td><td>$269,564</td></tr>
<tr><td>Decreasing effects of intervention on suicide attempts to 18% and suicides to 11% (from 27% and 16%)</td><td>$161,420</td></tr>
<tr><td>Using upper limit of healthcare costs, societal costs and indirect costs of suicide (rather than average)</td><td>Savings of $2,418,264</td></tr>
<tr><td>Using lower limit of healthcare costs, societal costs and indirect costs of suicide (rather than average)</td><td>$222,643</td></tr>
</table>

HCA Sensitivity Analysis (one-way):
<table>
<tr><td></td><td>Cost per life year saved</td></tr>
<tr><td>Main calculation</td><td>Savings of $3,979</td></tr>
<tr><td>Reducing population of depression successfully treated from 7% to 1% additional</td><td>$5,513</td></tr>
<tr><td>Decreasing effects of intervention on suicide attempts to 18% and suicides to 11% (from 27% and 16%)</td><td>$1,522</td></tr>
</table>
</td>
<td>and suicides, and using lower and upper limits of costs) create significant variations in results.</td>
</tr>
</table>

Bibliographic details	Intervention and Comparison	Data sources	Time horizon & Method	Results	Authors' discussion
				Using upper limit of healthcare costs, societal costs and indirect costs of suicide (rather than average): Savings of $146,216 Using lower limit of healthcare costs, societal costs and indirect costs of suicide (rather than average): $4,120	

Appendix F: GRADE tables

F.1 Suicide rate

Quality assessment							Suicide rate per 100,000		Effect		Committee confidence
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	After	Before	Relative risk ratio (RR) (95% CI)	Absolute difference in rates	
Multi-component interventions (5 studies)											
1 (Knox et al 2010/2003)	Experimental	Serious[1]	No serious	No serious[2]	No serious[3]	Air Force Suicide Prevention Programme (AFSPP)	9.7 (33/341,497)	13.3 (60/452458)	0.76 (0.65, 0.90)	3.6 fewer per 100,000	MODERATE

						(population = active duty force soldiers					
1 (Ono et al 2013)						Multimodal community intervention programme- (study population=residents in the areas where interventions were implemented)	17.9 (102/570721)	22.5 (133/590073)		4.6 fewer per 100,000	
3 (Hergerl 2010, Hubner 2010, Szekely 2013)						Alliance against depression (residence in study population)	16.3 (117/719133)	21.7 (155/715186)		5.4 fewer per 100,000	

1. Confounding factor (there was the activation of US air force for warfare (Afghanistan and Iraq); accuracy data reporting/recording;
2. Interventions, population and outcomes are in line with review protocol, but the effective of individual component of the intervention was not unknown.
3. 95% CI of RR around point estimate does not cross line of no effect which the committee agreed should be the minimal important difference

Quality assessment							Suicide rate per 100,000		Effect		Committee confidence
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**	**Relative risk ratio (RR) (95% CI)**	**Mean difference (95%CI)**	

Garret Lee Smith Memorial suicide prevention Programme (GLS)-(population = residents in counties where the programme implemented across USA), population= aged 10-24 years											
1 (Walrath et al 2015)	Experimental	Serious[1]	N/A	No serious[2]	No serious[3]	none	Not reported (NR)	NR	-	1.33 fewer per 100,000 from 0 to 2 fewer)	MODERATE

1. Difference between exposed and controlled areas may affect estimated effect
2. Interventions, population and outcomes are in line with review protocol
3. 95% CI of MD around point estimate does not crossing line of no effect which the committee agreed should be the minimal important difference

F.2 Suicide attempts

Quality assessment							Number of event/participants		Effect		Committee confidence
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**	**Relative risk ratio (RR) (95% CI)**	**Absolute/mean differences (95%CI)**	
Garret Lee Smith Memorial suicide prevention Programme (GLS)-(population = residents in counties where the programme implemented across USA), population= aged 10-24 years											
1 (Garraza et al 2015)	Experimental	Serious[1]	NA	No serious[2]	No serious[3]	none	Not reported	Not reported	-	4.9 fewer per 1000 (-8.0 to -1.8)	VERY LOW

