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TECHNICAL REPORT

Interventions to Prevent Suicide

A Literature Review to Guide Evaluation of California's Mental Health Prevention and Early Intervention Initiative

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Sponsored by the California Mental Health Services Authority

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The research described in this report was prepared for the California Mental Health Services Authority and was conducted within RAND Health, a division of the RAND Corporation.

Published 2012 by the RAND Corporation
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Preface

This review is one of a series of three literature reviews conducted by RAND to inform its evaluation of the California Mental Health Services Authority (CalMHSA) Prevention and Early Intervention (PEI) initiatives. CalMHSA is an organization of county governments working to improve mental health outcomes for individuals, families, and communities. Prevention and Early Intervention programs implemented by CalMHSA are funded through the voter-approved Mental Health Services Act (Prop. 63). Prop. 63 provides the funding and framework to expand mental health services to previously underserved populations and all of California's diverse communities.

CalMHSA's PEI initiatives fall into three related areas: stigma and discrimination reduction, suicide prevention, and student mental health, with several programs within each initiative area. RAND is charged with conducting evaluations at the program, initiative, and statewide levels. We reviewed the evaluation literature in each PEI initiative area to understand the state of the art in each area, including relevant theories of change, what is and is not known about PEI program effectiveness, and what kinds of methodologies have been previously used in evaluations of PEI programs. These are not comprehensive reviews of the broader literatures addressing the topics of mental health stigma, suicide, and student mental health. This particular document summarizes the literature related to suicide prevention.

The information in this report and in the other two companion reviews should be of interest to a wide range of stakeholders both within and outside the state of California, from organizations and counties implementing PEI programs, to policymakers making key funding decisions in this area. It will help stakeholders understand the evidence base for preventive interventions, including what kinds of programs have empirical support and the areas where further evaluation is needed.

This document was prepared with the input of stakeholders across the state of California. In particular, members of the Statewide Evaluation Experts (SEE) Team provided input to guide the development of the document and feedback on a draft of the report. The SEE is a diverse group of CalMHSA partners and community members, including CalMHSA board members, representatives of counties of varied sizes, representatives of the California Mental Health Directors Association, a representative from the California Institute for Mental Health, members of the Mental Health Services Oversight and Accountability Commission, a representative from the California State Department of Mental Health, individuals with expertise in cultural/diversity issues, behavioral scientists with evaluation expertise, and consumers and family members who have received mental health services.

Contents

Figures

Tables

Summary

There are more than 3,000 suicide deaths in California each year—roughly nine deaths for every 100,000 California residents. To prevent suicides and other mental health problems, the California Mental Health Services Authority (CalMHSA) is implementing a variety of Prevention and Early Intervention (PEI) initiatives. CalMHSA is an organization of county governments working to improve mental health outcomes for individuals, families, and communities. PEI programs implemented by CalMHSA are funded through the voter-approved Mental Health Services Act (Prop. 63). Prop. 63 provides the funding and framework to expand mental health services to previously underserved populations and all of California's diverse communities.

CalMHSA asked RAND to evaluate the PEI initiatives to prevent suicide. To help inform the design of this evaluation, we reviewed some key aspects of the suicide prevention (SP) program evaluation literature to understand the state of the art, including relevant theories of change, what is and is not known about suicide prevention program effectiveness, and what kinds of methodologies have been previously used in evaluations of suicide prevention programs.

This report summarizes this scientific literature related to suicide prevention and is organized into three sections. First, we provide an overview of the epidemiology of suicide and of non-fatal self-inflicted injuries in California, as well as the empirical support for suicide risk factors, and explain why understanding this epidemiology is a critical first step in any effort to evaluate the effectiveness of suicide prevention programs. Second, we present our framework for conceptualizing suicide prevention programs that can be used to guide evaluation; it is based on a review of the relevant scientific literature. Finally, we conclude with a discussion of the measures that have been used to evaluate suicide prevention programs in the past.

The Epidemiology of Suicide in California

Suicide trends in California, by age, sex, and race, parallel trends seen more broadly in the United States. However, California's suicide rate is the same, if not higher, than the U.S. rate until age 55, at which point it becomes consistent with or lower than the national rate. As in the United States more broadly, California suicide rates are highest among whites and males. According to data from 2009, the majority of suicides in California resulted from self-inflicted gunshot wounds or hanging, strangling, or suffocation (California Department of Public Health, 2011). To date, three risk factors for suicide have the strongest empirical support: prior suicide attempts (Harris and Barraclough, 1997), mental health disorders

(Beautrais et al., 1996; Cavanagh et al., 2003; Goldsmith et al., 2002; Harris and Barraclough, 1997), and substance misuse, abuse, and dependence (Goldsmith et al., 2002; Wilcox et al., 2004). Understanding these trends in deaths by suicide and suicide behaviors and the data sources for each is important for informing evaluations that rely on these data as a key or ultimate outcome.

RAND Conceptual Model of Suicide Prevention Programs

RAND developed a conceptual model of suicide prevention programs to help guide the CalMHSA evaluation design. The model is built on nine different categories of suicide prevention programs and displays proximal program goals and ultimate outcomes of different types of suicide prevention programs.

The nine categories of suicide prevention programs are training on coping skills and self-referral, marketing campaigns, gatekeeper trainings, crisis hotlines, postvention programs that guide a community to appropriately respond to suicide to prevent possible contagion, screening programs to identify and refer individuals in distress, provider training in suicide risk assessment and management, targeted mental health interventions, and social/policy interventions that increase access to care or restrict access to lethal means through policies that create a safe environment (e.g., restricting access to firearms). To date, there has been limited research on the effectiveness of many of these types of programs, but the literature suggests that three program approaches can lead directly to reductions in suicides: social/policy interventions that reduce access to lethal means (e.g., Ajdacic-Gross et al., 2006; Florentine and Crane, 2010; Sinyor and Levitt, 2010), increased provision of high-quality mental health care through targeted mental health interventions (e.g., Blue Ribbon Work Group on Suicide Prevention in the Veteran Populations, 2008; Brown et al., 2005; Jobes et al., 2005; Leitner et al., 2008; Stanley and Brown, 2008), and effective acute crisis response (e.g., through provider or physician trainings, postvention programs, or crisis hotlines) (Doshi et al., 2005; Mann et al., 2005; van der Feltz-Cornelis et al., 2011a). We propose that these strategies need to be accompanied by efforts that ensure individuals know what services are available (e.g., via marketing campaigns to increase awareness, training on self-referral skills), procedures and trainings that help identify those at risk (e.g., through screening programs), and efforts that ensure individuals have access to and feel comfortable accessing care themselves or referring to care those at risk (e.g., by training the individual on coping skills or by gatekeeper trainings).

Measures for Suicide Prevention Program Evaluation

Suicide prevention program evaluations are challenged by methodological issues including the relative rarity of suicide deaths (Goldsmith et al., 2002; Mann et al., 2005; Ramchand et

al., 2011). Given the rarity of suicide, intermediate outcomes are often used to evaluate suicide prevention programs. This report contains sample evaluation measures corresponding to each of the aforementioned proximal program goals and the ultimate outcome (i.e., fewer suicides).

Our review of the literature found that very commonly, suicide attempts (either self-reported or measured in hospital records) are used as the primary outcome in suicide prevention research. Although the validity of this measure is substantiated by evidence suggesting that a prior suicide attempt is the strongest predictor of subsequent death by suicide, it should also be kept in mind that about half of those who die by suicide have no history of a prior attempt (Gibb et al., 2005; Isometsa and Lonnqvist, 1998; Suominen et al., 2004), and the majority of those who make non-fatal attempts do not go on to die by suicide (Gibb et al., 2005; Suominen et al., 2004). Other proximal program goals may be changes in knowledge, skills, and attitudes or in intervention behaviors (e.g., after exposure to a media campaign or a gatekeeper training program); changes in access to and use of behavioral health care for programs designed to reduce mental health stigma or otherwise increase access; and clinical measures (e.g., treatment adherence) for programs designed to improve care. In addition, programs that target known risk factors for suicide might also be effective at preventing suicide.

Conclusions and Next Steps

Our review identified several important methodological considerations that can inform evaluation of suicide prevention programs.

- **Suicide is a rare event.** Even with a well-constructed evaluation, identifying that a prevention program was effective at reducing suicide deaths is challenging because of the narrow sample and lag in the availability of suicide data.
- **Suicide varies by age, race, and sex.** Thus, prevention programs may have differential effects on different population subgroups.
- **Suicide ideation and attempts are important indicators of suicidality, but their relationship with suicide death is complicated.** Even if a program shows immediate reductions in ideations and attempts, its effects on long-term suicide deaths are uncertain.

In addition to these methodological issues related to SP program evaluation, we also identified two areas where more research is needed:

- **Linking SP programs to suicide rates.** Although a body of SP evaluation research explores the effects of SP programs on such outcomes as reduced access to lethal

means, provision of care, and crisis response, we also need to learn more about how these programs influence suicide rates.

- **Determining SP program effectiveness among population subgroups.** Although some evidence suggests that SP programs targeted for specific subgroups can be effective ("Suicide Prevention Evaluation in a Western Athabaskan American Indian Tribe—New Mexico, 1988–1997," 1998; May et al., 2005), more research must address the differential effectiveness of SP programs for population subgroups vulnerable to suicide.

Acknowledgments

The RAND Health Quality Assurance process employs peer reviewers, including at least one reviewer who is external to the RAND Corporation. This study benefited from the rigorous technical reviews of Jerry Reed and Terry Schell, which served to improve the quality of this report.

Abbreviations

CalMHSA	California Mental Health Services Authority
CALM	Counseling on Access to Lethal Means
CDCP	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CHIS	California Health Interview Survey
CSS	Columbia Suicide Screen
DBT	dialectical behavior therapy
DPS	Diagnostic Predictive Scale
ED	emergency department
LASPC	Los Angeles Suicide Prevention Center
MST	Multisystemic Therapy
NCHS	National Center for Health Statistics
NREPP	National Registry of Evidence-Based Programs and Practices
NSPL	National Suicide Prevention Lifeline
PEI	Prevention and Early Intervention
P.L.	Public Law
PSSI	Post-Screening Structured Interview
PTSD	Post-Traumatic Stress Disorder
SAFE VET	Safety Plan Treatment Manual to Reduce Suicide Risk: Veteran Version
SEE	Statewide Evaluation Experts
SOS	Signs of Suicide program
SP	suicide prevention
SPP	Suicide Prevention Program
WISQARS	Web-Based Injury Statistics Query and Reporting System

Chapter 1. Introduction

More than 36,000 Americans die by suicide every year and another 465,000 receive medical care for self-inflicted injuries. In 2009, suicide was the 10th leading cause of death among people age 10 and older in the United States, accounting for 36,891 deaths (Centers for Disease Control and Prevention, 2012). For every person who dies by suicide, more than 30 others attempt suicide. Suicide places a heavy burden on the nation in terms of the emotional suffering that families and communities experience as well as the economic costs associated with medical care and lost productivity. Since the 1999 release of the *The Surgeon General's Call to Action to Prevent Suicide* (U.S. Public Health Service, 1999), which sets forth a national agenda for suicide prevention, progress has been made nationally to address this public health issue. Key accomplishments include the passing of the Grant Lee Smith Memorial Act—the first large federal grant program directed at suicide prevention, creation of the National Suicide Prevention Lifeline (800–273–TALK/8255) and its partnership with the Veterans Crisis Line, establishment of the Suicide Prevention Resource Center, as well as increased training of clinicians and community members to identify and intervene with individuals at high risk for suicide.

However, as evidenced by the continued rates of deaths by suicide, there still remain gaps in prevention. The most recent National Strategy for Suicide Prevention (U.S. Department of Health and Human Services [HHS] Office of the Surgeon General and National Action Alliance for Suicide Prevention, 2012) identified four national priority areas for 2012–14:

1. "Integrating suicide prevention into health care reform and encouraging the adoption of similar measures in the private sector;
2. Transforming health care systems to significantly reduce suicide;
3. Changing the public conversation about suicide and suicide prevention; and
4. Increasing the quality, timeliness, and usefulness of surveillance data regarding suicidal behaviors." (p. 26)

In addition, the National Strategy identified common themes that are relevant across all four priorities. These common themes emphasize the importance of bringing together public health and behavioral health practitioners to better coordinate and integrate ongoing public health activities with existing efforts addressing health and behavioral health.

State investments in these four priority areas are needed if the nation is to make progress toward reducing deaths by suicide. In California, the California Mental Health Services

Authority (CalMHSA) is implementing a variety of Prevention and Early Intervention (PEI) initiatives to prevent suicide including media campaigns to affect the public dialogue, improving surveillance efforts in California, and further expanding the services offered through crisis hotlines. CalMHSA is an organization of county governments working to improve mental health outcomes for individuals, families, and communities. PEI programs implemented by CalMHSA are funded through the voter-approved Mental Health Services Act (Prop. 63). Prop. 63 provides the funding and framework to expand mental health services to previously underserved populations and all of California's diverse communities.

CalMHSA asked RAND to evaluate the PEIs to prevent suicide. To help inform the design of this evaluation, we first explored the epidemiology of suicide in California to determine whether it aligned with U.S. trends and to examine trends by specific subgroups (e.g., race/ethnicity, age). In addition, we reviewed the suicide prevention program evaluation literature to understand the state of the art, including relevant theories of change, what is and is not known about suicide prevention program effectiveness, and what kinds of methodologies have been previously used in evaluations of suicide prevention programs.

Purpose of This Report

This report summarizes the findings from our epidemiological review of California's existing suicide surveillance data and the literature review of suicide prevention program evaluations. These reviews were done to answer the following questions:

1. What are the rates of suicide and suicidal behaviors (suicide attempts and ideations) in California and are they similar to U.S. trends? How do these rates vary by sex, age, or race?
2. How can the existing evidence be used to develop a framework for conceptualizing suicide prevention programs that can guide program evaluation?
3. What measures have been used to evaluate suicide prevention programs? What are the methodological challenges that need to be considered when designing an evaluation?

