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# Saving Lives: A Systematic Review on the Efficacy of Theory-Informed Suicide Prevention Programs

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## Abstract

Suicide is a global epidemic. This review assessed the scope and effectiveness of suicide prevention programs. Systematic literature searches were conducted using PsycINFO, ERIC and MEDLINE to retrieve articles published between January 2007 and March 2017 and fulfilled inclusion criteria (studies evaluating the efficacy of theory/model-informed suicide prevention programs in increasing participant knowledge or skills when presented with a *peer* at risk of suicide). The review is informed by PRISMA guidelines. Of 1398 studies identified, 25 were reviewed and most: targeted professionals; were 1–4-day workshops; were underpinned by 21 different theories; taught less detail to the community than professionals; and improved target outcomes. Current programs, although effective, are limited by their inaccessibility, narrow content for the community and substantial variability in theory base. Future suicide prevention programs will benefit from being informed by a more specific theory, delivered through technology, targeting more of the community and improving methodological rigour.

**Keywords** Community awareness · Suicide prevention · Theory/model-informed education · Technology

## Introduction

One person dies by suicide every 40 s around the world (World Health Organisation, 2019c). Suicide has reached global epidemic proportions and is a leading cause of death in many countries (Jones & Cipriani, 2016; World Health Organisation, 2019b). Contemporary research suggests a nine-level system is necessary to reduce suicide including: reducing access to lethal means, responsible media reporting, community awareness programs (e.g., training workshops, flyers, media awareness campaigns), gatekeeper training, school-based suicide prevention programs, training of general practitioners (GPs), training of frontline staff, effective psychotherapy and follow-up for individuals with a recent suicide attempt (Hegerl & Wittenburg, 2015; Hickie et al., 2014; Krysinska et al., 2015; Werner-Seidler et al., 2016). Despite public health efforts in each of these areas, significant headway in reducing suicide rates seems lacking.

Although the whole system described above is important, it seems that close family and friends have an especially pivotal role to play (pertaining to the community awareness domain in the nine-level system). This is because research has identified that persons at risk are significantly more likely to communicate their suicide risk to family and friends (occurring for 70–90% of individuals who die by suicide) than professionals (occurring for only 20–30% of individuals) (Bloch, 1987; Britton et al., 2008; Cimini et al., 2014; Joffe, 2008; Kalafat et al., 1993; Klimes-Dougan, Klingbeil, & Meller, 2013; LaFromboise & Lewis, 2008; Schmidt et al., 2015; Simpson, Franke, & Gillett, 2007). These warning signs can be behavioral (e.g., withdrawal, preparing a will), verbal (e.g., saying 'I can't do this anymore') and/or situational (e.g., recent relationship break-up, recent shame/embarrassment) (King et al., 2008). Those at risk, are said to lack help-seeking behavior due to high self-reliance, lack of perceived need for treatment, and stigmatizing attitudes toward suicide, mental health issues, and seeking professional help (Han, Batterham, Calear, & Randall, 2018). Those at risk are instead much more likely to access informal forms of support through family and friends than more

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formal forms of support from professionals (Cimini et al., 2014; Kalafat et al., 1993; LaFromboise & Lewis, 2008; Schmidt et al., 2015). Current literature suggests the community awareness component of suicide prevention is lacking in focus and progress, despite its apparent importance identified above (Cimini et al., 2014; Harned et al., 2016).

Although the community is vital in suicide prevention, many studies have identified the general public to be ill-prepared and inactive in responding to suicide risk (Rudd et al., 2013). The Bystander Effect has been found in scenarios of suicide risk over many decades. The Bystander Effect, a well-founded social psychological phenomenon, refers to the inaction of bystanders in a situation where help is required due to fear, incompetence and diffusion of responsibility (Latané & Darley, 1970). Bloch (1987) stated that almost 80% of persons who kill themselves give definite verbal or behavioral warning signs before taking their lives but most who hear these threats or see such behavior do not take them seriously and fail to intervene. Furthermore, Jorm et al. (2005) found approximately 30–50% of participants presented with a vignette involving suicidal thoughts lacked appropriate intervention skills (e.g., seeking professional help, asking about intentions of acting on thoughts, etc.). In addition, Klimes-Dougan et al. (2013) stated approximately 75% of adolescents reported keeping the intentions of suicidal peers secret. Finally, Rudd et al. (2013), found participants were unlikely to seek emergency support when presented with a vignette of someone voicing specific suicidal thoughts with intent to die. As outlined above, the Bystander Effect is well established in scenarios of suicide risk, where inaction by most is evident.

It is important to identify gaps in community education programs (e.g., flyers, workshops) which might explain part of the apparent slow progress in suicide prevention. The above literature review summarizes that contemporary research suggests a nine-level approach and that the community domain of that system is particularly important due to the majority of those at risk not accessing professional support. This high level of importance of the community justifies a review of the literature of whether the community are being focused on adequately in suicide prevention education and research. Various systematic reviews have already assessed the efficacy of different parts the nine-level suicide prevention system [see Mann et al. (2005), Isaac et al. (2009), Clifford et al. (2013), Cusimano and Sameem (2011), Harlow and Clough (2014), Katz et al. (2013), Zalsman et al. (2016)]. None of these have investigated which theories or models are informing their design and delivery. Despite many reviews, interventions still appear to be less than effective given a recent statement by the World Health Organization that if current suicide prevention efforts continue, reduction goals will not be met (World Health Organisation, 2019a). There has been a dearth in innovative suggestions being put forward to improve community programs. The objective of this review is to explore who current suicide prevention programs are targeting (to see if a strong consideration of the public is apparent), what theories and models are informing training programs (to see if a strong consideration of the Bystander Effect is present), what modalities are being used to deliver training (to see if a strong consideration of accessible modes of delivery is occurring) and the efficacy of programs (to enquire if they are working). This review aims to compare these outcomes to the evidence and theory base of suicide prevention education requirements and suggest innovative ways to improve interventions to be more in line with the above identified important needs.

