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Developmental Approach to Prevent Adolescent Suicides:

Research Pathways to Effective Upstream Preventive Interventions

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Abstract

The 2012 National Strategy for Suicide Prevention expands the current suicide prevention paradigm by including a strategic direction aimed at promoting healthy populations. Childhood and adolescence are key suicide prevention window periods, yet knowledge of suicide prevention pathways through universal interventions is limited (Aspirational Goal 11). Epidemiologic evidence suggests that prevention programs in normative social systems such as schools are needed for broad suicide prevention impact. Prevention trial results show that current universal prevention programs for children and young adolescents are effective in reducing adolescent emotional and behavioral problems that are risk factors for suicidal behavior, and in the case of the Good Behavior Game, suicide attempts. A developmentally sequenced upstream suicide prevention approach is proposed: (a) childhood programs to strengthen a broad set of self-regulation skills through family and school-based programs, followed by (b) adolescent programs that leverage social influences to prevent emerging risk behaviors such as substance abuse and strengthen relationships and skills. Key knowledge breakthroughs needed are evidence linking specific intervention strategies to reduced suicidal behaviors and mortality and their mechanisms of action. Short- and long-term objectives to achieve these breakthroughs include combining evidence from completed prevention trials, increasing motivators for prevention researchers to assess suicide-related outcome, and conducting new trials of upstream interventions in populations using efficient designs acceptable to communities. In conclusion, effective upstream prevention programs have been identified that modify risk and protective factors for adolescent suicide, and key knowledge breakthroughs can jump-start progress in realizing the suicide prevention potential of specific strategies.

Introduction

This manuscript offers a developmentally informed approach to prevent the emergence of suicidal behavior during adolescence, and research pathways to identify effective

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interventions. By focusing "upstream"—on factors that influence the likelihood a young person will become suicidal—this manuscript addresses Aspirational Goal 11 of the Prioritized Research Agenda for Suicide Prevention,[1] namely to identify clear targets and strategies for prevention programs that will reduce suicides by promoting resilience and health in broad-based populations.

Importance of Initiating Suicide Prevention During Childhood and Adolescence

Childhood and adolescence are key suicide "prevention window" periods. Approximately one half of emotional and behavioral disorders that are well-defined risk factors for suicide have onset of symptoms by age 14 years.[2] Many effective programs for children and adolescents prevent or reduce the severity of these mental, emotional, and behavioral problems, according to a recent National Academy of Sciences review.[2] In addition to being a critical period for preventing disorders, childhood and early adolescence are important periods for preventing the onset of suicidal behaviors. Adolescence is the age period of the highest rates of attempted suicide, and each attempt increases risk for future attempts and death due to suicide.[3]

Need to Expand Suicide Prevention Focus Upstream Prior to Suicidal Behavior

The 2012 National Strategy for Suicide Prevention (NSSP) expands the paradigm for suicide prevention by including a strategic direction aimed at promoting the general health of broad populations to reduce the risk for suicidal behaviors and related problems such as substance abuse and depression (Strategic Direction 1).[4] This expanded focus on modifying "upstream" risk and protective processes—before the emergence of suicidal behavior—stands in contrast to current youth suicide prevention programming focused on identifying and treating individuals who are already suicidal or at high risk by training adult gatekeepers[5] and screening.[6] Although efforts to identify and address the needs of high-risk youth should continue and be improved, expanding the suicide prevention paradigm to modify upstream processes is essential to reduce suicide rates. The population impact of strategies that identify and treat high-risk youth is limited by the following: (1) reliance on referrals to the mental health system will not suit many communities' ability to provide accessible, effective services; (2) limited ability to identify specific individuals who will die by suicide; and (3) even where treatment services are available, limited evidence that use of usual mental health treatment services will reduce suicide risk.[7]

Which Prevention Targets and Strategies Will Reduce Youth Suicides in the Population?

The following considerations, drawn from epidemiologic and prevention science perspectives, guided selection of the most promising prevention targets and research pathways.