Methods

To answer these questions, we used two distinct methodologies: a review of existing suicide epidemiological or surveillance data in California and an examination of peer-reviewed literature.

Epidemiological Review

Suicide Deaths. We examined the epidemiology of suicide deaths using data from the National Vital Statistics System and available for analysis by the National Center for Health

Statistics (NCHS). Data derive from death certificates that contain the single underlying cause of death, up to 20 additional multiple causes, as well as the mechanism of injury (based on International Classification of Disease-10 external cause of injury codes); death certificates also include limited demographic data. Suicide rate data are provided by NCHS using population data from the U.S. Census Bureau and available from the WISQARS ™ website (Centers for Disease Control and Prevention and National Centers for Injury Prevention and Control, 2005).

Suicide Ideation. Beginning in 2009, Californian adults have been asked about suicide ideation in the California Health Interview Survey (California Health Interview Survey [CHIS] 2009). The CHIS is a random-digit-dial telephone survey conducted of over 50,000 Californians every two years and designed to be statistically representative of California's population. These data are available from the CHIS website.

Non-Fatal Self-Inflicted Injuries. The California Department of Public Health has published data on non-fatal self-inflicted injuries resulting in hospitalization since 1991 and, since 2001, non-fatal self-inflicted injuries seen in emergency departments. In both cases, it is important to note that these injuries *include but are not limited to* suicide attempts. These data come from the California Office of Statewide Health Planning and Development Patient Discharge Data, which includes information on patients discharged from all non-federal hospitals in California, and Emergency Department (ED) Data, which include information on patients admitted to emergency departments in California and at which the patient was either treated and released or transferred to another facility. These data are available from California's Department of Public Health EpiCenter website (California Department of Public Health).

Literature Search

Between January and February 2012, we searched the peer-reviewed literature to identify evaluation approaches and process and outcome evaluation measures used in studies of suicide prevention programs (SPP). First, we searched for evaluation studies used to verify SPPs as evidence-based. These evaluation studies were located in the Substance Abuse and Mental Health Services Administration's National Registry of Evidence-based Programs and Practices for interventions with suicide as a listed outcome. To augment this literature, we also conducted a more comprehensive literature search on SPP evaluation and clinical trials of SPP in five databases that focused on substantive areas pertaining to health (psychology and medicine), defense, and the social sciences broadly: PsychINFO (psychology), PubMed (medicine), DTIC (defense), NY Academy of Medicine Grey Literature Collection (medicine), and Social Science Abstracts (social sciences). We did not limit our search to a specific range of years but searched all years available. In general, searches contained keywords combining suicide, program, and evaluation, or keywords combining suicide and clinical trial.

Our search resulted in 166 evaluation studies. For each study, we abstracted two sets of information: evaluation data and measure data. Evaluation data include a description of the suicide prevention/ reduction program(s), details about the evaluation design, and a synopsis of the study's findings. Measure data describe how study outcomes were assessed and details about measure administration, scoring, and reliability. Each piece of abstracted information represents a characteristic or quality of a program or measure that was useful to consider when designing a suicide prevention program evaluation. We also identified articles (n = 34) that did not include an evaluation but were still relevant to the evaluation of suicide prevention programs (e.g., discussions of evaluation methodology). From these articles, we abstracted information on the methodological challenges and approaches to suicide prevention program evaluation.

To ensure that information from the literature was abstracted consistently, we developed a standardized data abstraction form. Coders received initial instruction on use of the data abstraction form and the content to be included. They then each coded two articles, which were reviewed and discussed by the team. The remaining articles were distributed among the team for independent coding. Questions about coding were reviewed regularly by the team to ensure reliability and consistency among members. Once all articles had been coded, the first author reviewed all data abstraction forms for completeness and clarity.

The abstracted data were then reviewed and organized into the conceptual model. Specifically, we reviewed evaluation data abstracted to identify types of suicide prevention programs and the proximal goals that these programs rely on to prevent suicide. Measure data were reviewed to identify intermediate outcomes most linked to reductions in deaths by suicide, as well as specific measures used to capture these intermediate outcomes – as well as deaths by suicide and suicidal behaviors.

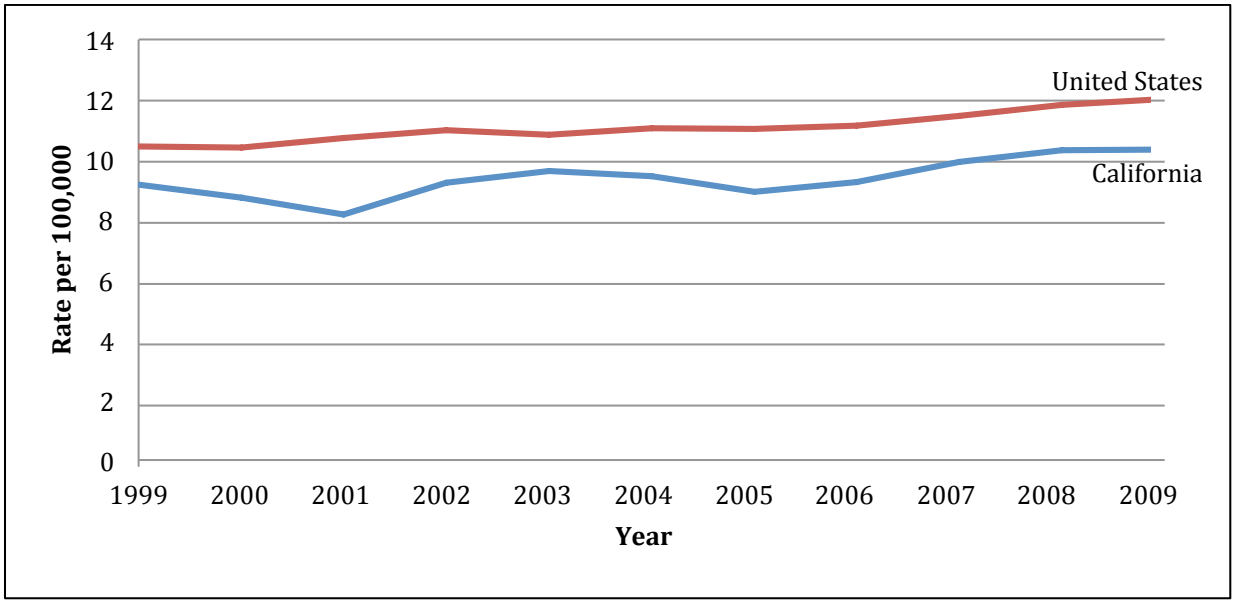
Organization of This Report

This report summarizes the scientific literature related to suicide prevention and is organized into three sections. First, we provide an overview of the epidemiology of suicide and of non-fatal self-inflicted injuries in California and explain why understanding this epidemiology is a critical first step in any effort to evaluate the effectiveness of suicide prevention programs. Second, we present the findings from our literature review organized into a framework for conceptualizing suicide prevention programs that outlines evidence-based approaches and proximal program goals that are worth examining for evaluation. Finally, we conclude with a discussion of the measures that have been used to evaluate suicide prevention programs in the past and highlight methodological challenges that should be considered when designing an evaluation of suicide prevention programs.

Chapter 2. Suicide in California: Epidemiology

Although the literature provides a number of different definitions of suicide, it is generally referred to as a self-inflicted behavior that results in a fatal injury, and for which there is evidence of some intent to die as a result of the behavior. Between 1999 and 2009 there have been between 2,831 (in 2001) and 3,823 (in 2009) suicide deaths each year in California. This corresponds to an average suicide rate of 9.4 per 100,000 individuals (range: 8.2 in 2001 to 10.3 per 100,000 in 2009). As shown in Figure 1, over this period, the suicide rate in California has been consistently lower than the national suicide rate.

Figure 1. Suicide Rate in California and the United States, by Year, 1999–2009



At the time of this writing (April 2012), data on suicides in California were available only up through 2009 (see Figure 1). The lag in availability is because it takes approximately two years for NCHS to collect, compile, verify, and prepare death certificate data that are provided to them from across the United States.[1] Verifying suicide data is an important component of surveillance, since there is known variability in how suicide deaths are defined (especially for ambiguous cases, such as one-car automobile crashes or Russian roulette deaths), requirements for who makes cause of death determinations (i.e., coroner versus trained medical examiner), the degree to which suicide deaths are investigated, and how data are managed across counties. Acknowledging variability across all of these

[1] California's Department of Public Health also provides data on suicides via its EpiCenter website (CDPH, 2011) but suicide data here are available only for 2009.

domains is important, because it is critical that any geographic differences in suicide rates (e.g., differences in rates between two counties) reflect actual phenomena versus artifacts resulting from differences in the ways suicides are tracked. Unfortunately, although we are aware that this variability exists, we do not know specific details about how suicide cases are determined and tracked in California's many counties; however, this will be a focus of our evaluation of California's Mental Health Prevention and Early Intervention Initiative.

Another important consideration when examining suicide data is that suicide is a low base-rate event. From a public health standpoint, this is a good thing: We do not want suicide to be common and through prevention strive to make it even rarer. However, low base-rate events pose significant analytic challenges. For surveillance, rate estimates generally become unstable[2] when there are fewer than 20 suicides in a specific category. For example, the estimated suicide rate is unstable for adolescent females of a certain race group if there are fewer than 20 adolescent females in that race group who died by suicide. In addition, as of 2008, the NCHS suppresses any figure in which there are fewer than 10 events in a category. In other words, if there were eight suicides among Asian/Pacific Islander adolescent females in California in one year and six in the next year, these data would not be shown on the NCHS database. However, they would be included in the total number of suicides in California.

Suicide Trends, by Age, Sex, and Race

Suicide trends in California by age, sex, and race parallel trends seen more broadly in the United States (see Figures 5, 6, 7, below). The data presented in these domains are based on RAND's analysis of NCHS data (Centers for Disease Control and Prevention and National Centers for Injury Prevention and Control, 2005); only crude rates are presented.

Suicide Rate, by Age

The distribution of suicides by age is shown in Table 1. Adolescent suicides accounted for less than 5 percent of all suicides, 71 percent occurred among adults (ages 20–59), and 26 percent occurred among those age 60 or older.

[2] Unstable is defined as highly variable; that is, if the number of suicides changes by a small factor (i.e., one additional or one fewer), the estimate may change dramatically.

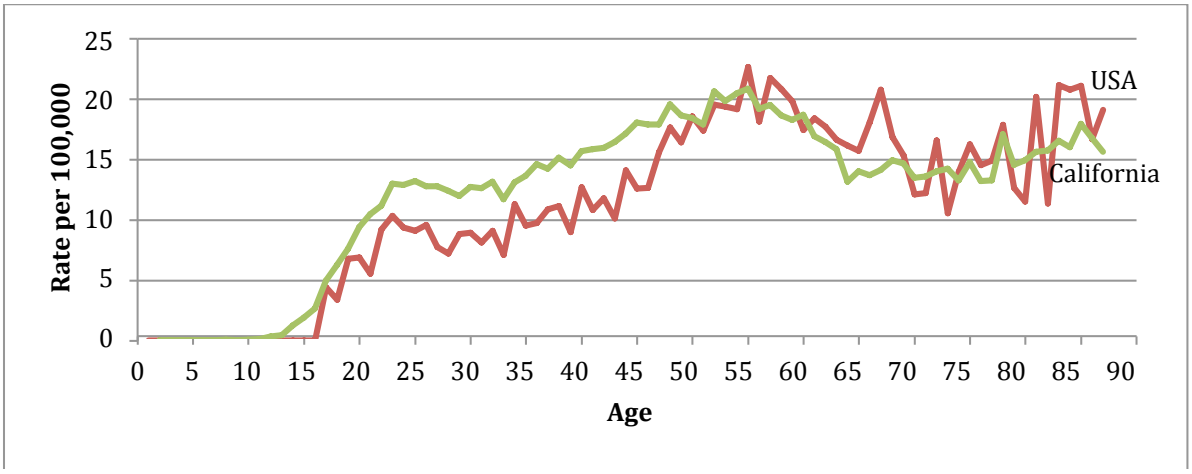
Table 1. Suicides in California, by Age, 2009

Age Group	N	% of California Suicides
<20	166	4%
20–29	480	13%
30–39	527	14%
40–49	781	20%
50–59	909	24%
60–69	481	13%
70–79	254	7%
80 or above	224	6%

NOTE: Percentages do not sum to 100 due to rounding.

As shown in Figure 2, suicide deaths in California generally increase as a function of age, beginning at or around age 10 and increasing until age 55. At age 55, the suicide rate in California plateaus or even decreases; however, at or around age 70, it begins to increase again. The trends in California and the United States are generally consistent; however, California's suicide rate appears higher than the U.S. rate up until age 55, at which point it becomes consistent with or lower than the national rate.