## Method

This review is informed by PRISMA guidelines.

### Eligibility Criteria

#### Inclusion

The first inclusion criterion of this review was that the study had to target a third-party/peer to a person at risk of suicide (professionals and the general public, i.e., not persons at risk themselves). This is because the review was interested in what theories are informing suicide prevention programs specifically for the community and professionals to assess whether they are set up to be able to actually initiate helping behavior. The second criterion was that the program delivery, content and/or evaluation had to be informed by a theory or model (study mentions theory/model in design). Thirdly, the study had to be evaluating change(s) in participants' (e.g., knowledge, awareness, confidence, skill, behavior) and be published in the English language. Finally, studies had to be peer-reviewed and published between January 2007 and March 2017 (previous decade at the time of conducting the review). The previous decade was focused on for recent information only, to assess why current efforts are not seeing significant changes in suicide rates. Studies could be of any design.

#### Exclusion

Studies were excluded if they: (1) targeted persons specifically thinking of suicide themselves, (2) were not informed by a theory or model, (3) evaluated changes in help-seeking behavior of suicidal persons or changes in suicide death or attempt rates only, (4) based on non-primary research (review, editorial, comment).

### Information Sources

PsychINFO, ERIC and Medline databases were searched for papers.

### Search Strategy

The key search terms comprised (Suicide Prevention) AND (program* OR strateg* OR training OR education OR intervention) AND (outcome OR success OR efficac* OR effective* OR evaluat*) NOT (review OR editorial OR comment*).

### Study Selection

All papers returned from the search were screened for eligibility according to inclusion and exclusion criteria by the first author in April–May 2017.

### Data Collection Process & Items

All data were extracted from papers by the first author using a data extraction form including the following data items: study design, number and type of participants, location, measures, control groups, type of suicide prevention program, program modality and length, underlying theory or model, content focus, outcome variable/s, outcome and outcome at follow-up.

### Risk of Bias

Each study was assessed for methodological quality and potential weakness and bias using criteria informed by Barker et al. (2016) and Sterne et al. (2019). The 12 items used for the quality assessment of studies included pre- and post-assessment of outcomes, randomization of participants, follow-up data, control groups, validated measures, sample size calculations, similarity in baseline data, blinding assessors to conditions, reporting confidence intervals, reporting effect sizes, standardized interventions and more than self-report measures. Methodological quality based on this scoring system was considered in the interpretation of results.

## Summary Measures

The current review aimed to assess whether current suicide prevention programs are in line with the identified needs in the literature for suicide prevention efforts to be effective. Based on the literature review, these needs include: (1) a strong focus on the public as they are most likely to be communicated to about someone's suicide risk, (2) a consideration of the Bystander Effect on helping behavior, (3) the use of technology to ensure that interventions are accessible to as many people as possible. Core summary measures to capture these needs include exploring effect sizes of outcomes, proportion of studies targeting the public, theories informing content and delivery of programs and delivery modality of material.

### Synthesis of Results

Table 1 summarizes the suicide prevention programs included in this review. The results section below presents the findings of this table.

### Declarations

There are no known conflicts of interest to report. All authors certify responsibility for the manuscript. The research was supported in kind by the university.

## Results

### Study Selection

Figure 1 shows a PRISMA flowchart (http://www.prisma-statement.org/) outlining the article selection process. A search of three databases found 1753 papers which were screened for eligibility; 1097 were excluded based on titles, 355 duplicates were removed, 211 were excluded based on abstracts and 3 studies were unavailable. After screening, 87 full articles were assessed for eligibility after which 62 were excluded according to inclusion/exclusion criteria, leaving 25 papers. The attributes of each of these 25 papers are summarized in Table 1, and described in more detail below.

### Population

The majority of the studies targeted 'gatekeepers' ($n=21$), comprising both clinical and non-clinical professionals. In this review, 17 studies included clinical professionals (e.g., general practitioners, mental health clinicians) and 21 included non-clinical professionals (e.g., teaching and administrative staff, police officers). Two studies targeted the general community (studies 5 and 13 in Table 1), six targeted school and university students (studies 1, 6, 7, 15, 22, 25 in Table 1), and one targeted family of persons at risk of suicide (study 5, Table 1). Some studies included multiple target groups. The 25 studies included both males and females, totaling 10, 872 participants.