Interventions delivered in social systems are needed for broad impact—

Children develop through interactions within social systems (e.g., families, schools), and interventions in these systems can influence emotional and behavioral developmental processes of large youth populations essential to reduce suicide rates. *Normative* social systems—such as public schools, community youth organizations—are settings for universal interventions and serve the broadest populations. Interventions delivered universally have

the greatest theoretic potential for reducing suicide mortality, if such interventions can address needs and priorities to make them attractive to social systems. *Reparative* social systems—such as juvenile justice—are important settings to reach high-risk youth through selective and indicated interventions, which should be a part of a comprehensive, integrated suicide prevention strategy. However, programs in reparative social systems alone will not reach many youth who will die by suicide. For example, although youth in juvenile justice facilities have a suicide rate that is approximately three times higher than that of the general population, only 0.25% of youth are in justice facilities at any given time in the U.S.[8]

Interventions that reduce common, multiple risk factors will maximize impact—Scientific evidence suggests that the potential for large population reductions in suicide may be as great or greater for approaches that target more common, lower-risk conditions compared to rarer, high-risk conditions.[9,10] For example, preventing new instances of substance abuse problems would have a substantial impact on reducing suicides because substance use problems are highly prevalent, even though the relative risk for suicide from substance problems is lower than that for depression. It is also the case that interventions that modify multiple, rather than single, risk factors have the potential for largest population impact on reducing suicide rates.

Leveraging system-level influences will maximize prevention impact—System-level interventions modify socialecologic contexts, which have risk-protective effects above and beyond individual factors. The Good Behavior Game (GBG) program that reduces aggressive–antisocial behavior leverages the influence of teacher practices and students across the classroom to promote behavioral control and classroom norms.[11]

Testing interventions to build more robust models for suicide prevention—Current models guiding suicide prevention are based primarily on observational studies linking suicidal behaviors to risk and protective factors, few of which have been established as "causal" factors.[12] Rigorous experimental designs involving randomization are the most potent methods for establishing causal pathways and building stronger conceptual models. Understandably, many communities are reluctant to participate in randomized trials in which they might get no intervention. Designs such as those that randomly assign groups (e.g., communities) to begin interventions at different time phases have been acceptable for communities to test suicide prevention programs.[13]

Proposed Prevention Targets and Intervention Strategies to Reduce Suicide Rates

Table 1 outlines a developmentally sequenced approach for preventing adolescent suicide: (1) childhood programs to strengthen a broad set of self-regulation processes (i.e., behavioral and emotional self-control) through family and school-based programs; followed by (2) adolescent programs that leverage system-level influences (e.g., peer norms) to prevent emerging risk behaviors (e.g., substance abuse) and strengthen relationships and skills that are protective (e.g., coping). The suicide prevention potential of selected programs is summarized regarding demonstrated impact on risk and protective processes upstream to suicidal behavior. For a population of children, optimal suicide prevention impact would be expected when they are exposed to effective childhood programs (e.g., strengthen classroom

behavior) that prepare them to enter adolescence as behaviorally and emotionally competent, and then they are exposed to effective programs that address specific adolescent risk and protective processes such as substance abuse.

Strengthen Self-Regulation of Behavior and Emotions in Children

Increasing self-regulation, which encompasses behavior, emotions, and cognitive processes, is a key indicator of healthy childhood development according to evidence from diverse fields ranging from developmental psychopathology[14] to developmental neuroscience.[15] These self-regulatory processes are first learned within parent–child dyads and are embedded over time in broader systems including classrooms and peer relationships. Failures in self-regulatory processes are conceptualized as a key mechanism through which biological, social, and psychological influences lead to more differentiated and stable mental, emotional, and behavior disorders.[14] Aggressive school behaviors are salient prevention targets because these problems are moderately stable and magnify risk for cascading problems including delinquency and substance abuse. Dysregulation of emotions frequently co-occurs with early aggressive behavior, is associated with suicidal ideation during childhood,[16] and emotion dysregulation persisting into adolescence is a specific risk factor for attempting suicide.[17] Self-regulation also extends to executive-cognitive functions, which continue to mature into early adulthood,[18] and normative delays in these functions are linked to adolescent impulsivity and susceptibility to suicide contagion effects.[19]

Seminal research findings that the GBG implemented in first or second grade urban classrooms reduced suicidal behavior 15 years later demonstrates the potential suicide prevention impact from enhancing self-regulatory processes through universal interventions. Training teachers to promote positive student classroom behavior, the GBG evaluated through a rigorous RCT decreased substance use, antisocial and risky sexual behaviors,[11] and self-reported suicidal ideation and attempts occurring by age 19–21 years by one half (Table 1).[20] Less-rigorous GBG implementation in a second cohort had a directionally similar, but non-significant impact on reducing suicidal behaviors, indicating the need to replicate and determine how to achieve high-quality implementation needed for suicide prevention impact.