Figure 2. Suicide Rate in California and the United Stages, by Age, 2009

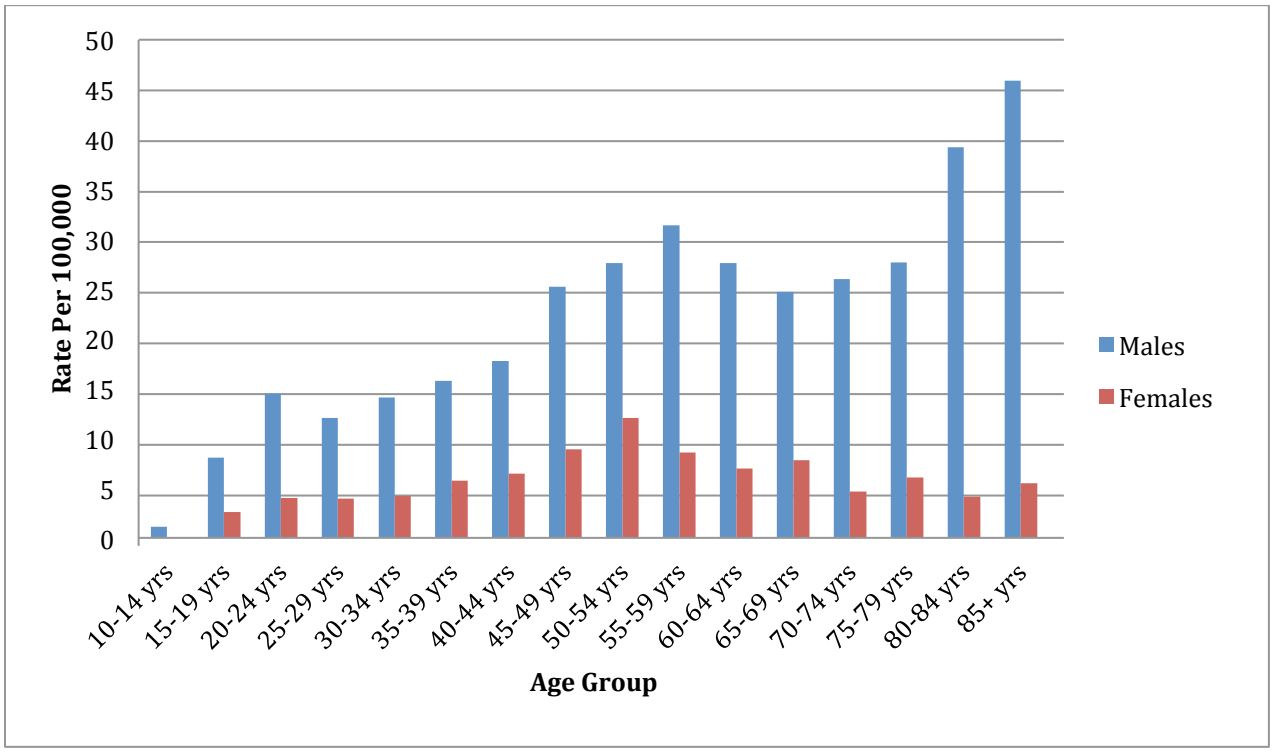


Suicide Rate, by Sex

In 2009, 76 percent of all suicide deaths in California were male. Figure 3 presents data on how suicide death rates differ across age groups between males and females in California.

Nationally, males have up to a four times higher suicide rate than females (though the difference is much greater at older ages). Many theories have been proposed to explain these differences, including that males use more lethal means to attempt to kill themselves than do females, who use more reversible methods.

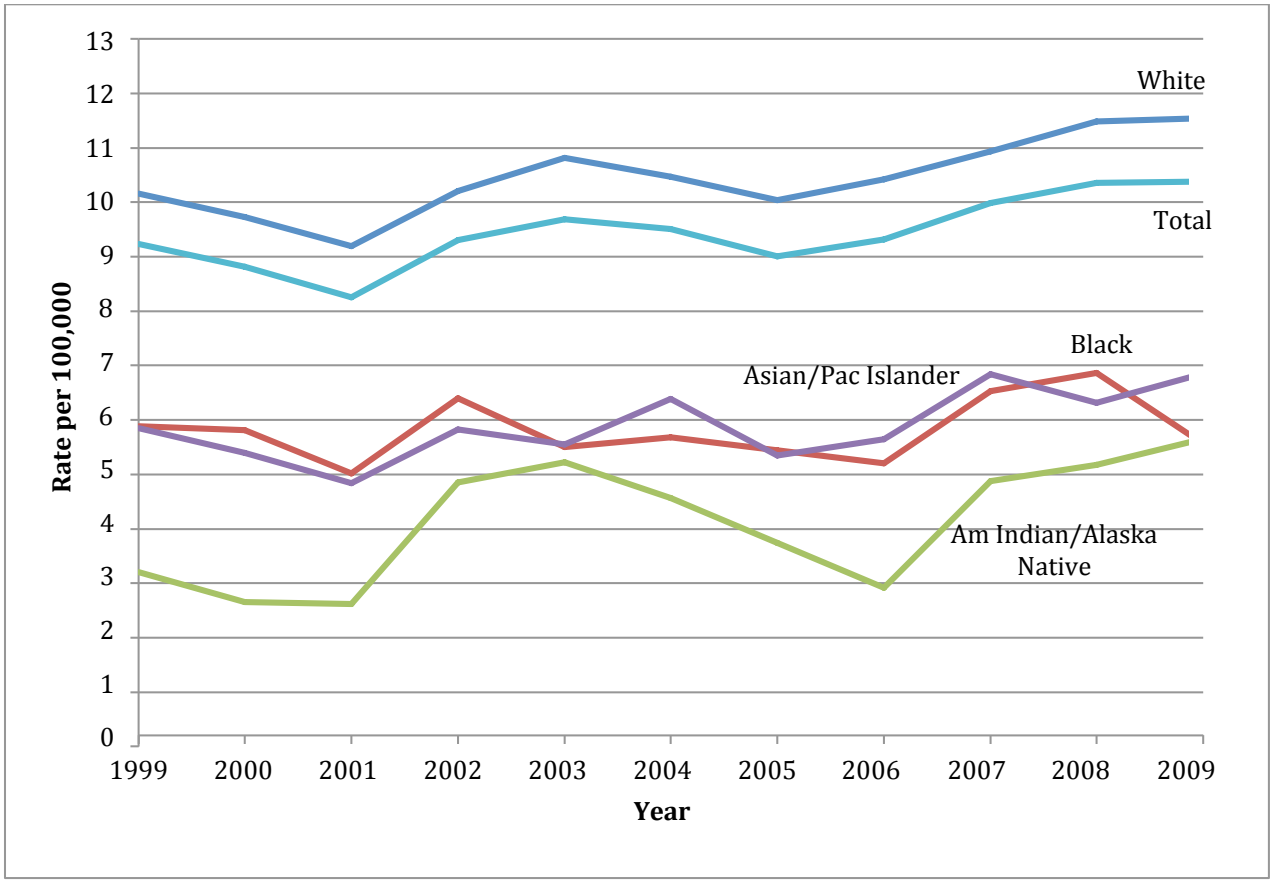
Figure 3. California Suicide Rate, by Age Group and Sex, 2009



Suicides, by Race

Figure 4 shows suicide rates in California, by year and race. As in the United States more broadly, the suicide rate in California has been consistently highest among whites, hovering between 9 and 12 per 100,000. However, American Indians/Alaskan Natives, who nationally have relatively high suicide rates, have much lower rates of suicide than other race groups in California. Overall, the suicide rate among blacks and Asian Pacific Islanders has fluctuated around an average of 5.7 per 100,000 from 1999–2009, which is much lower than the 2010 national average of 11.4 per 100,000. However, since 2006, the rate among these groups has been increasing and has dropped below 6 per 100,000 among blacks only in the last year of observation.

Figure 4. California Suicide Rate, by Year and Race



In 2009, 87 percent of suicide deaths in California involved whites. The proportion of suicide deaths accounted for by California's other racial groups is much lower: 4 percent for blacks, 1 percent for American Indian/Native Americans, and 3 percent for Asians/Pacific Islanders.

Mechanism of Injury

Understanding the means by which individuals in California have died by suicide has important implications for prevention. These data are available to the public from California's Department of Public Health (CDPH, 2011). In 2009, 34 percent of California suicides were self-inflicted firearm fatalities. Twenty-nine percent of suicides resulted from hanging, strangling, or suffocation, and 15.5 percent resulted from poisoning. Falls (including jumping) accounted for about 4 percent of California suicides in 2009; the rest were caused by various other means. This is consistent with 2005–2009 national statistics, which found that the greatest percentage of suicides occurred by firearm, suffocation, and

poisoning for individuals 25 to 64 years (Centers for Disease Control and Prevention and National Centers for Injury Prevention and Control, 2005).

Suicides in California, by County

There are two sources of information on suicides in California by county. These data are available from the California's Department of Public Health EpiCenter website (CDPH, 2011). In addition, California's Office of Suicide Prevention provides county-level summaries available for download from their website. Unlike the NCHS data, California includes data when the total number of cases is fewer than 10; however, it also cautions about the stability of rate estimates for categories that have fewer than 20 cases and does not calculate suicide rates in these instances. RAND will further explore county-level estimates and differences in suicide rates within the state as part of our evaluation but will do so only when we obtain a better understanding of the methods by which the different counties within the state make suicide death determinations.

Suicide Attempts and Ideation

In addition to actual deaths by suicide, "nonfatal suicide attempts," and "suicide ideation" are used to track general levels of distress as well as to evaluate program effectiveness. Although these are useful indicators, the precise relationship of these constructs to each other, and to death by suicide more specifically, is complicated. "Suicide ideation entails a range of thinking, from passive thoughts about wanting to be dead to active thoughts about killing oneself" (Ramchand et al., 2011). To date, data have not yet shown whether those who report thinking about killing themselves are actually more likely to die by suicide than those who do not report thinking about suicide.

More is known about attempts: It is estimated that between 5 and 15 percent of those who have made a suicide attempt in the past will die by suicide; thus, those who have attempted suicide in the past have a 40- to 50-fold elevated risk of dying by suicide (Harris and Barraclough, 1997). However, it is also estimated that close to half of those who die by suicide do so on their first attempt (Gibb et al., 2005; Isometsa and Lonnqvist, 1998; Suominen et al., 2004).

Because suicide ideation is a thought, data on the prevalence of ideation are generally collected via self-reports. Beginning in 2009, CHIS added a question about suicide ideation in its adult survey. In 2009, about 9 percent of adults in California reported having seriously contemplated death by suicide at some point during their lifetime (from AskCHIS website, UCLA Center for Health Policy Research, 2008). The 2009 National Survey on Drug Use and Health asked a similar question of a nationwide sample and found that 3.9 percent of women and 3.5 percent of men had had serious thoughts of suicide in the past year.

On the other hand, data on actual suicide attempts can be collected via self-reports or third-party reports (e.g., emergency department visits or hospitalizations). For California, we have to date found only state-level data for third-party reports of self-inflicted injuries that include, but are not limited to, suicide attempts and that result in hospitalization (data available since 1991) or that are seen in an emergency department (data available since 2006).

Data from these third-party sources indicate that in 2009, 16,356 Californians were hospitalized for a non-fatal self-inflicted injury that include suicide attempts, and close to 28,000 went to the emergency room because of a self-inflicted injury. We present descriptive statistics on these third-party reports of self-inflicted injuries at the end of this report, and we summarize the findings here.

Rates of hospitalization for self-inflicted injuries in California have generally remained stable for the past decade, hovering between 40 and 50 per 100,000; however, rates of emergency department visits have increased from 65.4 per 100,000 in 2006 to 72.0 per 100,000 in 2009 (Figure 5). In 2009, youth age 15 had the highest rate of admissions to the emergency department for self-inflicted injuries, and as age increased, the rate steadily decreased (Figure 6). Thus, the pattern of self-harm across ages is strikingly different from the pattern of suicides by age, with more self-harm occurring in the younger group but more deaths in the older age group.

In addition, rates of self-inflicted injury differ by sex. For those under age 20, the 2009 rate of emergency department visits for self-inflicted injuries was higher for males than it was for females. However, after age 20, the rate of visits for self-inflicted injuries is much higher among females than for males; for example, among 20–24 year-olds the rate is 282.4 per 100,000 for females and 127 per 100,000 for males. The rate for women remains higher until age 85, when it becomes about 13 per 100,000 for both groups (Figure 7). Again, this pattern differs from that of suicides by sex.

Finally, the rate of hospitalizations for self-inflicted injuries in California has been highest among whites for the past decade; the rate among black Californians has been consistently lower by a factor of 10 per 100,000, whereas the rate for Hispanics, Asian/Pacific Islanders, and American Indians has generally fluctuated from 20 to 30 per 100,000 (Figure 8).

Figure 5. Self-Inflicted Injury Rate in California, by Year, 1999–2009

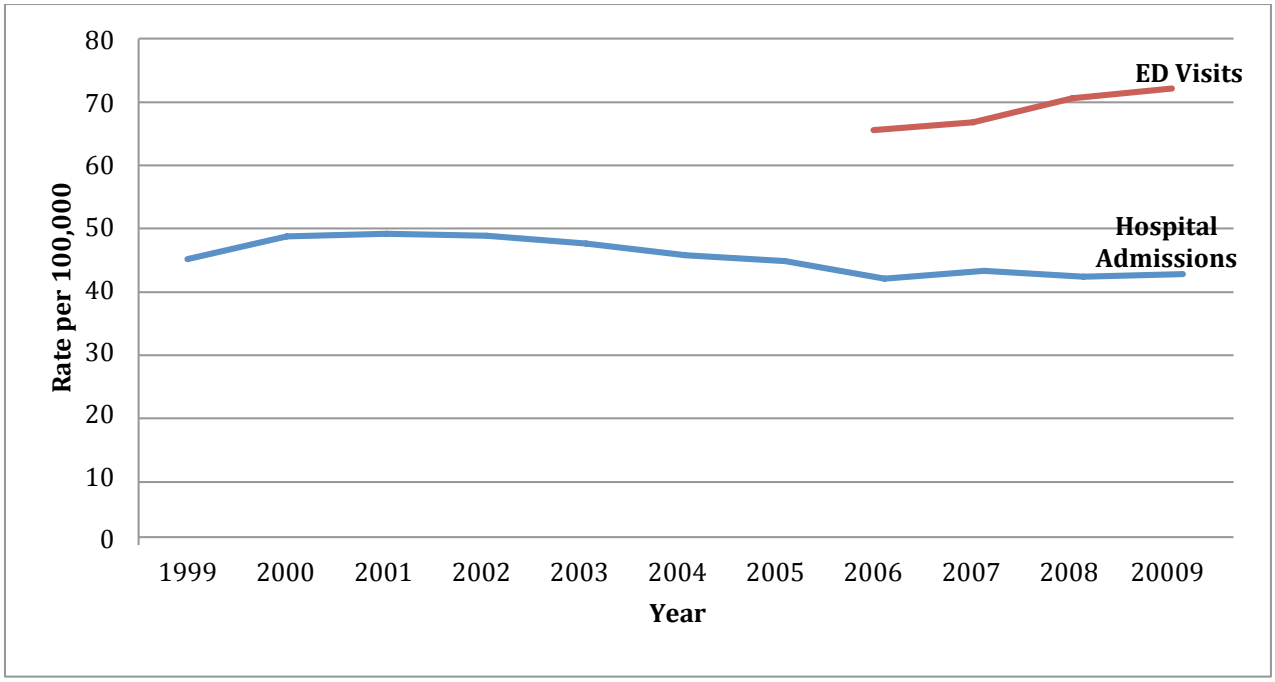


Figure 6. Self-Inflicted Injury Rate Seen in California Emergency Departments, by Age, 2009