**Table 1** Characteristics of studies included in the systematic review

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Strunk et al. (2014) | RCT, between-groups repeated-measures 2×2 | 1547 USA | High school students | Self-report questionnaire | Waitlist | *Surviving the Teens*® 4×50-min sessions F2F Program educator | Social Cognitive Theory | Risk factors, how to recognise signs, how to act | Knowledge, attitudes, confidence, behavioral intentions | + $\eta^2$: .004-.075 (small-medium) | None |
| 2 | Matthieu and Hensley (2013) | Within-groups repeated-measures 1×2 | 50 USA | Professionals in substance abuse treatment facility | Self-report questionnaires | None | *QPR* 3 sessions F2F Doctoral level Social Worker | Active Learning Theory | How to intervene, self-efficacy, declarative knowledge | Perceived self-efficacy | + ES: 1.18 (large) | None |
| 3 | Clark et al. (2010) | Within-groups repeated-measures 1×2 | 365 USA | Community- & school-based staff | Self-report questionnaires | None | Samaritans of New York's Public Education Suicide Awareness and Prevention training F2F 3 h | Samaritan's Befriending Model, Samaritan's Communication Model | Overview of model, statistics, myths, stigma, warning signs, intervention and risk assessment techniques, active listening, suicide prevention plan | Self-efficacy | + ES: .6 (medium) | None |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | de Beurs et al. (2015) | RCT<br>2×2 | 303<br>Nether-lands | Mental health profession-als | Self-report response to online videos | IAU control | Dutch Multi-disciplinary Suicide Prevention Guideline<br>1 h online module<br>1 day F2F<br>Mental health profession-als | Stress Vulner-ability and Entrapment Model, Train-the-Trainer Model, Adult Learning Theory, Diffusion of Innovation Theory | Not clear | Knowledge, confidence, recognising appropriate response to suicidal behavior | Did not report | 3-month follow-up:<br>+<br>ES: .4–1.0 (small-large) |
| 5 | Sun et al. (2014) | RCT, between-groups repeated-measures<br>2×2 | 74<br>Taiwan | Family of people with suicide ideation | Self-report question-naires | Control group received normal suicide care support | Suicide Care Education Interven-tion<br>F2F<br>2 h | Suicide Care Theory | Not clear | Ability to care, stress levels, attitudes towards attempted suicide | Stress: 0<br>Other: +<br>ES: not reported | None |
| 6 | Wyman et al. (2010) | RCT, between-groups repeated-measures,<br>2×2 | 3128<br>USA | Peer leaders and school students | Self-report question-naire | Waitlist | *Sources of Strength.*<br>F2F<br>4–6 h | Diffusion of Innovations Theory | Protective factors, skills for increasing protective factors | Connected-ness to adults, school engage-ment, likelihood to refer, perceptions of support, acceptabil-ity of help-seeking | +<br>ES: .21-.75 (small-medium) | None |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Cimini et al. (2014) | Case study | 335 USA | University staff, students | Self-report questionnaires | None | Gate-keeper training program F2F 1.5 h | Gatekeeper Surveillance, Gatekeeper Communication Models | Risk factors, resources for assistance, options for intervention, practice in delivering interventions | Knowledge, comfort | + ES: not reported | 3-month follow-up: 0 |
| 8 | Matthieu et al. (2009) | Within-group repeated-measures, 1×3 | 71 USA | Employees of the Veterans Health Administration | Self-report questionnaire | None | *QPR* F2F 3 sessions Doctoral level Social Worker | Active Learning Theory | Not clear | Knowledge, self-efficacy | + ES: .5-.6 (medium) | 1-year follow up: Self-efficacy = + ES = .3-.5 (small-medium). Knowledge = 0 |
| 9 | Conner et al. (2013) | Within-group repeated-measures 1×3 | 273 USA | Substance use disorders treatment providers | Self-report questionnaire | None | Suicide prevention training video 2 h | Social Learning Theory | Not clear | Self-efficacy, knowledge, frequency of prevention behaviors | + ES: .35-.77 (small-medium) | 2-month follow-up: + ES: .35-.77 (small-medium) |
| 10 | Keller et al. (2009) | Within-group repeated-measures 1×3 | 416 USA | Child welfare, juvenile justice, health, and education system employees | Self-report questionnaire | None | *QPR* F2F 3 h | Early Detection and Referral Model | Not clear | Knowledge, self-efficacy, attitudes | + ES: .5–1.54 (medium-large) | 6-month follow-up: + ES: .7-.83 (medium-large) |
| 11 | Chan et al. (2008) | Qualitative | 54 Hong Kong | Nurses | Focus groups | None | Education program on suicide prevention and management F2F 18 h | The Stress-Vulnerability Model Care Model | Not clear | Attitude, confidence, professional skills | + ES: not reported | None |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Walsh et al. (2013) | Within-group repeated-measures 1×2 | 237 USA | High school staff | Self-report questionnaires | None | Suicide education session F2F 1.5 h | Systems Level Change Theory | Not clear | Knowledge, confidence, competence | + ES: not reported | None |
| 13 | Robinson et al. (2014) | Mixed quantitative and qualitative | 168 Scotland | General public | Self-report surveys, focus groups, interviews | None | Public awareness campaign – *Choose Life* | Theory of Behavior Change | Crisis service numbers, challenging stigma | Suicide awareness, attitudes, behavior | + ES: not reported | None |
| 14 | Chagnon, Houle, Marcoux, and Renaud (2007) | RCT, between-groups repeated-measures 2×3 | 71 Canada | Youth workers | Self-report questionnaire | No intervention | Suicide Action Montreal F2F 3 days Senior staff from the suicide prevention centre | Competency-Based In-service Training Model | Risk and protective factors, distress cues, signs of mental disorder. persons to contact for referrals, crisis intervention skills | Knowledge, attitudes, intervention skills | + ES: not reported | 6-month follow-up: + ES: not reported |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Bean and Baber (2011) | Within-group repeated-measures 1×2 | 852 USA | Police officers, first responders, primary care providers, educators, guidance counsellors, social service workers, mental health care providers and high school students | Self-report questionnaire | None | *Connect* F2F 3 h | Ecological Model | Knowledge, attitudes, beliefs | Knowledge, attitudes, belief in the usefulness of mental health care, stigma associated with help-seeking | + ES: 1.23–1.93 (large) | None |
| 16 | Jacobson et al. (2012) | Within-group repeated-measure, 1×3 | 452 USA | Clinicians | Self-report questionnaire | None | *Recognising and Responding to Suicide Risk* F2F 2 days | Early Detection and Referral Model | Confidence, assessing and formulating suicide risk, developing suicide prevention treatment plans | Attitudes, confidence | + ES: not reported | 4-month follow-up: + ES: not reported |
| 17 | Cross et al. (2011) | RCT, between-groups repeated-measures 2×3 | 147 USA | School staff and parents | Self-report questionnaire, observation | Gatekeeper training AU (without behavioral rehearsal) | *QPR* F2F 1 h 2 certified QPR trainers | Adult learning Theory | Epidemiology of suicide, statistics, myths, warning signs, gatekeeper skills | Knowledge, attitudes, spread of gatekeeper training information to others, observed gatekeeper skill | + ES: .3–2.7 (small-large) | 0 |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | LaFromboise and Lewis (2008) | Within-groups repeated-measures 1×2 | 602 USA | Counselling staff from Department of Veterans Affairs | Self-report questionnaire | None | *QPR* F2F 3 sessions Doctoral level Social Worker | Culturally-Informed Model | Epidemiology of suicide, statistics, myths, warning signs, gatekeeper skills | Knowledge, self-efficacy | + ES: not reported | None |
| 19 | Reis and Cornell (2008) | Between-groups repeated-measures 2×2 | 410 USA | Counsellors and teachers | Self-report questionnaire | No QPR training | *QPR* F2F 1.5 h | Chain of Survival Model | Not clear | Knowledge, prevention practices | Not reported | 4-month follow-up: + ES: not reported |
| 20 | Wyman et al. (2008) | RCT between-groups repeated-measures 2×2 | 249 USA | Secondary School Staff | Self-report questionnaire | Waitlist control | *QPR* F2F 1.5 h | The Surveillance Model, Gatekeeper Communication Model | Rates of youth suicide, warning signs, risk factors, assessment skills, referring a student for help | Knowledge, efficacy, service access | Not reported | 1-year follow-up: + ES: .41–1.22 (small-large) |
| 21 | Cross et al. (2007) | Within-groups repeated-measures 1×2 | 76 USA | Non-clinical employees in a university hospital workplace | Self-report questionnaire, observation in role plays | None | Community gatekeeper training F2F 1 h | Active Learning Theory, Diffusion of Innovations Theory, Interpersonal-Psychological Theory | Not clear | Knowledge, attitudes, self-efficacy, demonstration of skills | + ES: not reported | None |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | Baber and Bean (2009) | Pre and post within-groups | 288<br>USA | Police officers, first responders, primary care providers, educators, guidance counsellors, social service workers, mental health care providers, school custodians, bus drivers, school students | Self-report questionnaire | None | Community training sessions<br>F2F<br>3 h | Ecological Risk/Protective Model | Not clear | Knowledge, belief in the usefulness of mental health care, preparedness to help, sense of responsibility to help, likelihood to seek help | +<br>ES: 1.1–1.8 (large) | None |
| 23 | Gask et al. (2008) | Within-groups repeated-measures<br>1×3 | 203<br>England | Council and voluntary organisation staff, GPs, social workers, nurses, occupational therapists | Self-report questionnaire, telephone interview | None | *STORM*<br>F2F<br>12 trained facilitators | Adult Learning Theory, Bandura's Social Learning Theory | Not clear | Attitudes, confidence | +<br>ES: not reported | +<br>ES: not reported |
| 24 | Chan et al. (2009) | Between- and within-groups repeated-measures | 110<br>Hong Kong | Registered nurses | Self-report questionnaire | Yes | Education program on suicide prevention<br>F2F<br>8.5 h | Stress-Vulnerability Model | Not clear | Suicide knowledge, opinion, acceptability, management | 0 | None |