Findings from a randomized trial testing the New Beginnings Program (NBP) for divorcing families[21] is an illustrative example of the prevention potential of strengthening protective processes, including self-regulation, through family-based programs. Promoting parenting and child skills for coping, NBP reduced adolescent mental health disorders, substance use, and behavioral problems, and the positive preventive effects increased over time. However, as with nearly all prevention programs for youth, the impact of NBP on suicidal behaviors was not assessed.

Leverage Peer and Family Influences to Reduce Adolescent Substance Use and Bullying and Increase Healthy Coping and Connectedness

Parent–youth relationships and norms generated through peers exert a potent influence on specific emerging risk factors for suicide. System-level interventions that leverage these

influences have become state of the art. Examples of promising system-level interventions during adolescence and their demonstrated impact on risk/protective factors for adolescent suicide (Table 1) are as follows. Substance use initiation is reduced by the universal Life Skills curriculum that strengthens resistance to peer influences,[22] by interventions delivered through schools to strengthen family functioning (e.g., Iowa Strengthening Families Program),[23] and by programs assisting communities to implement evidence-based programs (e.g., Communities that Care).[24] By modifying school-wide practices including student perceptions regarding acceptable behavior, the Olweus program reduces school-wide bullying.[25] Training for high school student peer leaders to prepare them to modify norms through their natural social networks (Sources of Strength) has increased school-wide help-seeking acceptability, coping norms, and engagement of adults to help suicidal peers.[26]

As with nearly all other prevention programs, with the exception of the GBG, the impact on reducing suicidal behaviors of these adolescent programs is largely unknown. To date, few RCTs evaluating these interventions have incorporated suicidal behaviors as an outcome or have sufficient power to assess impact on suicide attempts or mortality.

Proposed Step-By-Step Research Pathways

Breakthroughs in the following areas would jump-start progress in realizing the suicide prevention potential of upstream approaches: (1) establishing causal links between specific intervention strategies and programs (e.g., classroom interventions; substance abuse prevention) and reductions in adolescent suicidal behaviors, beginning with suicide attempts and medically serious attempts; (2) identifying intervention mediators and pathways (e.g., reduced adolescent substance use) to reduced suicidal behaviors; and (3) providing evidence that specific interventions, or combinations of interventions, implemented in broad populations lead to reduced suicide rates (long-term objective). To achieve these breakthroughs, the following research pathways are proposed.

Short-term Research Objectives and Potential Barriers (4–8 years)

By capitalizing on completed trials of preventive interventions and strategically chosen new trials, the following objectives can significantly advance knowledge within 4–8 years. First, data should be leveraged from the large number of preventive intervention trials with youth already completed to identify intervention strategies that reduce suicidal behaviors, including deaths (e.g., linking to the National Death Index). This first short-term objective may be accomplished by utilizing new methods for synthesizing data across multiple trials, even if different measures of similar constructs are used.[27] Second, in selecting specific programs for data synthesis, universal and selective programs should be prioritized by targeting self-regulation processes such as classroom behavior and emotion self-regulation, programs for adolescent substance use and bullying prevention, and interventions that strengthen norms for coping with stress and increase youth-adult connections. By synthesizing data from multiple programs that impact common proximal outcomes (e.g., reduced aggressive behavior; delayed onset of alcohol use), and identifying valid indicators of suicidal behavior (e.g., from depression scale items) there is the potential to identify which strategies and outcomes are most promising. Third, a specific priority should be to combine follow-up data from multiple implementations of GBG. Fourth, many school-based

interventions have been, or could be, adapted to reparative systems (e.g., juvenile justice), with similar testing for suicide prevention impact by aggregating groups of institutions. Fifth, estimates of reductions in suicidal behavior and mortality associated with changes in targeted behaviors should be developed. A potential barrier is that few trials may have assessed suicidal behavior, although more will have suicidal ideation, which could be used to estimate impact on suicidal behaviors.

Efforts should be made to increase the number of prevention researchers in fields such as substance abuse, bullying, and parenting that incorporate high-quality measures of suicidal behavior in their work. To that end, tools should be developed and researchers should be encouraged to include valid and reliable measures of suicidal behavior in follow-up evaluations of prevention programs through the following: (1) creating and distributing protocols and expertise on accessing resources (e.g., National Suicide Prevention Hotline) to respond to trial participants identified as suicidal to reduce ethical and pragmatic concerns; (2) creating consensus lists of high-quality measures for assessing suicidal behavior for youth of different ages, including those that can be deployed in population-based studies, and potential modifications needed for specific populations (ethnic, race, and cultural differences); and (3) developing new approaches for conducting follow-ups of subjects in preventions trials such as using Internet-based surveys for brief, rapid assessments of suicidal behaviors,[28] which could be de-identified to protect confidentiality. Potential barriers include the need to address “silo” priorities in prevention, including funding agency priorities, to encourage collaboration so that alcohol prevention researchers, for example, are motivated to incorporate measures of suicidal behavior.