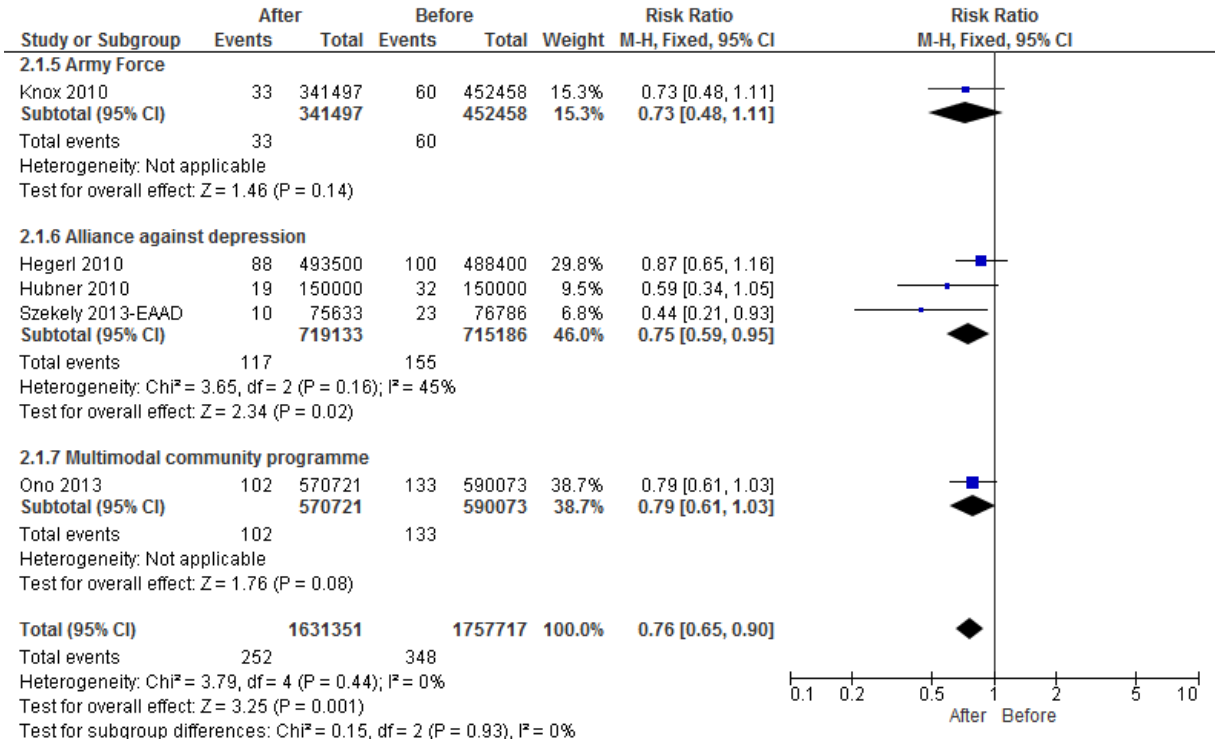
1. Self-reported suicide attempts and Difference between exposed and controlled areas may affect estimated effect
2. Interventions, population and outcomes are in line with review protocol
3. 95% CI of estimated effect around point estimate does not cross line of no effect which the committee agreed should be the minimal important difference

Quality assessment							Number of event/participants		Effect		Committee confidence
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**After**	**Before**	**Relative risk ratio (RR) (95% CI)**	**Absolute/mean differences**	
Multimodal community intervention programme-(study population=residents in the areas where interventions were implemented)											
1 (Ono et al 2013)	Quasi-experimental	Serious[1]	NA	No serious[2]	Serious[3]	none	9.3 (53/570721)	11.0 (65/590073	0.84 (0.59, 1.21)	1.7 fewer per 100.000	VERY LOW

1. Accuracy of data reporting and recording
2. Interventions, population and outcomes are in line with review protocol
3. 95% CI of estimated effect around point estimate crosses line of no effect which the committee agreed should be the minimal important difference