**Table 1** (continued)

| No | Author | Design | N & location | Population/s | Measures | Control | Suicide prevention program type, length & providers (if known) | Theory/model | Content | Outcome variable | Outcome immediately post-intervention | Outcome at follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | Silk et al. (2017) | Quasi-experiment with a control condition | 391 USA | University students | Focus groups, surveys | Control neighbourhood conditions | Peer and celebrity sources: table toppers, posters, e-mails, digital sign | The Social Norms Approach | Peer and celebrity sources to promoting help-seeking | Perception of help-seeking, intention of helping | + ES: not reported | None |

$\eta^2$ partial eta squared, *ES* effect size (Cohen's d), *RCT* randomised control trial, *USA* United States of America, *F2F* face-to-face, *QPR* Question, Persuade, Refer, *IAU* Implementation as Usual, + significant effect found, *0* no significant effect found

## Mode

The majority of studies ($n = 22$) comprised face-to-face lecture/workshop-based programs ranging between 1 to 3-h and 2 to 4-days. One delivered their program via e-learning modules (study 4, Table 1), although this study also included a 1-day workshop. Two studies used printed media (e.g., posters and leaflets) (study 13 and 25, Table 1).

## Theoretical Frameworks

Across the 25 studies in this review, 21 different theories and models were identified. Table 2 summarizes these theories which include theories about learning, behavior change and knowledge of pathology. The learning theories highlight how people learn new information best, for example, through observation and active role plays. Behavior change theories suggest confidence, competence and reduced stigma should be a focus. Theories about pathology suggest awareness of risk factors and warning signs is important to lead to early recognition and action. Some studies employed more than one theory. The most common theories used were: (1) Diffusion of Innovation Theory (studies 4, 6, 21), (2) Active Learning Theory (studies 2, 8, 21) and (3) Adult Learning Theory (studies 4, 17, 23).

## Training Content

The training content for each study was explored. A theme which emerged was a difference in the level of detail between training for the public, school and university students, non-clinical professionals and clinical professionals (see 'Population' section above for studies pertaining to each group). Training for the public included the least detail. Their training mainly focused on changing attitudes toward suicide, reducing stigma towards suicide and raising awareness of crisis service numbers. Their training lacked any in-depth teaching of how to detect someone at risk and how to intervene if someone they know is at risk. This is concerning given most people at risk communicate their distress to peers, not professionals. Training for high school and university students included similar training to the public in addition to learning about suicide risk factors and warning signs and how to refer someone at risk to a professional. Training for non-clinical professionals included similar information to the public and students. However, their training also covered how to practically respond to someone at risk of suicide (e.g., risk assessment skills). Training for clinical professionals addressed all aforementioned factors in training for the public, students and non-clinical professionals in addition to treatment planning skills.