Finally, researchers should determine whether combining interventions targeting multiple preventive targets (e.g., substance abuse, bullying, youth-adult connectedness) may have greater impact on suicide prevention. Combinations of programs and choices may provide better “fit” with community needs, using models such a Communities that Care,[24] to help communities identify needs and select evidence-based programs across the full prevention continuum (universal, selected, indicated). Use of trial designs that randomize communities to receive intervention at different phases[13] may increase acceptability and participation. RCTs should incorporate program implementation research, to identify levels of implementation quality necessary for suicide prevention impact and utilize social network tools to determine diffusion of intervention impact and which practices reach highest risk youth. The use “roll out” designs[29] can also increase impact in large population-based trials needed to identify interventions that reduce suicide mortality. Roll out designs enroll multiple cohorts over years and modify content or implementation to account for what is learned in early cohorts—an approach that can increase responsiveness to community needs. Determining how to best engage schools to implement universal programs while having multiple competing demands is an important barrier to address.

Long-Term Objectives and Potential Barriers (12–20 years)

Ultimately, the most robust data and knowledge needed to identify strategies to reduce suicide rates will come from large-population randomized trials of promising interventions, or combinations of interventions, with long-term follow-up. The following are

recommended as strategies to maximize knowledge gains from such RCTs: (1) prioritizing both rural communities and other regions with high suicide rates (western U.S. states), which can enhance efficiency and statistical power to detect impact on suicide mortality; (2) using ongoing surveillance (e.g., Youth Risk Behavior Surveillance System) that may provide efficient and relatively inexpensive means of testing intermediate outcomes and suicidal behavior impact in large regions. Potential barriers include long waiting periods for child populations to reach periods of elevated suicidal behavior needed to determine intervention impacts. However, when using designs that randomize large community segments to implement programs at different phases over 3–4-year periods, intermediate effects can be detected, and large cohorts of youth followed for suicide prevention impact.

Conclusions

Upstream interventions delivered through social systems in childhood and early adolescence have the potential for reducing population-level suicide rates by decreasing the number of adolescents with mental emotional and behavioral problems, as well as creating social environments that expose adolescents to positive coping norms, increase youth-adult connections, and reduce adverse experiences such as bullying. Effective prevention programs already have been identified across childhood and adolescence prevention window periods that modify multiple risk and protective factors for adolescent suicide and can reach large populations of youth. Key research gaps must be addressed to identify specific strategies and programs with greatest suicide prevention potential. School-based interventions have been highlighted in this manuscript based on prior work identifying promising interventions and the potential for reaching population groups. Prenatal and early childhood programs shown to reduce adolescent antisocial behaviors and other problems[30] may also have suicide prevention potential, particularly if implementation is expanded to reach broader population segments. In the future, other intervention strategies and settings may emerge as promising, such as interventions aimed at modifying adolescent norms for behavior through social media networks or that provide “option-rich” alternatives that can be adapted to address individual needs (e.g., individuals choose modules to suit specific emotional, behavioral, or life-context needs).[17]

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Table 1

Developmental-sequenced upstream approach for preventing adolescent suicide: demonstrated impact by adolescence of illustrative programs

	Childhood programs strengthen self-regulation of behavior and emotions		Adolescent programs target differentiated risk and protective processes	
Social system	**Specific target**	**Illustrative program** **Impact in adolescence**	**Specific target**	**Illustrative program** **Impact in adolescence**
Family	Parenting skills for children under family stress	New Beginnings Program[21] *MEB, substance use*	Parenting skills for adolescent risk behaviors	Iowa Strengthening Families Program[23] *Substance use*
School	Strengthen classroom behavior, reduce aggression	Good Behavior Game[11] *Suicide attempts MEB, substance use*	Bullying	Olweus Bullying Program[25] *Bullying school-wide*
			Substance use	Life Skills[22] *Substance use*
Peers			Peer norms in social networks	Sources of Strength[26] *Coping Connectedness*
Community			Community-wide prevention system	Communities that Care[24] *MEB, substance use*

MEB, reduced mental, emotional, or behavioral problems