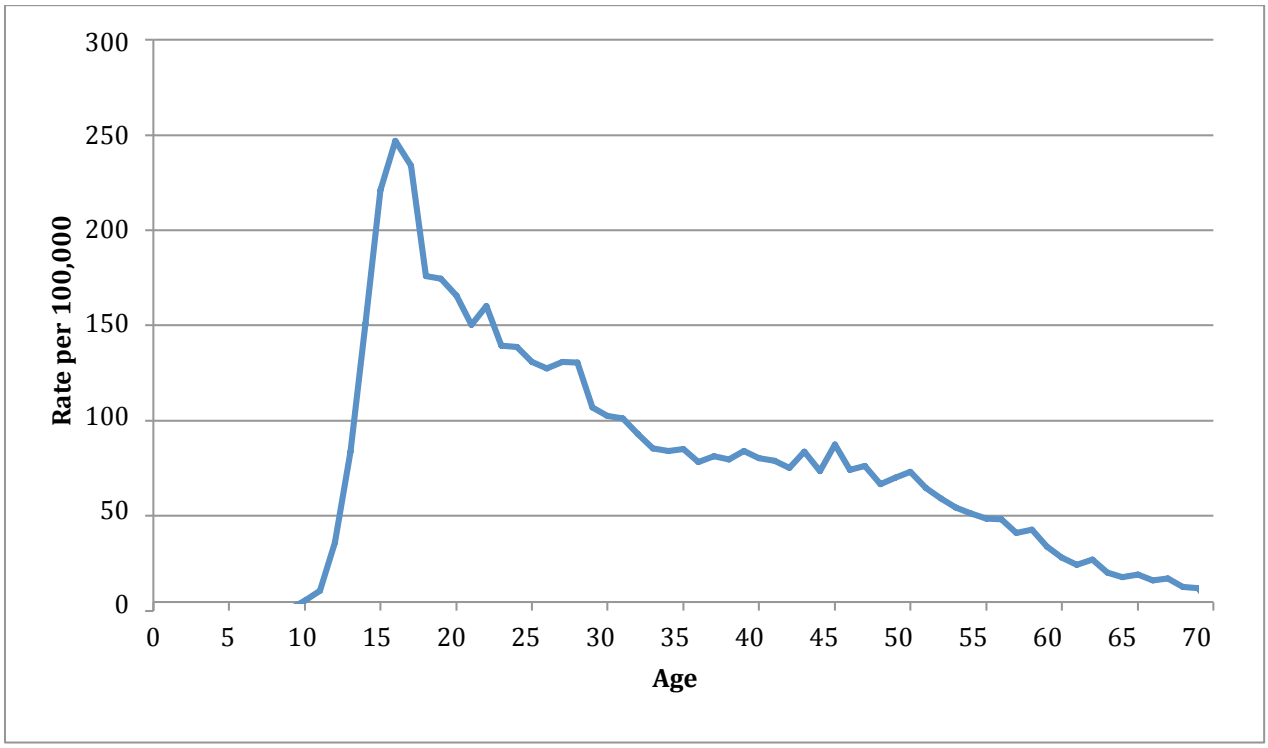


Figure 7. Self-Inflicted Injury Rate Seen in California Emergency Departments, by Age Group and Sex, 2009

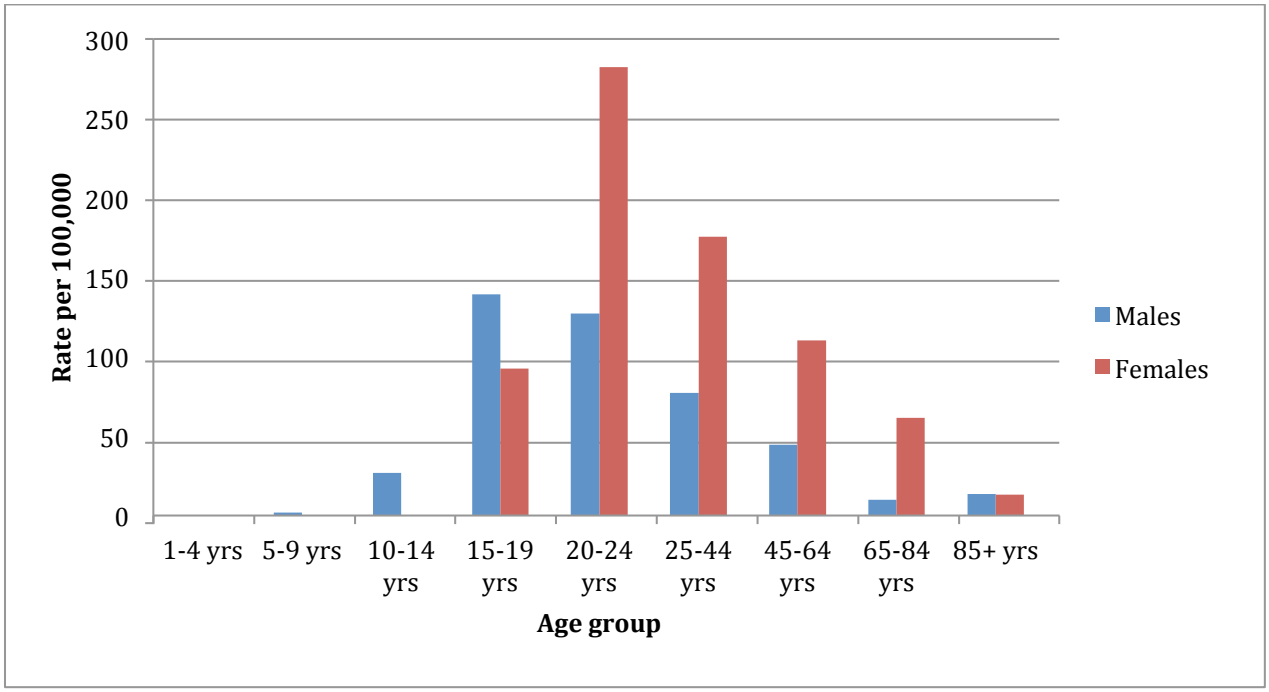
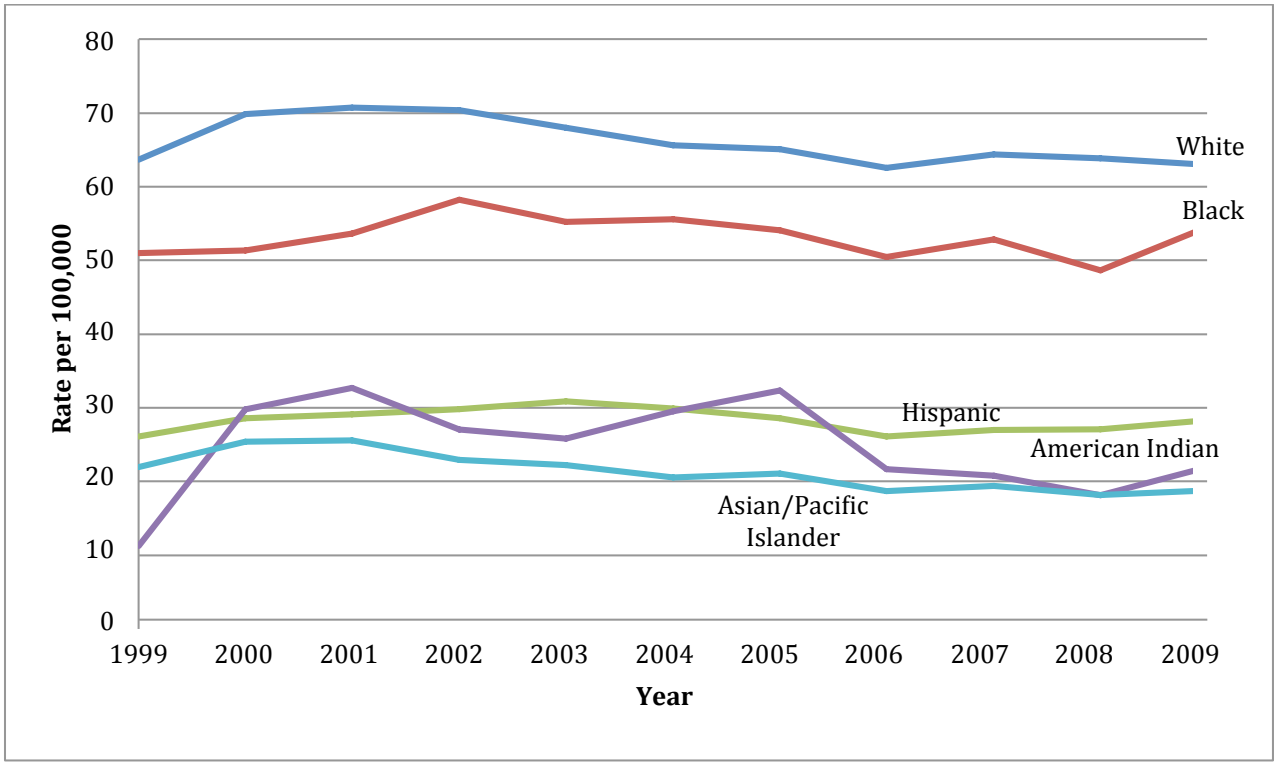


Figure 8. Self-Inflicted Injury Hospitalization Rate in California, by Race and Year



Risk Factors for Suicide

Because of the challenges associated with using deaths by suicide as the outcome of interest (e.g., suicide is a rare event), risk factors for death by suicide are also tracked as part of epidemiologic studies (Ramchand et al., 2011). The scientific literature provides strong evidence for three risk factors for suicide: prior suicide attempts; mental health disorders; and substance misuse, abuse, and dependence:

- *Suicide Attempts.* Although the majority of suicide deaths occur on an individual's first attempt, and the majority of those who make non-fatal attempts do not go on to die by suicide, a prior suicide attempt is the strongest predictor of subsequent death by suicide. Across studies, individuals with a history of suicide attempts have a 40- to 50-fold elevated risk of dying by suicide (Harris and Barraclough, 1997), though it is estimated that only 5–15 percent of those who make an attempt go on to die by suicide (Gibb et al., 2005; Suominen et al., 2004).

- *Mental Health Problems.* Mental health problems are among the greatest risk factors for death by suicide. One study found that approximately 90 percent of those who die by suicide have evidence of a mental disorder; case-control studies indicate that this compares with a mental disorder rate of 27 percent among (mostly living) controls (Cavanagh et al., 2003). Among mental disorders, depression is the most common mental disorder seen in suicide decedents with a history of mental illness (Cavanagh et al., 2003). In cohort studies, persons with major depression have about 20 times the risk of dying by suicide (Harris and Barraclough, 1997), and 4 percent of persons with depressive disorders will die by suicide—much higher than a rate of 0.01 percent in the general population who will die by suicide (Goldsmith et al., 2002). Having more than one mental disorder increases the likelihood of dying by suicide. Research has shown that 57 percent of those who made serious suicide attempts had two or more psychiatric disorders and that the likelihood of having attempted suicide increased with increasing psychiatric morbidity (Beautrais et al., 1996).

- *Substance Misuse, Use, and Abuse.* Substance abuse is also strongly correlated with both mental disorders and suicide. Psychological autopsies indicated that between 19 and 57 percent of those who die by suicide have comorbid substance abuse with a mental disorder, whereas the rate among (mostly living) controls is between 0 and 19 percent. Prospective studies indicate that the increased risk of suicide varies from three-fold (among heavy drinkers) to 17-fold (among those who use multiple drugs) (Wilcox et al., 2004). Case series of suicides also found that between 28 and

53 percent of suicides are alcohol-related, depending on the population being studied, and that between 20 and 30 percent of those who die by suicide were legally intoxicated at the time they died (Goldsmith et al., 2002).

Other risk factors are thought to be associated with suicide, although the scientific research is not as strong as it is for the aforementioned risk factors. Areas in which the science is emerging include:

- *Psychological Correlates.* There is some research among those with mental illness suggesting that individuals with higher levels of hopelessness are more likely to die by suicide; other psychological constructs where there is some research evidence are impulsivity and problem-solving deficits (Mann et al., 1999; McMillan et al., 2007; Pollock and Williams, 2004; Rudd et al., 1994; Wenzel et al., 2009).

- *Genetics.* Epidemiological evidence from family, twin, and adoption studies suggests that there may be a genetic component to suicide (Brent and Mann, 2005; Fu et al., 2002; Glowinski et al., 2001; Roy and Segal, 2001; Schulsinger et al., 1979; Statham et al., 1998).

- *Neurobiology.* Ongoing studies are looking specifically at the role of serotonin and norepinephrine in suicide (Mann, 2002).

- *External Factors or Triggering Events.* There is significant interest in how life events, such as the loss of a relationship or financial hardship, may be linked to suicide. In general, the research suggests that these events interact with a person's underlying vulnerability to suicide. However, there is stronger evidence that being the victim of childhood abuse, and in particular childhood sexual abuse, may be independently associated with suicide (Brent et al., 1999; Fergusson et al., 2000; Goldsmith et al., 2002; Molnar et al., 2001; Paolucci et al., 2001; Santa Mina and Gallop, 1998; Cavanagh et al., 1999; Luoma and Pearson, 2002; Paykel et al., 1975; Yen et al., 2005).

- *Societal Factors.* As we discuss below, some social factors have also been linked with suicide. In the United States, firearm access is correlated with suicides. In addition, there is some evidence that suicides may clusters in time and space, particularly among teens and young adults. Although the phenomenon of clustering has yet to be fully explained, there is some belief that, as with stressful live events, imitative

suicides interact with underlying vulnerability (Gould, 1990; Gould et al., 1990a; Gould et al., 1990b; Insel and Gould, 2008; Kellermann et al., 1992; Kung et al., 2005).