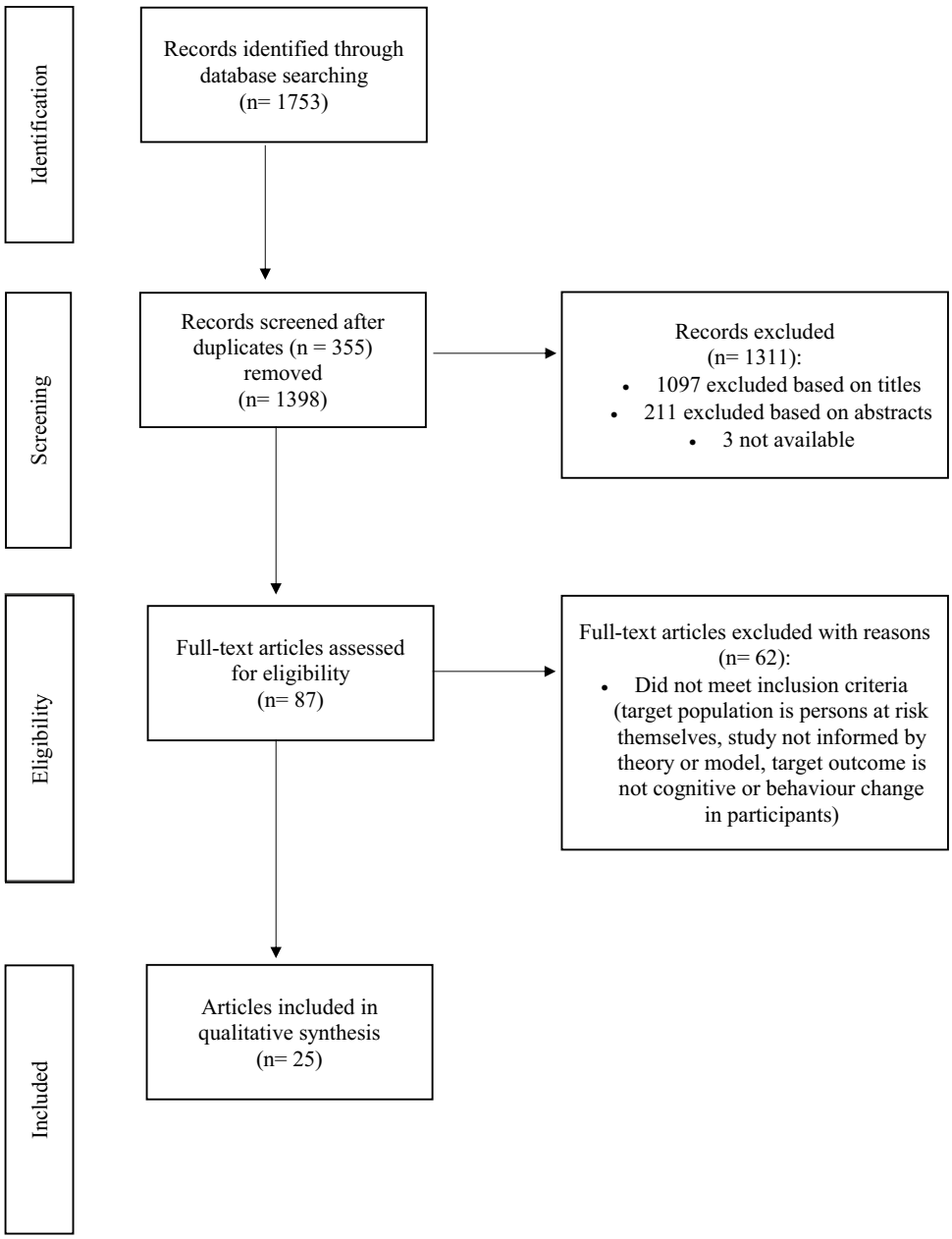


**Fig. 1** Flowchart of article selection process

## Outcomes

A majority ($n = 21$) of the studies reported a significant improvement between groups or time points (depending on design) in their outcome variables (e.g., knowledge, awareness, stigma), ranging from small to large effect sizes post intervention. Three studies did not assess outcomes immediately post-intervention (follow-up only) (studies 4, 19, 20, Table 1) while another study reported no significant difference in the outcome variable (suicide knowledge, opinion, acceptability and management) after training (clinical professionals) (study 24, Table 1). Designs used in the reported studies included RCTs, case studies, within-group repeated measures, qualitative studies and quasi-experimental studies.

## Follow-Up

Eleven studies included a follow-up of between two and twelve months after the original program (studies 4, 7, 8, 9, 10, 14, 16, 17, 19, 20, 23). Nine of these maintained their effects at follow-up (studies 4, 8, 9, 10, 14, 16, 19, 20, 21), while two did not (studies 7, 17), suggesting some potential for long-term effects on the target populations. The studies which did not maintain effects included populations of