Appendix G: Forest plot

Suicide rate



Appendix H: Expert testimony

Expert testimony to inform NICE guideline development

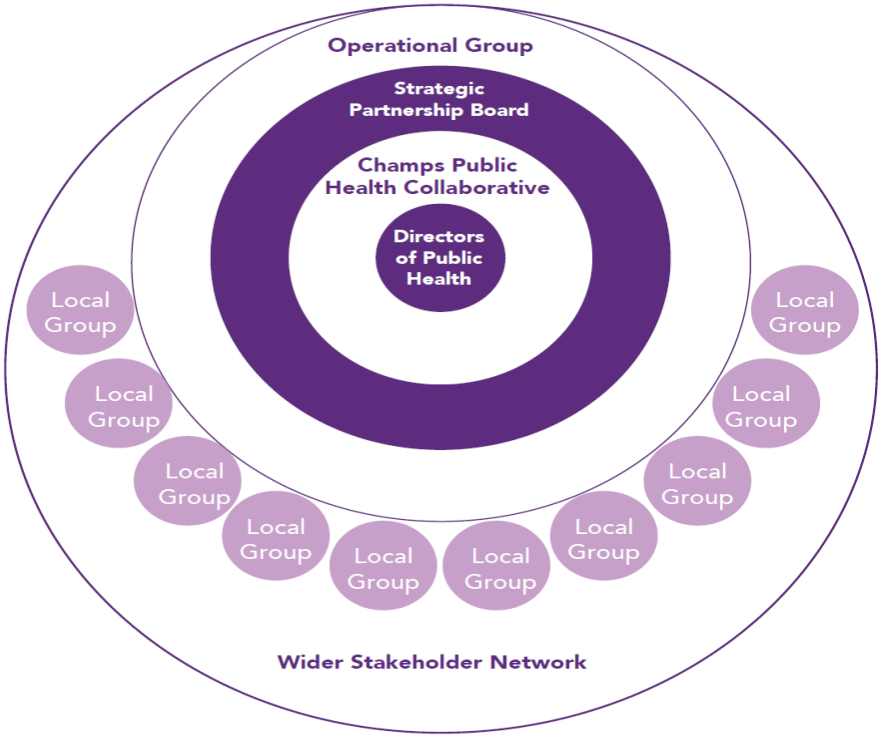
Section A:	
Name:	Pat Nicholl
Role:	Mental Wellbeing Lead
Institution/Organisation (where applicable): **Contact information:**	Champs Public Health Collaborative Champs Support Team (hosted by Wirral Council) Suite 2.2, Marwood, Riverside Park, Southwood Road, Bromborough, Wirral CH62 3QX
Guideline title:	Preventing suicide in community and custodial settings
Guideline Committee:	PHAC A
Subject of expert testimony:	Multi-agency partnerships
Evidence gaps or uncertainties:	Are local multi-agency partnerships effective and cost-effective at preventing suicide? To ensure approaches are effective at preventing suicide: • Which agencies need to be involved? • What skills, mix and experience of team members is needed? • Which stakeholders need to be involved? • At what points do key partners need to be involved?

Section B:

Summary testimony:

The Cheshire Merseyside sub-region is working to prevent suicides through the adoption and implementation of NO MORE, A Zero Suicide Strategy for Cheshire Merseyside 2015-2020 www.no-more.co.uk . A multi-sectoral NO MORE Partnership Board drives the strategic direction and provides leadership for the Cheshire Merseyside Suicide Prevention Network; the Operational Group, Local Groups and the wider stakeholder network. The Operational Group acts collaboratively to implement the Action Plan, optimising joint and shared action by the nine local groups situated within each Local Government Authority.(1) See Appendix for Membership & TOR. The Local Groups have partners, stakeholders and people with lived experience on their local suicide prevention group, reflecting the varied nature of the communities across Cheshire Merseyside. The Local Suicide Prevention Groups deliver the NO MORE Action Plan as well as plans tailored to their own population.

Structure of the Cheshire Merseyside Suicide Prevention Network



Evolution of the Network

• 2000 -08	Limited localised suicide audits and actions
• 2008-14	Public Mental Health Leads, champions & CALM co-ordinator work jointly and form a network
• 2014-15	Leadership and governance through Directors of PH supported by Champs Public Health Collaborative
• 2015	Network Structure established
• 2015	Launch of the NO MORE Strategy & Action Plan
• 2016-17	Action Plan implementation Board membership reviewed and refreshed

The Champs Public Health Collaborative was established by the Cheshire Merseyside Directors of Public Health in 2003 and the Champs ethos underpins a multi-sectoral approach for preventing suicide across the Cheshire Merseyside sub-regional footprint.

- Improving health and wellbeing outcomes in Cheshire Merseyside by collective strategic action
- Enabling and delivering strong public health system leadership and collective working
- Promoting effective and innovative public health interventions and the use of evidence-base
- Facilitating shared learning, expertise, knowledge transfer and peer support
- Collectively commissioning cost-effective sub-regional public health programmes and interventions

The success of the CMSPN stems from the collaborative ethos and 'systems leadership'(2) that has cultivated the following:

- Leadership and a whole system approach
- Dedicated local practitioners
- Network co-ordinator
- Inspirational speakers, CPD events and raising the profile
- Champions across and within organisations
- Clear strategy and framework for action

Relationships and networks are crucial to the implementation and sustainability of the NO MORE Strategy. The Leadership of the CMSPN Board has enabled the strategic profile to be raised at the sub-regional level, including with local government Chief Executives and councillors and the sub-regional planning for the NHS, the Cheshire & Merseyside Sustainability and Transformation Plans.

The national reputation and recognition for the CMSPN provides an exchange of practical implementation and learning that is beneficial; keeping sub-regional action planning updated and relevant, such as the increased focus on self-harm in the National Strategy.