Summary

The epidemiological analysis of suicide highlighted several methodological challenges to evaluating suicide prevention programs. Three challenges in particular should be considered when designing an evaluation:

- **Suicide is a rare event.** Because it is rare, it is difficult to identify differences in suicide rates over time or between geographic regions. Thus, even with a well-constructed evaluation, identifying that a prevention program was effective at reducing suicide deaths is challenging. This is made even more difficult by the lag of availability of suicide data and rules that protect individual and family privacy.

- **Suicide varies by age, race, and sex.** Thus, prevention programs may have differential effects on different population subgroups. In addition, if a program is very effective at reaching elderly women, its overall effect on California suicide deaths may be marginal, because the rate of suicide among this group is already low relative to the rate in other subpopulations.

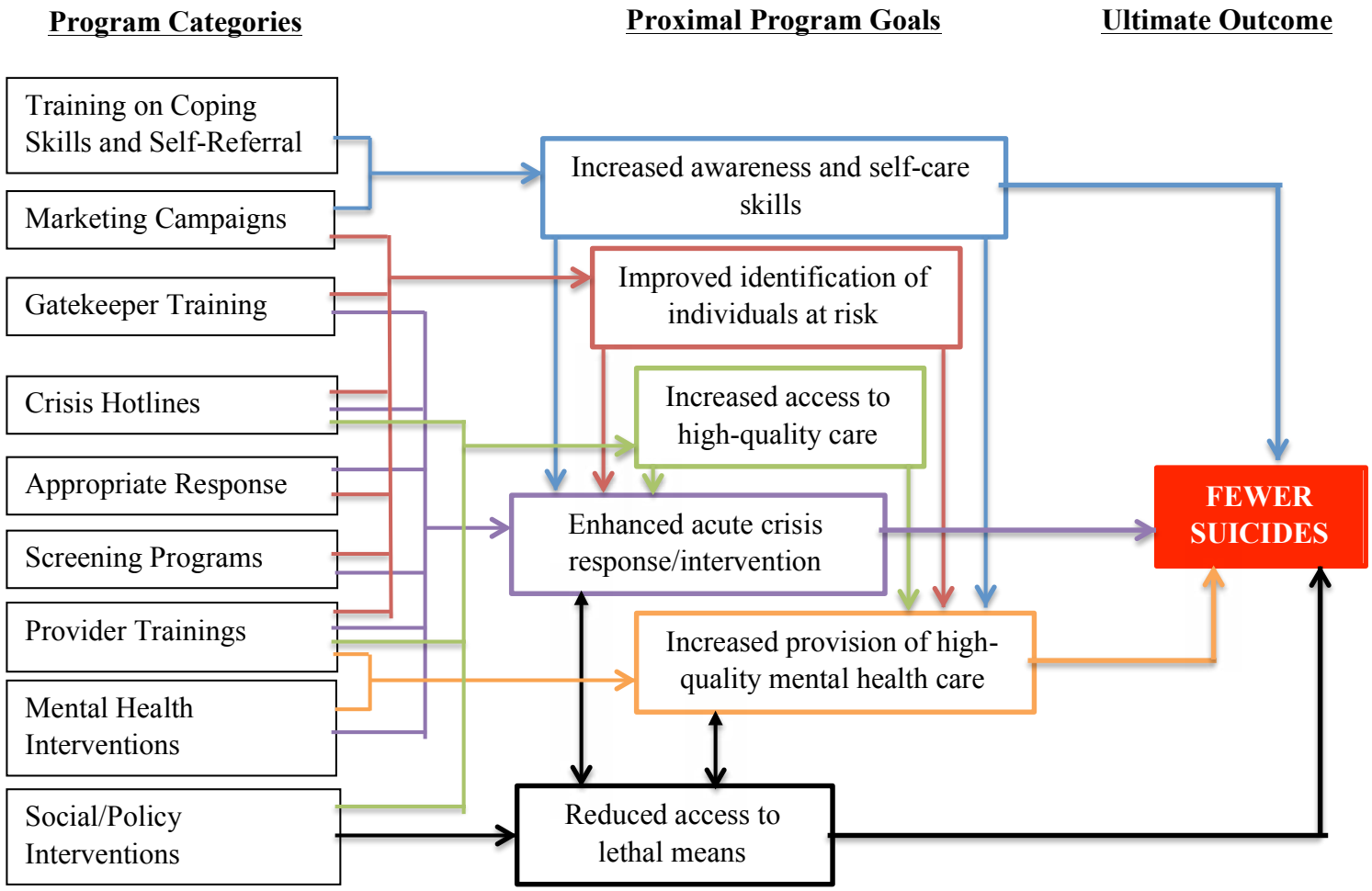
- **Suicide ideation and attempts are important indicators of suicidality, but their relationship with suicide death is complicated.** A well-designed evaluation that demonstrates a reduction in suicide ideation and attempts has made a substantial achievement by reducing these thoughts and behaviors. However, the long-term effect of the program on suicide deaths is uncertain: first, the relationship between suicide ideation and making either non-fatal or fatal suicide attempts is unclear, and second, many of those who die by suicide have never made a previous attempt. For example, the suicide rate in California is highest among the aged, a group that has a very low rate of hospital admissions or emergency department visits from self-inflicted injuries.

Chapter 3. RAND's Conceptual Model of Suicide Prevention Programs

The types of suicide prevention programs identified in our literature review differed widely, and the majority of the evaluation studies we reviewed were either quasi-experimental or non-experimental. In addition, changes in rates of suicides can be difficult to detect without a very large sample size, and many studies did not assess whether the program reduced deaths by suicide. Instead, these studies often used more proximal "program goals" to indicate whether the program was effective. Therefore, the evidence that specific programmatic approaches were effective in reducing suicides was also highly variable. Because of this variation, we have organized the literature review findings into a conceptual model. This model describes how, if programs achieve their proximal program goals, they may ultimately help reduce suicides. In this section, we present our conceptual model and, in doing so, describe the findings from our literature review within the model.

Our model was built by first organizing existing suicide prevention programs into nine distinct categories. We then looked at the programs in each category to examine how they have been evaluated in the past and, specifically, what proximal program goals they had sought to achieve. We then describe how, if these program goals are accomplished, these changes would ultimately result in reduced suicides. Our conceptual model is presented in Figure 9. In the following sections, we discuss the literature behind each component in the model, beginning with the program categories on the left side of the model.

Figure 9. RAND's Conceptual Model of Suicide Prevention Programs



Nine Types of Suicide Prevention Programs

Our review identified nine categories that can be used to describe suicide prevention programs. We describe these categories below; the appendix lists exemplar interventions in each area.

1. **Training on coping skills and self-referral** can include general health promotion programs aimed at increasing awareness of the signs of suicide and symptoms of mental health problems, as well as enhancing individual protective factors and reducing risk factors associated with suicide. There is mixed evidence about the effectiveness of these programs. Some have been found to reduce participants' suicidal planning and attempts and increase self-efficacy and behavioral intentions toward help-seeking (e.g., Surviving the Teens Suicide Prevention and Depression Awareness Program [King et al., 2011]); whereas other programs have shown no effects (e.g., problem-solving intervention [Rudd et al., 1996]). One example of effective training is Signs of Suicide (SOS), a school-based program that teaches youth participants to "acknowledge, care, and tell" about suicide. A classroom-based trial of SOS showed that those who completed the training self-reported fewer suicide attempts in the three months following training and also reported increased knowledge and awareness about depression (Aseltine et al., 2007).

2. **Marketing campaigns** can be used to advertise crisis hotlines and to create public awareness about the signs of suicide and symptoms of mental health problems. There is little research on whether these kinds of campaigns are effective. The National Suicide Prevention Campaign for Teens (www.reachout.com) is one example of a campaign that provides fact sheets on a variety of mental health problems (e.g., depression, anxiety) and suicide; fact sheets on available treatments; written and audio testimonials describing how youth experience and address their mental health problems and suicidal ideations; and links to relevant crisis hotlines including the National Suicide Prevention Lifeline, the Trevor Project (a crisis hotline for gay and lesbian youth).

3. **Gatekeeper trainings** educate friends, family members, clergy, and employees in work and school settings to identify when an individual they know is in distress, to know how and where to refer them for help (e.g., to a school guidance counselor or employee support program that can get them mental health treatment if needed), and to increase the comfort of these gatekeepers when making personal referrals. Many programs fall within this model, but only a few have been systematically evaluated. An evaluation of the Question, Persuade, Refer program, which trained adults in schools to be gatekeepers for students, found that knowledge of services and appraisals of efficacy

and access to services improved as a result of this gatekeeper training. However, these results differed across job type and the effect on staff behavior was limited to those who were already communicating to students about suicide at baseline (Wyman et al., 2008). Some gatekeeper trainings also include skills in how to intervene with someone in an acute suicidal crisis.

4. **Crisis hotlines** are telephone hotlines, such as the National Suicide Prevention Lifeline (NSPL), that an individual can call when in distress (other technologies are also recently being used to provide such services, such as online chat or text messaging; however, neither of these approaches has yet been evaluated). The intent of these services is to provide immediate support, suggest a point-of-access to care, and conduct a short screening protocol to assess suicidal risks (Gould et al., 2007; Kalafat et al., 2007). Conducting evaluations of crisis hotlines is challenging, primarily because it is difficult to compare the proportion of suicidal callers who did and did not access crisis lines and the corresponding proportion that went on to die by suicide in each group. However, a large-scale evaluation of the NSPL that employed third-party listeners did indicate that suicidal callers had lower rates of suicidality after the call, and those re-contacted after three weeks had further reductions in hopelessness and psychological pain (Gould et al., 2007). A more recent study indicates that 44 percent of suicidal callers follow up with the mental health referral provided during the telephone call (Gould et al., 2012a). Hotline counselors can also send emergency personnel to a caller's location to interrupt or "rescue" a caller—in one study, hotline counselors initiated rescue procedures with 13 percent of callers (Gould et al., 2007).

5. **Appropriate response** is important, because there is some evidence that suicides occur in clusters, and because suicides themselves are traumatic events that may act as "triggers" for already vulnerable persons. Guidance is available on how to respond to suicides in a responsible way, both to help survivors grieve but also possibly to prevent future suicides. The most recognized of these are guidelines for the media on how to appropriately report on suicides. There is some evidence to suggest that extended, prominent newspaper coverage of suicides is associated with increased community suicide rates (Gould, 2001); however, studies of television coverage and fictional accounts are inconclusive (Pirkis, 2009).

   Many countries have established guidelines for the media on how to report on suicides; however, evidence of how implementing these guidelines affects suicide is inconclusive (Pirkis, 2009). Guidelines developed by a consortium of advocates and experts are located online (www.reportingonsuicide.org). These guidelines stress that the amount, duration, and prominence of coverage relates to the rate of increased risk; and that risk increases when stories explicitly describe the suicide method, use dramatic or graphic

headlines or images, and sensationalize or glamorize death. Proper coverage, however, can encourage those who are vulnerable to seek help.

6. **Screening programs** use standardized instruments in primary care and non-mental health settings to identify individuals at risk for suicidal behaviors. Currently, the U.S. Preventive Services Task Force recommends that primary care physicians screen for depression, but it does not provide a recommendation for or against specifically screening for suicide risk (U.S. Preventive Services Task Force, Undated). However, there have been some successes with screenings in other contexts. Evaluation of the TeenScreen program, which is a universal screening program for youth conducted in schools, has shown that screening identifies more problems than relying on school professionals alone (Scott et al., 2009), and there is some evidence that screening helps identify those thinking about suicide but who have not yet asked for help on their own (Husky et al., 2009). There is no evidence that among youth, screening for suicide risk increases suicidal thoughts or behaviors (Gould et al., 2005); however, essential for any screening program is the ability to provide adequate resources for those identified as being at increased risk (Hallfors et al., 2006).

7. **Provider trainings** can fall within three domains: training primary care physicians on mental health awareness (Rutz et al., 1989), providing more general training in suicide risk assessment and management, and training providers who treat suicidal individuals with evidence-based therapies known to reduce suicidality (Brown et al., 2005; Linehan et al., 2006b). There is convincing, though not direct, evidence that improved depression awareness among health care professionals can lead to reductions in suicides (Rutz et al., 1989; Mann et al., 2005; van der Feltz-Cornelis et al., 2011b). Because many suicides have contact with a primary care physician within a month of death, primary care physician education programs could be a useful point of intervention. Several studies of primary care physician education programs outside the United States, mostly targeting depression recognition and treatment, reported that these programs resulted in increases in prescription rates for antidepressants and declines in suicide rates (Rutz et al., 1989; Rutz, 2001; Rihmer et al., 2001; Takahashi et al., 1998; Marusic et al., 2004).

   There is limited research on the effectiveness of risk assessments, but examples include the Suicide Attempt Self-Injury Interview (Linehan et al., 2006a), the Collaborative Assessment and Management of Suicidality (Jobes et al., 2005), and SAFE VET (Stanley and Brown, 2008), which have been developed to help restrict patients' access to lethal means in hospital and employment settings. These protocols, however, have not yet been evaluated. Research suggests that many mental health care providers are not formally trained in or do not feel comfortable managing suicidal patients (Dexter-Mazza

and Freeman, 2003; Feldman and Freedenthal, 2006; Feldman et al., 2007), making provider training an especially important, though often overlooked, component of suicide prevention (Ramchand et al., 2011).

8. **Mental health interventions** are the therapeutic approaches used by mental health providers to treat patients who are at-risk for suicidal behaviors. Two treatments—dialectical behavior therapy (DBT) and cognitive therapy—have been shown to be effective in reducing suicidal behaviors in some patients (Brown et al., 2005; Linehan et al., 2006b). DBT is a year-long, mental health treatment model that has been shown to reduce suicide attempts among individuals with borderline personality disorder displaying suicidal or self-injurious behavior (Linehan et al., 2006b). Cognitive therapy, another form of mental health treatment, has also been shown to reduce suicide attempts among prior attempters (Brown et al., 2005). Even relatively low-effort interventions, such as sending "caring letters" to patients with depression, has led to reduced suicides (though replication of this model has not produced consistent results (Aoun, 1999; Morgan et al., 1993; Motto and Bostrom, 2001).