**Table 2** Theories and models underpinning studies

| Theory | Guidelines for Content | Study |
|---|---|---|
| Diffusion of Innovation Theory | People adopt new information better through their trusted social networks. Content should therefore be targeted at gatekeepers (Cross et al., 2007; de Beurs et al., 2015; Wyman et al., 2010) | 4, 6, 21 |
| Social Learning Theory | Training should include videos and role plays as new behaviors are acquired through observation and imitation (Conner et al., 2013; Gask et al., 2008) | 9, 23 |
| Stress-Vulnerability Model | Training should teach how to recognise persons at risk of suicide who should be flagged for intervention (Chan, Chien, & Tso, 2008, 2009) | 11, 24 |
| Social Norms Theory | Content should be delivered by social peers and present intervention as the norm as participants will adopt similar attitudes and behaviors as their peers (Silk et al., 2017) | 25 |
| Active Learning Theory | Training should include the use of role plays (e.g., rehearsal of gatekeeper skills judged by trainers) to enhance the transfer of learning through experience (Cross et al., 2007; Matthieu & Hensley, 2013; Matthieu et al., 2009) | 2, 8, 21 |
| Adult Learning Theory | Training should include collaboration, relevance and experience as adults learn best through these factors (Cross et al., 2011; de Beurs et al., 2015; Gask et al., 2008) | 4, 17, 23 |
| Theory of Behaviour Change | Training should include the progression through the five stages of pre-contemplation, contemplation, preparation for action, action, and maintenance (Robinson et al., 2014) | 13 |
| Train-the-Trainer Model | Content should focus on teaching participants skills and how to deliver this information to others (de Beurs et al., 2015) | 4 |
| Competency-Based In-service Training Model | Content should teach core competencies to promote intervention including risk and protective factors associated with suicide (Chagnon, Houle, Marcoux, & Renaud, 2007) | 14 |
| Early Detection and Referral Model | Content should teach the ability to recognise risk factors early to promote early intervention (Jacobson et al., 2012; Keller et al., 2009) | 10, 16 |
| Chain of Survival Model | Content should teach warning signs for early detection and intervention (Reis & Cornell, 2008) | 19 |
| Surveillance Model | Content should teach risk factors of suicide to promote recognising suicidal communications from others (Wyman et al., 2008) | 7, 20 |
| Gatekeeper Communication Model | Content should focus on enhancing knowledge of warning signs and self-efficacy to intervene among large numbers of gatekeepers in a community to increase identification and referral of those at risk (Cimini et al., 2014; Wyman et al., 2008) | 7, 20 |
| Systems Level Change Theory | A primary barrier to change is that individuals involved do not feel competent to take on new roles. Training should therefore focus on increasing perceived confidence and competence to increase the responsiveness to others at risk of suicide (Walsh et al., 2013) | 12 |
| Ecological Risk/Protective Model | Content should teach how to weigh up a peer's risk and protective factors to suicide to determine whether intervention is necessary (Baber & Bean, 2009; Bean & Baber, 2011) | 15, 22 |
| Social Cognitive Theory | Content should target participants' self-efficacy beliefs in being able to help a peer as self-efficacy is a major determinant in regulating behavior to enact change (Strunk et al., 2014) | 1 |
| Samaritan's Befriending and Communication Model | Content should teach participants active listening and sensitivity against biases to intervene when someone is thinking of suicide (Clark et al., 2010) | 3 |
| Culturally-Informed Model | Content should teach how to consider diverse cultural beliefs and practices and how this may impact suicide risk and intervention (LaFromboise & Lewis, 2008) | 18 |
| Suicide Care Theory | Content should address stigma and teach families how to support those with mental illness (Sun et al., 2014) | 5 |
| Interpersonal Psychological Theory | Content should teach that suicidal behavior occurs when there is suicidal desire and capability to act on desires (Cross et al., 2007) | 21.2 |
| Entrapment Theory | Content should focus on teaching how to reduce a sense of feeling trapped in those at risk (de Beurs et al., 2015) | 4 |

school staff and parents and university staff and students. Both groups received gatekeeper training via workshops.

### Methodological Quality

The methodological quality of the 25 included studies is summarized in Table 3. Only 9 of the 25 studies met at least half of these criteria indicating a deficit of methodological quality. Missing in most studies were: randomization, follow-up, control groups, validated measures, sample size calculation, similar or controlled baseline data, blinding assessors, confidence intervals, effect sizes and more than self-report measures, comprising methodological rigor. These criteria are taken from Barker et al. (2016) and Sterne et al. (2019) which outlines requirements for both quantitative and qualitative data to be robust and have methodological and scientific rigour. The majority of studies were RCTs and within-group repeated measures designs ($n=22$). One of the research papers was a case study (study 7), one study included qualitative data (study 11) and one included quasi-experimental data (study 25). The criterion can be applied to qualitative and quantitative data. Criterion such as having a control group and randomisation can be applied to both forms of data collection. The case study is included in the current summary table to identify its limitations in terms of generalisability. The two methodological strengths of the studies were that most provided pre-and post-measurement and standardized interventions.

## Discussion

The present review of recently published suicide prevention programs aimed to explore aspects of target populations, delivery modalities, theory/model bases, training content and efficacy to identify potential gaps and suggest new, innovative ideas to address them. Key findings include that most current programs target professionals and there are limited interventions targeting the lay public. Also, there was substantial variability in the theory base informing interventions. Moreover, training for the public is very vague, lacking in depth education. Finally, training formats were found to be inconvenient and inaccessible (1–4-day workshops). Future suicide prevention programs are recommended to increase education for the lay public who are much more likely to be contacted by those at suicide risk than professionals, be delivered through technology-based formats to increase accessibility and potentially be informed by the Bystander Intervention Model to overcome inaction. These key findings and recommendations are further discussed below.

### Population

Studies in this review mainly targeted professional practitioners (both clinical and non-clinical). Training treating clinicians, frontline staff and gatekeepers is clearly important in managing suicide risk. It appears however, that 70–90% of those at risk, do not reach these groups who are trained to assist (Bloch, 1987; Cimini et al., 2014; Joffe, 2008; Kalafat et al., 1993; Klimes-Dougan et al., 2013). Instead, at-risk individuals communicate their distress to family and friends who are often far less competent to even detect, let alone respond to their signs (Cimini et al., 2014; Kalafat et al., 1993; LaFromboise & Lewis, 2008; Schmidt et al., 2015). Therefore, the current review highlights that education for the lay public is understudied and potentially not targeted enough if the dearth of research studies is representative of available training. The public may be an important gateway to notice individuals at risk and refer them to professionals and a bigger focus on their education is suggested. They may have previously been targeted less due to being seen as less important because they are not trained professionals. As outlined however, if they are not better equipped to detect those who are at risk and assist with referrals to professionals, we may continue to see persons at risk go undetected and untreated due to low rates of professional help-seeking.