Bringing together Board members from across the NHS, the Strategic Clinical Network, mental health and acute trusts, and primary care, has encouraged a focus on safe care and the patient journey across health care and geographical boundaries.

The 'Blue Light' services (ambulance, police, fire), along with transport (Network Rail, Highways) allow for best practice to be implemented with those in crisis and provide vital intelligence.

The local voluntary and charity sector reflect the concerns of those bereaved and with lived experience and ensure that their concerns and views are kept central to the Networks endeavours.

Why suicide prevention fits to the sub-region of Cheshire Merseyside:

- Economies of scale; efficiency and effectiveness
  Suicide rates and numbers for each LA may not be considered sufficient for local commissioning and allocation of resources, however joint planning and funding makes more actions possible
- Geographical footprint and shared boundaries for a population of 2.5 million
  - 1 Sustainability and Transformation Plan
  - 20 NHS Provider Trusts
  - 5 MH Crisis Care Concordats
  - 9 Local Authorities
  - 2 Police, coroners, fire service
  - 1 Merseyrail / National Rail Network

Implementation shared across the sub-regional footprint

Joint actions to implement the NO MORE Action plan adopt a 'sector-led improvement' (SLI) approach (3), based on a culture of collaborative working, sharing good practice, constructive peer support, challenge and learning. The following outputs have benefitted from the SLI approach: Intelligence, Suicide Prevention Awareness, Mental Health Promotion, Training, and Suicide Bereavement. Plans are in place for SLI on Healthcare and Evaluation. Where joint commissioning takes place a minimum of 5 of the 9 areas need to agree on the commission and funding.

Examples of C&M Joint Action to prevent suicides

1. Intelligence C&M Joint Standardised Suicide Audit
   SLI approach: Baseline of local audits, joint audit conducted 2014-challenge with differing data capture, timelines. Shared practice improved in 2015, however some discrepancies remained. SLI Workshop May 2015- agreed systematic approach resulting in Champs Audit Practice Guidance October 2016 (4): this resource is especially beneficial to new staff.
2. Bereavement Support AMPARO Commissioning (5)
   AMPARO Suicide Liaison Service has been jointly commissioned across 8 of the 9 LAs. This jointly commissioned service provides practical support to those bereaved by suicide 7 days a week.

The outcomes are a reduction in number of deaths by suicide and attempted suicides measured by the

- Alleviation of the distress of those bereaved or affected by suicide
- Reduction in the risk of imitative suicidal behaviour
- Reduction of suicide clusters
- Reduction of the economic costs of suicide

3. Training

CMSPN have established a three-tier suicide prevention training framework (6) for implementation across the nine local authorities in Cheshire and Merseyside. An overarching aims of establishing a framework is to ensure a consistent approach was taken across the sub-region. The C&M Framework followed a Rapid Literature Review on Suicide Prevention Training (7).

The key elements of the framework are:

(i) Community Gatekeeper suicide prevention training, aimed at those in contact with identified vulnerable groups

(ii) Primary Care suicide prevention training aimed at whole practices and being rolled out across 12 CCGs (8)

(iii) Mental Health Practitioner/specialist training utilising ASIST/STORM/Connecting with People and Mersey Care in-house training

In addition, the CMSPN is currently collaborating with Public Health England (PHE) in the development of a public-facing e-learning module. The module, funded by Health Education England (HEE), is intended to raise awareness about the issue of suicide and stimulate a general conversation about mental health and wellbeing within the public domain.

The NO MORE Strategy and action plan is being refreshed for a re-launch in September 2017, World Suicide Prevention Day. NW PHE is currently reviewing the monitoring and measurements of the action plan and are planning an overarching evaluation of the strategy.

References to other work or publications to support your testimony' (if applicable):

1 CMSPN Board Membership & TOR

SRN Partnership TOR March 2017

2 Systems Leadership http://www.leadershipacademy.nhs.uk/about/systems-leadership

3 Sector Led Improvement http://www.local.gov.uk/sector-led-improvement

4 Champs Audit Practice Guidance October 2016

C&M Suicide Audit Guidance

C&M Joint Suicide Audit Report 2015

C&M Suicide Audit Summary 2015

5 AMPARO Annual Report

AMPARO Annual Report Summary

6 C&M Suicide Prevention Framework

Suicide Prevention Training Framework

7 LPHO Rapid Review of Suicide Prevention Training
https://www.liverpool.ac.uk/media/.../lpho/LPHO,Suicide,Prevention,Training,Final.p

8 Mental Health Promotion and Prevention: The Economic Case DH/LSE 2011
http://www.lse.ac.uk/businessAndConsultancy/LSEEnterprise/pdf/PSSRUfeb2011.pdf