   Evidence-based psychotherapy and pharmacotherapy that improve mental health symptoms may also reduce suicides indirectly by improving mental health symptoms (Blue Ribbon Work Group on Suicide Prevention in the Veteran Populations, 2008; Goldsmith et al., 2002; Leitner et al., 2008). In addition to being evidence-based, the treatment should be delivered with continuity across the system of care. Studies have found that many individuals had seen a mental health professional a short time before killing themselves, but reviews of these data suggest that a breakdown in the continuity of care minimized the effectiveness of the system in preventing these suicides (Luoma et al., 2002). This underscores the need for the provider trainings discussed above.

9. **Social/policy interventions.** Interventions that have modified the physical environment have led to reductions in suicides. Means restrictions can include policies that restrict or delay access to firearms, restrict the availability and packaging of lethal medications, provide fences or other safeguards on bridges or buildings, or construct and implement "breakaway" shower curtain or window rods. The first evidence of means restriction as a way to prevent suicide occurred between 1955–75, when England shifted from toxic charcoal to nontoxic natural gas in homes and observed reductions in suicides of between 19 and 33 percent (Kreitman, 1976). Since that time, there has been evidence that other means restrictions practices prevent suicides, including limiting the quantity and packaging of potentially lethal medications such as over-the-counter analgesics (Hawton et al., 2004) and placing safeguards or fences on bridges to prevent fatal falls (O'Carroll and Silverman, 1994; Sinyor and Levitt, 2010).

Approximately one-third of California suicides involve firearms, and some studies have attempted to examine how firearm availability, or lack thereof, affects suicide. There are three types of studies in this area. First, there are ecological studies showing that suicides are higher in areas with more lax gun control laws or that changes in gun control policies led to changes in suicides (Ludwig and Cook, 2000b; Ludwig and Cook, 2000a). Second, there are ecological studies showing that household firearm ownership is positively correlated with suicides (Ajdacic-Gross et al., 2006). Finally, there are studies at the individual level showing that individuals who die by suicide are more likely to live in houses where firearms are present (Kellermann et al., 1992).

In addition to policies that create a safer physical environment, those that seek to increase health care access by either increasing the supply of properly trained mental health care providers or ensuring that those who need care services can receive them are important for preventing suicide. We discuss these policies in the next section.

In summary, of these nine program categories, there is evidence that only three reduce deaths by suicide: social/policy interventions, mental health interventions, and training on coping skills and self-referral. Means restriction (i.e., making less available the means by which individuals kill themselves)—one type of social/policy intervention—has been shown to reduce suicides. Both dialectical behavior therapy and cognitive therapy—mental health interventions—have shown to be effective in reducing suicidal behaviors in some patients (Brown et al., 2005; Linehan et al., 2006b). Signs of Suicide, a training on coping and self-referral skills, resulted in fewer self-reported suicide attempts in the three months following training and increased knowledge and awareness about depression (Aseltine et al., 2007). However, there was also some evidence that crisis hotlines affected suicidal behaviors, at least in the short-term. For example, one study suggested that crisis hotlines could lower rates of suicidality after the call, and those persons re-contacted after three-weeks had further reductions in hopelessness and psychological pain (Gould et al., 2007). There is some evidence that screening helps identify those who are thinking about suicide but have not asked for help on their own (Husky et al., 2009). However, it is not clear whether these crisis hotlines or screening programs will prevent suicide or suicidal behaviors over the long term. There is little research about whether marketing campaigns, provider trainings, or efforts to promote appropriate response after a suicide event are effective. Few gatekeeper programs have been evaluated, so there is only limited evidence on this approach to prevention.

Proximal Program Goals

The nine program types aim to reduce suicide by achieving proximal programmatic goals in one or more of the following areas:

1. increased awareness and self-care skills
2. improved identification of individuals at risk
3. increased access to high-quality care
4. enhanced provision of acute crisis response/intervention
5. increased provision of high-quality mental health care
6. reduced access to lethal means.

In this section, we discuss the programs types that lead to these program goals and, ultimately, how these proximal goals lead to fewer suicides.

1. **Increased awareness and self-care skills.** Programs that train individual coping skills and how to self-refer, along with media campaigns, generally have as proximal goals increasing awareness about suicide and resources available for individuals in distress and advice on how to care for oneself. There is a direct arrow between this proximal program goal and reduced suicides because, as mentioned above, an evaluation of one such program (SOS) showed that those who completed the training self-reported fewer suicide attempts in the three months following training and also reported increased knowledge and awareness about depression (Aseltine et al., 2007). However, to be effective it is equally important that both an acute crisis response and high-quality mental health care are available to care for those who self-refer.

2. **Improved identification of individuals at risk.** Six of the nine program types seek to better identify persons at risk of dying by suicide. As with trainings on increased awareness and self-referral, gatekeeper trainings and marketing campaigns teach individuals the signs and symptoms of suicide and the resources available for those at risk. However, these trainings may be focused on the steps people can take to identify and help *others* they recognize in distress as opposed to helping themselves. Ensuring that hotline counselors and health care providers are available to help those in crisis, and that they are appropriately trained on mental health awareness and/or suicide risk assessment, also helps identify individuals at risk. In addition, an appropriate response to suicides may provide specifically targeted programs to those who may be close to the decedent (Began, 2010) or those particularly vulnerable to suicide to both help these individuals grieve and prevent possible contagion. Finally, screening entire populations has been proposed, particularly in schools.

There is no direct evidence linking improved identification of persons at risk to reduced suicides. As mentioned above, when discussing screening programs specifically and as with programs that raise self-awareness, key to program effectiveness is the ability to provide adequate and high-quality resources for those identified as being at increased risk. Thus, there is no direct arrow in our conceptual model from improved identification of those at risk to reduced suicides; rather, programs that improve identification of those at risk operate vis-à-vis other proximal program goals: the increased provision of acute crisis response and increased provision of high-quality mental health care (discussed below).

3. **Increased access to high-quality care.** Ensuring that hotlines are adequately staffed and that counselors are appropriately trained to deliver high-quality care are fundamental components of increased access to care. Similarly, ensuring that health care providers—including those who are not mental health care providers but who may deal with suicidal patients, such as emergency medical personnel and those who work in primary care—are available and trained in mental health awareness and suicide risk assessment specifically ensures that persons in crisis have access to high-quality care. Again, though no studies have shown that increased access to care results in reduced suicides, access is necessary to ensure that individuals can benefit from acute crisis response or high-quality care that is available (both of which are described below).

   Policy and legislation is also important for ensuring access to high-quality care. Two policies, in particular, are relevant to expanding access to care through expanded insurance coverage. The Affordable Care Act, which includes the Patient Protection and Affordable Care Act (Public Law [P.L.] 111-148) and the health care provisions of the Health Care and Education Reconciliation Act of 2010 (P.L. 111-152), aims to decrease the number of uninsured Americans and reduce the overall costs of health care. March 2012 estimates from the Congressional Budget Office predict that by 2016, 89 percent of the non-elderly population will have health insurance compared to 80 percent without this legislation. The Mental Health Parity and Addiction Equity Act of 2008 requires that group health plans and health insurance issuers provide mental health or substance use disorders insurance benefits, in particular financial requirements (e.g., co-pays, deductibles) and treatment limits (e.g., visit limits), at a comparable level or no more restrictive than benefits for medical and surgical care. This federal legislation aims to reduce restrictions found more commonly in the coverage of mental health and substance abuse services than in most other health services. These restrictions include

annual or lifetime limits on the number of provider visits or inpatient days, annual or lifetime caps on spending for mental health or substance abuse services, or differential co-pay requirements for these services (Ridgely et al., 2012).

However, gaps remain in workforce capacity, particularly in the areas of mental health and substance abuse providers. In 2006, the Institute of Medicine indicated that the number and geographic distribution of providers were inadequate to meet the service needs of consumers. As of October 2012, 87.7 million people were still living in areas designated as having mental health provider shortages (Health Resources and Services Administration, 2012). [3]

4. **Enhanced provision of acute crisis response/intervention.** Some suicide attempts are interrupted by third parties, including family members, friends, strangers, emergency personnel, or clinicians. Thus, there is a direct arrow from this proximal program goal to reduced suicides. Gatekeeper trainings, crisis hotlines, providing an appropriate response to a suicide, screening programs, provider trainings, and intervention all work to either enhance the capacity of acute crisis response or ensure that people are adequately trained to respond appropriately. Although the number of interrupted attempts in California is unknown, we do know that there were 28,000 emergency department admissions for self-inflicted injuries in 2009 (e.g., poisoning, cutting/piercing). Though the ultimate outcomes of these visits are unknown, other literature allows us to make some extrapolations. Namely, individuals who are admitted for self-inflicted injuries rarely die in the emergency department and are often transferred to another facility or service provider such as social services (Doshi et al., 2005). Though the actual proportion is unknown, it is clear that without this type of crisis intervention provided by emergency response personnel, some of those who self-injured may have ultimately died from their injuries.

5. **Increased provision of high-quality mental health care.** Although not all those with mental disorders are at risk of dying from suicide, there is some evidence to indicate that the majority of those who die by suicide have some sort of mental health problem. There is both direct and indirect evidence that providing high-quality mental health

[3] A shortage area is designated as having one of the following: (1) A population-to-core-mental-health-professional ratio greater than or equal to 6,000:1 and a population-to-psychiatrist ratio greater than or equal to 20,000:1; (2) a population-to-core professional ratio greater than or equal to 9,000:1; (3) a population-to-psychiatrist ratio greater than or equal to 30,000:1.

care can reduce suicides, thus there is a direct arrow from this proximal program goal to reduced suicides. The most direct evidence comes from randomized control trials of specific mental health interventions. Both dialectical behavior therapy and cognitive therapy have been shown to be effective in reducing suicidal behaviors in some patients (Brown et al., 2005; Linehan et al., 2006b). Provider trainings and further development of evidence-based interventions will help improve the provision of quality care.

6. **Reduced access to lethal means.** Making less available the means by which individuals kill themselves has been shown to reduce suicides, represented by a direct arrow from this proximal program goal to fewer suicides (Kreitman, 1976; Hawton et al., 2004; O'Carroll and Silverman, 1994; Sinyor and Levitt, 2010). However, the most researched, and also the most controversial, means restriction efforts include policies that restrict access to firearms to prevent self-inflicted gunshot wounds. Though collectively reduced access to lethal means is linked with a reduction in suicide, the process by which reduction occurs is debated. Many posit that without lethal means present, impulsive suicide attempts are thwarted. However, there is also the possibility that persons still attempt suicide but use less lethal, and more reversible, means.

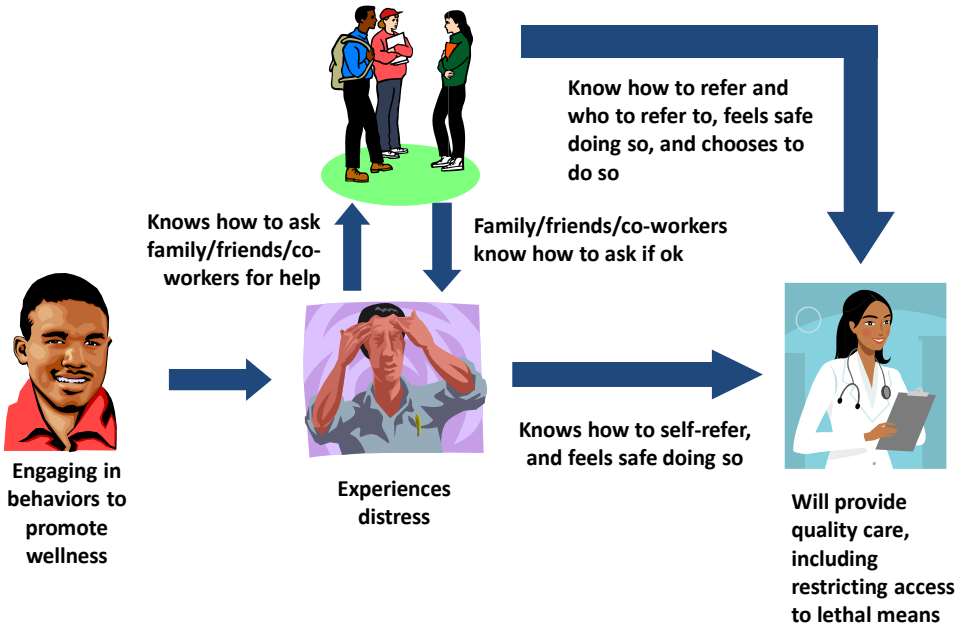
   Generally speaking, social policy that creates safer physical environments by, for example, restricting access to firearms or re-packaging lethal medications largely leads to reduced access to lethal means. It is important to note that though the delivery of high-quality care and means restrictions can be independent efforts, they can also be interrelated (represented in the figure by the bi-directional arrow). More specifically, the delivery of quality mental health care can include means restrictions efforts. For example, assessing individuals for suicide risk and restricting their access to lethal means are seen as key elements when intervening with individuals in crisis (e.g., individuals accessing crisis intervention services, suicide hotlines, and the emergency room).

Proximal Program Goals Work Together

Figure 10 highlights, from an individual perspective, how attaining these proximal program goals might prevent suicide for an at-risk individual. The arrows in this figure represent possible pathways of influence. For example the bottom left arrow shows that individuals may be engaging in healthy behaviors and learning healthy coping skills (training on coping

skills). Continuing along the bottom of the figure, if an individual becomes distressed, he or would know how to self-refer and would feel comfortable doing so (access to high-quality care). This self-referral action would take the individual to quality care, which includes attention to means restriction. However, if the individual were not able to self-refer, he or she may be encouraged to seek help by friends, family, coworkers, and other community members. As shown in the vertical arrows at the top of the figure, these support networks (e.g., family, friends) would know how to ask if the person was in crisis and would understand how, and to whom, to refer the individual (identification of person at risk); or if asked by the individual for help, people in these support networks would feel comfortable in choosing to make the referral. Once the individual was directed to the community's system of care, he or she would receive seamless, coordinated, and quality care that helped avert the immediate suicidal thoughts and behaviors and helped prevent future suicidal behaviors. As part of the delivery of quality care, the physical environment would be secured to reduce access to lethal means.