### Mode

Twenty-three out of the 25 suicide prevention programs in this review were delivered through 1-to-4-day lectures and workshops. Many researchers have called for more technology-based suicide prevention interventions (Christensen & Petrie, 2013; Hickie et al., 2014; Werner-Seidler et al., 2016). Training workshops are inconvenient, expensive and too time-consuming (McMillen et al., 2016). Technology-based training for example, through videos, smart phone applications and websites, may address these issues by reaching larger numbers, in a faster, more convenient and more cost-effective way. Technology-based training programs can lead to participants performing as well as or better than instructor-led training workshops (McMillen et al., 2016). Slow progress toward suicide prevention may also represent a lack of attendance at previous training workshops. Hill, Somerset, Schwarzer, and Chan (2020) for example, found approximately 73% of their lay public participants had no previous suicide prevention training ($n=281$). If interventions were more accessible, it may increase the public's exposure to suicide prevention education. Of the mere two studies who solely focused on the lay public in this review, one's training material included a 40-page

**Table 3** Methodological quality of each study

| Criteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre and post measures | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X |
| Randomization | ✓ | X | X | ✓ | ✓ | ✓ | X | X | X | X | X | X | X | ✓ | X | X | ✓ | X | X | ✓ | X | X | X | ✓ | X |
| Follow-up | X | X | X | ✓ | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | X | ✓ | ✓ | X | ✓ | ✓ | X | X | ✓ | X | X |
| Control group | ✓ | X | X | ✓ | ✓ | ✓ | X | X | X | X | X | X | X | ✓ | X | X | ✓ | X | ✓ | ✓ | X | X | X | ✓ | ✓ |
| Validated measures | ✓ | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | X | X | ✓ | X | X | X | Unclear | X | ✓ | X | X | X | ✓ | ✓ |
| Sample size calculation | X | X | X | ✓ | ✓ | ✓ | X | X | X | ✓ | X | X | X | X | X | X | X | Unclear | X | ✓ | X | X | X | ✓ | X |
| Similar baseline data | ✓ | X | X | (Adjusted) | ✓ | (Adjusted) | Unclear | X | X | X | ✓ | X | ✓ | (Adjusted) | Unclear | Unclear | ✓ | Unclear | X | ✓ | Unclear | Unclear | Unclear | ✓ | X |
| Blinding of outcome assessor | X | X | X | X (not possible) | X | X | X | X | X | X | X | X | X | X | X | X | ✓ | Unclear | X | X | X | X | X | X | X |
| Reporting confidence intervals | X | X | X | ✓ | X | ✓ | X | X | X | X | X | X | X | X | X | X | X | Unclear | X | ✓ | X | X | X | X | X |
| Reporting effect sizes | ✓ | ✓ | ✓ | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | X | X | X | X | ✓ | X | ✓ | Unclear | X | ✓ | X | ✓ | X | X | X |
| Standardized delivery of intervention | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Unclear | X |
| More than self-report measures | X | X | X | X | X | X | X | X | X | X | ✓ | X | ✓ | X | X | X | ✓ | X | X | X | ✓ | X | ✓ | X | ✓ |
| No. of criterion met | 7 | 3 | 3 | 10 | 7 | 9 | 3 | 5 | 4 | 5 | 6 | 2 | 2 | 7 | 3 | 3 | 9 | 2 | 4 | 10 | 3 | 3 | 4 | 6 | 3 |

handbook, 2-h lecture and 2 h of telephone follow-up. The other only included hard copy information such as posters, cards, branded football products, newspapers and some other forms of media including TV, radio, DVDs and billboards targeting awareness of crisis lines and stigma. Neither of these included brief, easy to access training.

## Theory and Training Content

In the 25 studies reviewed, 21 different theories informing program content and design were identified, representing substantial variability. While many were evidence-based and considered important aspects of human behavior, indeed as Christensen (2015) commented, current suicide prevention approaches appear 'scattergun', uncoordinated, involve disparate approaches and are devoid of a single foundation theory.

For any community suicide prevention program to be effective, it must generate action through helping behavior from the lay public who are most often communicated to about suicide risk. As stated in the introduction, some studies suggest a strong deterrent to helping behavior is the Bystander Effect; i.e., inaction by bystanders when help is necessary due to diffusion of responsibility, fear of negative evaluation, ambiguity, lack of confidence and group conformity (Fischer et al., 2011). While clearly many theories have been considered, none seem to have taken into consideration the common theme that people close to those are risk are communicated to, but often do nothing (Rudd et al., 2013). The Bystander Intervention Model (BIM) is one model which considers this aspect of human behavior and is missing in all studies in this review. The BIM contends that for bystanders to overcome the Bystander Effect, they must go through five vital sequential steps: notice the event, interpret it as urgent/important, accept personal responsibility to help, feel competent and confident to help and reach a conscious decision to help (Darley & Latané, 1968; Latané & Darley, 1970). The models identified in the current review are important and can help encourage learning. Learning increases knowledge, however, knowledge is not enough to motivate helping behavior. Motivating helping behavior, which suicide prevention programs aim to promote, must be informed by models which take the effect of 3rd parties on human behavior into account.

The Bystander Effect has been replicated in many scenarios where helping behaviour would be required, for example bullying and sexual harrasment, where it is consistently found that most people lack appropriate helping behavior (Nickerson et al., 2014). This effect has been replicated in scenarios of suicide risk (as outlined in the introduction) (Jorm et al., 2005; Rudd et al., 2013). The BIM has been applied to sceniaors of bullying and sexual harrasment. Each step builds on the previous and leads to helping behaviour (Nickerson et al., 2014). The BIM has recently been applied to suicide prevention education material and found to lead to increased readiness, confidence and intent to help, compared to controls whose education content was not BIM-informed (Hill et al., 2020). The community domain of the nine-level system aims to educate the public to intervene when they recognise someone at risk. Thus, the BIM may add significant value to program designs and stimluate actual helping behaviour, not just increase knowledge.

The importance of education moving beyond just knowledge is further supported by Miller (1990) who states that knowledge alone is not enough to lead to action. They put forth a four-part framework to lead to appropriate professional action by physicians in patient care settings. Appropriate action refers to accurate assessment, diagnosis, and treatment of medical-related issues. The four parts of the framework in order include knowledge, competence, performance, and action (Miller, 1990). While this framework moves beyond most identified in the current review which mostly target knowledge and performance alone, it lacks three important components that the BIM covers. These include being relevant to emergency situations, encouraging participants to interpret a situation as urgent and encouraging participants to take personal responsibility to help or find help. The key aim of suicide prevention education for the community and gatekeepers is intervention. Key barriers to helping behaviour is inaction in the context of the Bystander Effect. Education material informed by the BIM is more likely to overcome inaction and is therefore highly recommended to be considered in future research.

The BIM can also be applied to other third parties to someone at risk including clinical professionals. People often mention and display suicide risk factors and warning signs to GPs and mental health professionals for example, a change in distress levels, sleep issues, low motivation, hopelessness, recent loss, etc. and these professionals reportedly often do not assess for suicide risk (Black Dog Institute, 2016; Hegerl & Wittenburg, 2015). Research has found for example, many people with suicidal thoughts who visit their GPs, often do not mention their suicide ideation (Black Dog Institute, 2016). Reportedly, those who do state their suicide ideation to their GPs, often do not receive the care they need (Craven & Bland, 2013; Hegerl & Wittenburg, 2015). This has been said to be due to fear, stigma, and time pressure (Black Dog Institute, 2016). Training for clinical professionals informed by the BIM may be able to overcome some of these barriers and increase suicide preventative behaviours due to a focus on noticing risk factors, interpreting them as urgent and taking personal responsibility to help (factors missing in other theories).

### Outcomes

Most studies appeared to be effective in improving target outcomes. Examples of outcome variables include knowledge, confidence, attitudes, behavioral intentions, self-efficacy, acceptability of help-seeking, comfort and competence. Bystander Effect research however states that the aforementioned factors are unlikely to result in action (Darley & Latané, 1968). Participants can have strong knowledge and positive attitudes and perceptions but if they do not go through the five parts of the Bystander Intervention Model (BIM) they are unlikely to act which is essential to community efforts toward suicide prevention (Darley & Latané, 1968). The BIM posits that knowledge and other skills are not enough and that participants must notice the risk, interpret the risk as urgent to assess and support, take personal responsibility to help, feel confident and competence to help and actively decide to help (Darley & Latané, 1968). Without each of these steps in order, helping behavior has consistently been found to be lacking. Therefore, even though the reviewed studies are effective in improving their target outcomes, they may not be teaching and assessing all necessary aspects to lead to action. Programs are urged to teach all aspects of the BIM relevant to suicide prevention to increase the likelihood of community action.

### Follow-Up

Less than half of the studies included a follow-up phase to gauge duration of effect. Of these, most maintained their effects at follow-up, indicating longer-term efficacy of interventions. Future studies are recommended to include follow-up studies to add to the body of longitudinal research.

### Methodology

The overall methodological rigor was poor in the reviewed studies with many lacking randomization, follow-up measures, control groups, validated measures, sample size calculations, similar or controlled baseline data, blind assessors, confidence intervals, effect sizes and more than self-report measures. This may dampen reports of efficacy and may mean that programs reported to be efficacious are being implemented which require strengthening.

### Strengths

The current review was the first to specifically explore theories underpinning suicide prevention training. It was the first review to highlight the diversity of theories being applied to interventions intending to reduce suicide risk and is the first to highlight that the BIM has been overlooked in intervention design. It was also the first to comment on delivery modes and highlight the need for more accessible training formats. This review provides evidence to support comments that current efforts are disjointed and unlikely to have a far reach and uptake in the community.

## Limitations

Most of the reviewed studies were conducted in the USA and conclusions should be generalized with caution. Additionally, only studies which included an underpinning theory or model were included. The initial search identified 50 other potentially eligible studies without a theoretical underpinning, but analysis of these was beyond the scope and criteria of this review (although initial screening indicated similar results to above). Further, future research may consider conducting an updated review. Finally, only one author completed the study selection.

## Conclusion

While the studies in this review demonstrated some efficacy, suicide rates continue to rise globally. Key issues identified in this review include substantial variability in the theory base informing interventions, limited interventions targeting the lay public and inaccessible training formats. The gaps identified by this review suggest suicide prevention programs need to go beyond current efforts and increase education for the lay public who are much more likely to be contacted by those at suicide risk than professionals, be delivered through technology-based formats to increase accessibility and potentially be informed by the Bystander Intervention Model to overcome inaction. Future research should also apply rigorous methodological design to test the efficacy of these recommendations. The public are crucial gatekeepers in linking those at suicide risk, to professional practitioners who can help. A community that is better equipped to detect and respond to suicide risk, is a pathway to reducing suicide rates.

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## Declarations

**Conflict of interest** The authors have no conflicts of interest to declare.

**Ethical Approval** The study is a systematic review. The Australian Catholic University has confirmed that no ethical approval was required.

**Informed Consent** The study is a systematic review. The Australian Catholic University has confirmed that informed consent was not required.

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