Figure 10. Possible Ways the Proximal Program Goals Could Influence an Individual in Distress



Differential Effects of Prevention Programs, by Race

As described above in the first section of this review, rates of both suicide and self-inflicted injuries differ by sex and by race/ethnic groups. Thus, there is interest in whether certain types of programs are more effective at reaching specific racial/ethnic groups or are more effective at reaching males versus females. Unfortunately, few studies have focused significantly on these characteristics. Those that have, however, can be categorized into three types. The first type features programs that were designed to fit the needs of a specific demographic group. The Zuni Life Skills Curriculum (LaFromboise and Howard-Pitney, 1995) and the Suicide Prevention Program of a Western Athabaskan American Indian Tribe ("Suicide Prevention Evaluation in a Western Athabaskan American Indian Tribe—New Mexico, 1988–1997," 1998; May et al., 2005) each target American Indian populations. Customized to address cultural norms, these programs aim to outperform more generic alternatives. Studies reported lower rates of suicidal acts, less hopelessness, and greater intervention and problem-solving skills, suggesting that these culturally tailored programs were indeed effective but they were not tested against other, more general, efforts.

The second type of study has a population whose demographics are significantly disproportionate to those of the general population because certain sex or racial/ethnic groups were intentionally or unintentionally oversampled. Some studies restricted participation to female subjects (Linehan et al., 1991; Rotheram-Borus and Bradley, 1991), whereas others comprised solely male participants (Daigle et al., 2006; Mishara et al., 2005). One study focused entirely on African American students (Brown and Grumet, 2009). In addition, depending on the sampling procedure, some studies have unintentional overrepresentation. With the participants coming from a hospital in a predominantly Latino neighborhood, the subjects of one study were primarily Latina (Rotheram-Borus et al., 1996); in a study on adolescent runaways in New York City, participants were predominantly of minority racial groups (Rotheram-Borus and Bradley, 1991). Because these studies did not include a comparison or control group and were not testing a program specifically tailored for a racial/ethnic group or sex, they are not particularly useful for assessing whether programs are more or less effective for certain populations.

The third type of study explores the differential effectiveness of suicide prevention programs with respect to demographic differences. There is almost no literature describing significant differences in program effectiveness based on the racial or ethnic identity of the subjects. However, several studies report variation in effectiveness by sex. Studies on the Suicide Awareness Curriculum and the Nuremberg Alliance against Depression suggest that female subjects are more receptive to and more likely to gain from these programs than their male counterparts (Dietrich et al., 2010; Spirito et al., 1988). Another study reported a 74 percent reduction in suicide risk for elderly women in the intervention

region, with no change in risk observed for men in the same region or either men or women in the comparison region (Oyama et al., 2006b). A study on gatekeeper training concluded that while female students reacted positively to the program by showing less hopelessness and more appropriate attitudes and strategies post-training; male students actually demonstrated a decrease in appropriate response and an increase in hopelessness after participation (Overholser et al., 1989). While not suggesting differential effectiveness of the program, one study of the Air Force Suicide Prevention Program reported variation by sex in the emotional responses to the curriculum materials themselves: Suicidal female subjects showed a decrease in negative emotion over the course of the program, yet no comparable change was observed for the male subjects (Bryan et al., 2009).

Chapter 4. Commonly Used Measures for Evaluating Suicide Prevention Programs

After reviewing the literature, we thought it necessary to identify measures used to evaluate programs in light of the aforementioned challenges inherent in showing that a program reduces suicides or suicide attempts. We identified sample measures that correspond to each of the proximal program goals identified in our conceptual model, as well as measures of the ultimate outcome—suicidal behaviors (see Table 2). Measures related to knowledge, skills, and attitudes were the primary measures used in past evaluations of media campaigns and individual and gatekeeper training programs. Evaluations of programs focused on increasing identification of individuals' knowledge or level of risk measured changes in suicide intervention skills, the self-efficacy of referrers, and the sensitivity and specificity of screening instruments to identify individuals exhibiting impulsive and self-damaging behaviors, suicide risk behaviors, and mental health and substance abuse problems. Access to care was evaluated by assessing perceived barriers to mental health treatment and availability of mental health care providers. Evaluations of mental health treatment services considered measures of treatment adherence both to psychotherapeutic and psychotropic treatments, presence and severity of mental health problems, and hopelessness. Finally, suicide itself was compiled by death records, described above. Research studies also used some measures of suicidal ideation and suicide attempts that may be useful to consider when designing program evaluations.

Table 2. Sample Measures for Evaluating Suicide Prevention Programs

Sample Measures	Brief Description	Reference(s)[4]
Increased awareness of suicide signs and symptoms and self-care skills		
Problem solving skills	Extent to which an individual applies problem-solving skills and has a proactive coping style (e.g., tackles problems head-on)	(Thompson and Eggert, 1999)
Knowledge about suicide	Extent of an individual's knowledge about the signs and symptoms of suicide, as well as the mental health problems associated with suicide such as depression and substance abuse (e.g., depression is an illness that a doctor can treat)	(Shaffer et al., 1991; Spirito et al., 1988)
Attitudes about suicide	Assessment of stigma associated with suicidal behaviors and the extent to which suicide can be prevented (e.g., If somebody really wants to kill him/herself, there is not much I can do about it)	(Shaffer et al., 1991; Spirito et al., 1988)
Attitudes toward mental health treatment	Extent to which individuals have a negative attitude toward mental health treatment or have concerns that that might affect their decision to seek treatment for a psychological problem from a mental health professional	(Britt et al., 2008; Rotheram-Borus et al., 1996)
Skills associated with help-seeking behaviors	Extent to which individuals have engaged in help-seeking behaviors in the past three months (e.g., in the past three months, have they received treatment from a psychologist….)	(Aseltine and DeMartino, 2004)
Reasons for Living Inventory, Survival and Coping Scale	Assessment of positive expectancies about living as opposed to killing oneself and the importance of these beliefs in resisting suicide	(Linehan et al., 1983)

[4] These references include references to the source article where development of the measure is described, as well as references to evaluation studies and clinical trials where the measure was used.

Sample Measures	Brief Description	Reference(s)[4]
Improved identification of individuals at risk		
Suicide intervention skills	Extent to which gatekeepers were able to elicit a promise from the peer not to act on suicidal intentions until talking with someone first, express willingness to accompany the peer to a resource person, not agree to keep a secret about the peer's suicidal intentions, and display active crisis intervention skills	(LaFromboise and Howard-Pitney, 1995)
Self-efficacy identifying and referring individuals at-risk	Extent to which gatekeepers feel comfortable applying suicide prevention skills, active listening, problem-solving, anger management, and stress management skills to identify and refer individuals at-risk for suicide to appropriate care. This measure also relates to access to care.	(LaFromboise and Howard-Pitney, 1995)
Screening for self-damaging impulsive behavior	Extent to which an individual engages in self-damaging behavior including gambling, binge eating, substance misuse, and reckless driving	(Arntz et al., 2003)
Screening for suicide risk	Use of systematic tool such as the Symptom Driven Diagnostic System for Primary Care, the Scale for Suicidal Ideation, or the Suicidal Ideation Screening Questionnaire to screen individuals for suicide risk. Screenings can take place in primary care, school, employment, and other non-mental health and mental health settings	(Beck et al., 1997; Broadhead et al., 1995; Cooper-Patrick et al., 1994)
Screening for mental health and substance abuse problems	Use of systematic tool such as the Symptom Checklist-90 or the Alcohol Use Disorders Identification Test to screen individuals for mental health and substance abuse problems. Screenings can take place in primary care, school, employment, and other non-mental health settings.	(Derogatis, 1977; Saunders et al., 1993)
Increased access to high-quality care		
Barriers to care	Extent to which individuals experiences barriers that might prevent them from seeking treatment for a psychological problem (e.g., depression) from a mental health professional (e.g., a psychologist or counselor).	(Britt et al., 2008)

Sample Measures	Brief Description	Reference(s)[4]
Mental health care shortage areas	Whether individuals live in a mental health catchment area designated as having a provider shortage	(Gaynes et al., 2004)
Enhanced acute crisis response/intervention		
Follow-up to crisis referrals	Extent to which individuals actually sought mental health services they were referred to as part of crisis response	(Gould et al., 2012b)
Responder skills	Whether the responder handled the person in crisis with empathy, respect, a supportive approach, and collaborative problem-solving	(Mishara, 2007)
Improved provision of high-quality mental health care		
Treatment adherence	Extent to which patients follow recommended treatment regime suggested by mental health providers	(Rotheram-Borus et al., 2000)
Presence and severity of mental health problems	Extent to which an individual is suffering from a mental health problem as defined by a structured clinical interview for Axis I DSM-IV Disorders (e.g., depression, anxiety disorders)	(First et al., 1995)
	Severity of depression symptoms as measured by the Hamilton Depression Scale, Beck Depression Inventory, Center for Epidemiological Studies Depression Scale	(Beck et al., 1961; Hamilton, 1960; Radloff, 1977)
Medication use	Extent to which an individual is adhering to prescribed psychotropic medications	(Linehan and Heard, 1987)
Hopelessness	Extent to which individuals feel their lives are bleak, despairing, and that they have no hope of being successful (e.g., All I can see ahead of me are bad things)	(Beck et al., 1974; Kazdin et al., 1986)
Reduced access to lethal means		
Delivery of means restriction education	Whether means restriction education or injury prevention education was delivered to caregivers' family members advising them to dispose of or lock up suicide means	(Kruesi et al., 1999)

Sample Measures	Brief Description	Reference(s)[4]
Restriction of means	Presence or absence in the home means restrictions: firearms, over-the counter medications, prescription medications, or street drug	(McManus et al., 1997)
Development of a plan for restriction of means among individuals at-risk for suicide	Extent to which mental health providers develop a plan to restrict access to firearms for individuals at-risk for suicide	(McManus et al., 1997)
Suicidal behaviors		
Suicidal ideations	Harkavy Asnis Suicide Survey	(Harkavy-Friedman and Asnis, 1989; Harkavy-Friedman, 1985)
	Pierce Suicidal Intent Scale administered by physicians to patients includes 12-items (isolation, timing, precautions against discovery, seeking help, final acts, notes, predictable outcome, probability of death, patient's expectation of lethality, lethality, premeditation, reaction to act)	(Pierce, 1981)
	Single-item assessment of suicidal ideations (During the past 3 months, did you ever seriously consider attempting suicide)	(Kann et al., 2000)
Suicide attempts	Suicide attempt self-injury interview	(Linehan et al., 2006a)
	Suicidal behaviors questionnaire	(Linehan, 1981)
	Single-item assessment of suicide attempts (During the past 3 months, did you actually attempt suicide)	(Kann et al., 2000)

Conclusion

This report is a literature review designed with the specific goal of helping RAND evaluate CalMHSA's Prevention and Early Intervention programs for suicide prevention. To do so, we (1) analyzed the epidemiology of suicide, suicide ideation, and non-fatal self-injuries in California; (2) developed a conceptual model that we can use to guide program evaluation; and (3) identified measures that have been used to evaluate suicide prevention programs.

California has a suicide rate that is generally lower than that of the United States. Over the past decade, there are between 2,800 and 4,000 suicide deaths annually. Half of these deaths are among those over age 50, and the majority of suicide deaths in the state are among men. One-third of these deaths are caused by a firearm. Data such as these will be useful in identifying how programs may be targeted to different demographic groups, as well as whether there are important populations at risk of not being reached by programs across the state.

Three programmatic approaches were shown in the literature to reduce deaths by suicide: social/policy interventions, mental health interventions (dialectical behavior therapy and cognitive therapy), and training on coping skills and self-referral (e.g., Signs of Suicide). There was also some evidence that crisis hotlines and trainings on coping and self-referral skills affected suicidal behaviors (e.g., attempts or ideations). Overall, it is not clear whether these programs will prevent suicide or suicidal behaviors over the long term. However, by identifying key proximal program goals, the conceptual model we developed describes how, if the outcomes specified are achieved, programs *may* contribute to an overall reduction of suicides in California.

We were able to identify measures for relevant program outcomes, including deaths by suicide and suicidal behaviors, as well as measures that can be used to indicate achievement of proximal program goals, such as increased skills. As mentioned above, evaluating suicide prevention programs can be difficult because suicide is a rare event and data limitations and privacy concerns affect the availability of information. Variations in suicide by age, race and sex may result in differential effectiveness of programs, making outcomes even more difficult to detect. Finally, it is important to recognize the limitations of using suicide ideations and attempts as markers of program success.

In addition to these methodological issues related SP program evaluation, we also identified two areas where more research is needed. First, although a body of SP evaluation research explores the effects of SP programs on outcomes such as reduced access to lethal means, provision of care, and crisis response, we also need to learn more about how these programs influence suicide rates. Second, although some evidence suggests that SP programs targeted at specific subgroups can be effective ("Suicide Prevention Evaluation in a Western Athabaskan American Indian Tribe—New Mexico, 1988–1997," 1998; May et al.,

2005) more research is needed to address the differential effectiveness of SP programs for population subgroups vulnerable to suicide.

Appendix

Table A.1. Key Evaluations of Suicide Prevention Programs

Program Type	Description of Program	Description of Evaluation	Summary of Evaluation Findings	Reference
Training on coping skills and self-referral	*The Personal Growth Class* is a semester-long class involving a small-group work component to focus on social support, weekly monitoring of activities targeting changes in mood management, school performance and attendance, and drug involvement, and life skills training in self-esteem enhancement, decisionmaking, personal control, and interpersonal communication.	The evaluation compared youth in the class to a random sample of youth not at-risk for school failure over time.	The intervention resulted in improvements in outcomes (suicide risk behaviors, depression, hopelessness, stress, anger, self-esteem, and social network support) among the intervention group as compared with the control group. However, no differences in personal control were detected.	(Eggert et al., 1995)

Training on coping skills and self-referral	*Surviving the Teens Suicide Prevention and Depression Awareness Program* is a 4 session classroom intervention designed to increase knowledge, decrease stigma of depression and other mental disorders, improve coping, increase help-seeking, increase the likelihood of depressed teens seeking help, increase family and school connectedness, and decrease suicidal and other risk-taking behaviors.	A pre- and post-test was used to examine the effect of the intervention on suicide ideation, suicidal behavior, self-efficacy, and behavioral intent regarding help-seeking.	The evaluation found that youth participants exhibited reductions in considering suicide, making a suicidal plan and attempting suicide, as well as increases in self-efficacy and behavioral intentions toward help-seeking.	(King et al., 2011)
Training on coping skills and self-referral	*Problem-solving intervention* was designed to improve coping and problem-solving to decrease suicidal ideation and behavior. The program included an experiential-affective group, psycho-educational classes, and an extended problem-solving group. Treatment was group-based outpatient but in a partial or day hospital format.	Suicidal patients were randomly assigned to experimental group vs. treatment as usual. Treatment as usual involved a combination of inpatient and outpatient care.	The evaluation found no group differences at 1, 6, or 12 months. Both groups improved over time in terms of symptoms, problem-solving, suicidality, and other outcomes. However, the experimental group had less attrition than control group.	(Rudd, 1996)

Marketing campaign	*Suicide Prevention Week* is a yearly one-week media campaign that uses newspapers, radio, and television to change the behavior and attitudes of suicidal individuals and influence the public.	A random sample of Quebec male residents were surveyed regarding attitudes, knowledge, intentions, behaviors, and exposure to the campaign. Those who were not exposed to the campaign formed the control group. Data were also collected daily regarding number of suicides and suicide attempts, and use of various resources.	Respondents exposed to Suicide Prevention Week demonstrated significantly more knowledge about suicide than those who were not, but no differences were observed in attitudes or help-seeking intentions. Also there was no significant difference in observed behaviors, with the exception of suicide-related websites visited. No unintended negative effects of Suicide Prevention Week were observed.	(Daigle et al., 2006)
Marketing campaign	*Youth suicide: Recognizing the Signs* is a video campaign intended to teach the signs of suicide and how to respond.	The evaluation included a pre- and post-test of knowledge of suicide, response to suicidality, perceptions about suicide, and intention to respond to suicidal individuals.	After the video there was improved knowledge, response, and intention to help; attitude was more rejecting of suicide.	(Maine et al., 2001)

Gatekeeper training	*School Based Suicide Prevention Program Signs of Suicide (SOS)* teaches high school students to respond to the signs of suicidal thoughts and behaviors as a mental health emergency.	The safety, efficacy, and feasibility of implementing the SOS program was evaluated using data collected from 92 schools during the 2000–2001 school year.	The evaluation showed that there was a nearly 60% increase in help-seeking behavior among students following the training (help-seeking behavior being defined as seeking counseling for depression or suicidal ideation). Overall evaluations of the training program in general showed excellent ratings on the questionnaire.	(Aseltine, 2003)
Gatekeeper training	*Question, Persuade, Refer* is a 1-hour community gatekeeper training geared toward community members who may serve in gatekeeper roles for citizens in the community. The training is focused on suicide education and awareness, active listening, and used role-playing.	The goals of this pilot study were to (1) study training outcomes, including skills, from a brief gatekeeper training; (2) assess the feasibility of incorporating active learning principles (i.e., role-playing practice) into standardized gatekeeper training; and (3) examine employee satisfaction with, and diffusion of information from, gatekeeper training conducted in the workplace (e.g., share the training information with family and friends).	Pre-post analyses resulted in positive changes in participants' knowledge about suicide and attitudes (self-efficacy) about intervening with suicidal individuals. A subset of participants engaged in role play practice of gatekeeper skills following training and rated the experience positively.	(Cross et al., 2007)

Crisis hotline	*National Suicide Prevention Lifeline* centers attempt to reduce callers' current crisis or suicidal states and provide referrals to mental health care. Many federal and community public-awareness campaigns reference the Lifeline.	Lifeline callers who had received a mental or behavioral health care referral were interviewed two weeks after their call to assess depression, referral follow-through, and barriers to utilization in both suicidal callers and non-suicidal crisis callers.	Only 51.6% of subjects actually sought mental health services after their referrals. The most common barrier cited was the caller's perception about mental health problems, followed by the caller's financial problems. No significant difference in rates of mental health service utilization was observed between suicidal and non-suicidal crisis callers.	(Gould et al., 2012b)
Crisis hotline	*1-800-SUICIDE* is a national suicide prevention crisis hotline in the United States.	Trained observers listened to and coded calls in real time.	Empathy, respect, supportive approach, good contact, and collaborative problem-solving were significantly related to positive outcomes. Active listening was not related to outcomes.	(Mishara, 2007)

Crisis hotline	*A prevention program at the Los Angeles Suicide Prevention Center* provided a24-hour call hotline.	A comparison of suicide rates in Los Angeles County before and after the introduction of the suicide prevention service. Also, comparisons were made with the suicide rates in other California counties (1 of the other 3 counties had a prevention program, 2 did not).	Researchers did not find a decrease in the suicide rate of Los Angeles Country after implementation of the program but rather an increase. The suicide rate seemed to increase slightly with the rise in number of calls.	(Weiner, 1969)
Appropriate response	*Los Angeles Survivors-After-Suicide Program* provides eight sessions, once a week, conducted by two leaders (mental health professional and survivor of suicide who has gone through the program and received additional training). After eight weeks, participants are invited to attend monthly meetings as long as they wish.	Using an intervention and control group, study examines the results of the program through pre- and post-intervention questionnaires.	By end of program, significantly decreased ratings by intervention group on all emotions except feeling suicidal themselves (which was low to start with). Controls had only decreased in anxiety. Also, intervention group's ratings went down relative to control.	(Farberow, 1992)

Screening program	*Participatory screening program* included (1) public health education from 1991–2000 and (2) screening for depression with follow-up from 1991–1997, using public health and primary care resources in the town with the assistance of the psychiatric care resources in the neighboring country.	A quasi-experimental evaluation design was used to evaluate the program. Risk of death by suicide before and after the 10-year implementation was assessed in intervention and reference municipalities.	The risk for women in the intervention area was reduced by 64%, whereas there was no significant change in the risk for men in the intervention area and either men or women in the reference area. The risk reduction for women in the intervention area was greater than the secular trend.	(Oyama et al., 2006a; Scott et al., 2009)
Screening program	*Columbia Health Screen and Post-Screening Structured Interview (PSSI)* is a 14-item questionnaire that includes a question on reporting needing help with an emotional problem. Youth who screened positive were administered the PSSI by clinical staff.	Study randomized classrooms to receive the screening or not and then assessed differences in referrals to mental health services among those identified via screening versus those identified via usual process (parents, teachers, etc.).	Screened students were 21 times more likely to receive a referral for mental health services.	(Husky et al., 2009; Husky et al., 2011)

Screening program	*The Columbia Suicide Screen (CSS)* is an 11-item questionnaire embedded in a health survey administered during regular class time.	Several evaluation studies assess the CSS. In all studies youth who screened positive and a control group were re-assessed with the Diagnostic Interview Schedule for Children and school staff were also asked to assess all youths who completed the CSS for emotional problems. Scott et al. (2010) and Shaffer, Scott, and Wilcox (2004) also tested optimal positive-screen algorithm using sensitivity, specificity, positive-predictive value.	34% of those with mental health problems were identified by screening only; 13% were identified by school officials; 35% were identified by both. 18% of those with mental health problems were not identified by either (Scott et al., 2009). Three different screening algorithms were also tested and identified 96%, 92%, and 89% of youth with mental health problems (corresponding positive screens are 35%, 24%, 17%; Scott et al., 2010). Best algorithm relied on suicide ideation or previous attempt and a score greater than or equal to 3 for the screening questions about whether they were unhappy, withdrawing, irritable, and anxious (Shaffer, Scott, and Wilcox, 2004).	(Scott et al., 2010; Scott et al., 2009; Shaffer D, 2004)

Screening program	*Diagnostic Predictive Scales-8* (DPS-8) is an 84-item computerized voluntary self-report assessment offered to youth at no cost. The DPS-8 screen for mental health problems, including suicide.	Clinicians reviewed results of the screen at a visit and the study assessed whether youth who screened positive received pediatric mental health care or were referred to specialty mental health care.	14% of youth who completed the screening screened positive for one or more mental disorders. Screening was associated with an increased likelihood of receiving pediatric mental health care or referral for specialty mental health care	(Husky et al., 2011)
Provider training	*Counseling on Access to Lethal Means (CALM)* is a 2-hour workshop for mental health care providers to learn about how reducing access to lethal means can prevent suicide. The training included presentations, video-screening, instruction, discussion, and role-playing in addition to written materials.	Participants attended CALM training and they immediately answered a questionnaire comparing their pre-CALM and post-CALM attitudes and beliefs. This post-test was compared to the follow-up responses of the same group 6–8 weeks later.	Participating in CALM led to a significant increase in commitment and skills for counseling using means reduction. These beliefs and attitudes were sustained in the weeks following the program. However, there was a significant decrease in the perceptions of the effectiveness of means reduction between post-test and follow-up.	(Johnson et al., 2011)

Provider training	The *Gotland Educational Program* was directed at all general practitioners in Gotland, Sweden, and consisted of two 2-day sessions of oral and written information, group work, case reports, and discussions focused on suicide prevention.	Baseline measures, prior to the program, were compared to the trends of suicide rates, prescription rates, sick leave, inpatient care, and general practitioner attitudes over the next five years in Gotland.	General practitioners reported an increase in competency, knowledge, and support of comprehensive treatment. Additionally, the suicide rate, the number of psychiatric referrals, and depression-related sick leave and inpatient care decreased in Gotland following the program. Lithium and anti-depressant prescriptions also increased.	(Rutz, 2001)

Mental health intervention	*Multisystemic Therapy* (MST) is a home-based model of service provision/ treatment delivery grounded in social ecological and systems theories and used to treat youth with mental health problems.	Multiple evaluation studies have been conducted on MST comparing MST to hospitalization, by randomizing youth to receive one or the other.	Huey et al. (2004) found that MST was significantly more likely at reducing self-reported suicide attempts over the course of 16-months following recruitment, but there was no long-term effects were found for suicide ideation. Consumer satisfaction was also higher in the MST condition. Henggeler et al. (1996) and Rowland et al. (2005) found that MST was also significantly more likely to reduce externalizing symptoms and improving family functioning and school attendance. Schoenwald et al. (2000) found that 25% of youth randomized to MST were subsequently hospitalized during the 2 weeks following referral to MST.	(Henggeler et al., 1996; Huey Jr et al., 2004; Rowland et al., 2005; Schoenwald et al., 2000)

Mental health intervention	*Dialectical Behavior Therapy* (DBT) is a one-year behaviorally oriented outpatient psychotherapy for parasuicidal bipolar disorder patients with the goals of reducing parasuicide and life-threatening behaviors, reducing therapy-interfering behaviors, and reducing quality of life-interfering behaviors. It consists of weekly individual and group therapy sessions that include skill training and contingency management.	Multiple evaluation studies have been conducted comparing DBT to "treatment as usual" for parasuicidal patients with bi-polar disorder and personality disorder over the course of a year. Measures from these studies include the number of parasuicidal acts, maintenance in therapy, amount of psychiatric inpatient treatment, depression, hopelessness, reasons for living, anger, social adjustment, work performance, and suicide ideation. Turner (2000) examined the comparative effectiveness of DBT and Client-Centered Therapy.	The evaluations found those that received DBT exhibited: reductions in frequency and medical risk of parasuicidal behavior (Linehan et al., 1991; Linehan, Heard, and Armstrong, 1993; Bohus et al., 2004) ; lower attrition rates compared to the control group (Linehan et al., 1991); fewer days of inpatient hospitalization (Linehan et al., 1991, 2006b; Linehan, Heard, and Armstrong, 1993 ; Bohus et al., 2004) compared to the control group; less anger than the control group (Linehan, Heard, and Armstrong, 1993; Linehan et al., 1994); however, this was not replicated in Bohus et al. (2004); better self-reported social adjustment (Linehan, Heard, and Armstrong, 1993; Linehan et al., 1994); higher scores on the Global Assessment Scale (Linehan, Heard, and Armstrong, 1993; Linehan et al. 1994); better work performance than the control group (Linehan, Heard, and Armstrong, 1993); fewer self-mutilating behaviors and self-damaging impulsive behavior than the control group (Bohus et al., 2004); however, Verheul et al. (2003) found that DBT is more effective for patients with high-severity of self-mutilating acts, but not for low-severity patients. higher retention in therapy (Verheul et al., 2003)	(Bohus et al., 2004; Linehan et al., 1991; Linehan et al., 2006a; Linehan et al., 1993; Linehan et al., 1994; Turner, 2000; Verheul et al., 2003)

			There was mixed evidence as to whether DBT reduced depression, hopelessness, suicide ideation, and reasons for living. A 1991 study by Linehan et al. found that DBT did not have any significant effects on these outcomes. However, a later study by Linehan (2006b) found that DBT significantly reduced suicide ideation and depression, and improved reasons for living among patients. Turner (2000) found that DBT subjects showed more improvement than client-centered therapy subjects at both 6 and 12 months on their parasuicide rating, Brief Symptom Inventory, number of suicide attempts, and hospitalization days. At 12 months, DBT subjects showed more improvement in impulsiveness, anger, and depression. There was no difference in anxiety between treatments.	

Social/policy intervention	*Means restriction intervention* removed all charcoal packs from open shelves of major retail outlets in the intervention region for 12 months.	The evaluation compared charcoal burning deaths between the intervention region and a nearby region where the means restriction intervention was not instituted. The evaluation was a double blind trial, as the removal of charcoal packs was not publicly announced and public and frontline staff at supermarkets were not aware of the intervention. The control group was a region where charcoal packs were displayed as usual.	Suicide rates from charcoal burning decreased in the intervention region ($p<.05$) but not in the control region.	(Yip et al., 2010)

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