Vision Zero in Suicide Prevention and Suicide Preventive Methods

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Abstract

According to the World Health Organization (WHO), suicide is a global public health issue, and countries need to be working toward a comprehensive and holistic response to prevent suicide and suicidal behaviors. Vision Zero for

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suicide is an aspiring goal that aims to lower suicide occurrence through a combined action of public health and healthcare sectors. Vision Zero for suicide has a multilevel and multidisciplinary approach that intends to provide a systemic change in society to facilitate and put suicide prevention on the agenda. This chapter explores the origins of Vision Zero for suicide by first presenting theoretical models that influenced suicidal behavior preventive programs. Then, Vision Zero for suicide goals, advantages, challenges, and examples of implementation in some countries will be presented. Further, evidence-based suicide prevention programs in existing public health and healthcare settings will be described as they support the Vision Zero aims. Vision Zero is an ambitious goal, but one that is worth aspiring to achieve, as the potential outcomes for suicide prevention implementation and research are very worthwhile.

Keywords

Vision Zero · Suicide · Suicide attempts · Suicidal behavior · Suicide prevention · Healthcare approach · Public health approach · Evidence-based · Multilevel interventions · Strategies · Mental health

Introduction

Suicide is a significant public health issue with over 800,000 people worldwide dying by suicide each year (WHO 2016). At least 20 times as many attempt suicide. These figures have increased globally in the last decade by 4% (Brodsky et al. 2018). Suicide impacts every age group. Despite various national suicide prevention strategies which have been established to address this problem in countries around the world, suicide is the third leading cause of death globally in adolescents aged 15–19 years after road injuries and interpersonal violence (WHO 2018). A 10-year systematic review compiling almost 1,800 studies (Zalsman et al. 2016) highlighted that increasing and coordinating the application of evidence-based suicide prevention strategies is crucial. Zalsman et al. (2016) also emphasized the importance of implementing suicide prevention programs both across public health and mental healthcare systems. Vision Zero for suicide with a multilevel and multidisciplinary approach to drive evidence-based suicide prevention has been introduced in some countries. Suicide prevention relies on suicidal behavior research to implement the most accurate evidence-based programs. Knowledge about suicidal behavior, risk, and protective factors is paramount to ensure good practice in implementation. Therefore first, we provide an overview of models for suicide prevention; second, we present Vision Zero; third, we offer reflections on the advantages and challenges in the implementation process in some countries; and last, we describe public health and healthcare prevention programs which are recommended to be used in obtaining Vision Zero for suicide.

Models for Suicide Prevention

Suicide prevention strategies have been continually studied and developed over time. Understanding the complexity of suicidal behaviors and their multifactorial dimension is important when establishing effective suicide prevention strategies. Various theories – or models – explain the suicidal process and which factors lead an individual to develop suicidal behavior (Sisask and Kõlves 2018). Models and understanding their evolution, as well as theoretical influences, are crucial, when designing suicide prevention programs (Cramer and Kapusta 2017).

Below is a summary of important models which have influenced and continue to influence suicide prevention programs today.

Sociological Theory

Emile Durkheim, in his sociological investigation of suicide, stated that suicide is the result of society's strength or weakness of control over the individual (Durkheim 1897). Suicide is thought to be a result of an interaction between low and high levels of social regulation and moral integration. Social integration describes bonds with other members in society, while moral regulations are the adherence to existing norms in society. According to his theory, suicide occurs "when the level of social integration is too high (leading to altruistic suicide) or too low (leading to egoistic suicide) and when the level of social regulation is too high (leading to fatalistic suicide) or too low (leading to anomic suicide)" (Lester 1999). This contributed to the understanding of societal and community influences on suicidality. But the theory failed to consider individual variations in suicidal behavior (Mäkinen 2009).

Hopelessness Theory

The hopelessness theory by Beck highlights the notion of hopelessness as a psychological factor that has a central role in suicide (Beck et al. 1985). Hopelessness is defined as the fatalistic expectation of an individual. Nothing the individual wants or wishes for will happen, and there is nothing one can do to change it. Since the development of the model, research has shown that hopelessness is an important predictor of future suicidal behavior (Wolfe et al. 2019). However, this theory does not account for other factors contributing to suicidal behavior (Aish and Wasserman 2001).

Psychache Theory

Schneidman defined psychache as intense psychological pain. He emphasized that psychache is a necessary condition for suicide to occur and that this pain can overpower any other protective factor (Shneidman 1998). Schneidman further asserts that the only solution to stop the psychache is suicide.

Escape Theory of Suicide

The escape theory of suicide highlights the role of failure, disappointment, and setback (Baumeister 1990). Suicide is thus viewed as an escape from existential problems. Feelings of failure are a necessary but insufficient condition to attempt suicide. In addition to feelings of failure, the six-step process when considering suicide includes escape motivation, self-blame, depression, cognitive deconstruction, and disinhibition (Tang et al. 2013).

Emotional Dysregulation Theory

According to Linehan, emotional dysregulation is a process relating to the incapacity to adjust to and manage emotions. Emotion dysregulation is a risk factor predictive of suicidal behavior (Ammerman et al. 2015). This model was originally geared toward borderline personality disorder and was used to develop dialectical behavioral therapy (Hogan and Grumet 2016). There is strong evidence supporting this model.

Stress-Diathesis Model

This model takes into consideration that suicidal behavior is influenced by both individual biological/psychological predisposition (diathesis) as well as the surrounding environment (environmental stressors) (Mann 2003; Wasserman 2001). Although suicidal behavior is heterogeneous and varies between individuals, this model provides an explanation as to why some commit suicide and why others do not. The causes of suicidal behavior are complex with many interacting contributing factors (Sokolowski et al. 2015). Many factors can lead toward a predisposition for suicide diathesis such as genetic makeup, exposure to psychological stress, and adverse environmental conditions, especially in the developmental stages of childhood and adolescence (Mann 2003; Wasserman 2001). There are strong associations between suicide and inequity, social exclusion and socioeconomic deprivation which are all causes of stress.

Interpersonal-Psychological Theory of Suicide

This theory considers suicide to be the interaction between two states: (a) *Thwarted belongingness* is feeling that one does not have connections with others; (b) *perceived burdensomeness* is feeling that one is a burden for those around them. A*cquired capability* described as diminished fear of pain and death due to repetitive experiences with painful and fear-evoking life events leads individuals to getting used to self-harm, suicidal behavior as response to risk (Ribeiro and Joiner 2009). The strength of this theory is that, contrary to previous theories, it differentiates between suicidal ideation and suicidal behavior (Van Orden et al. 2010). The interpersonal-psychological theory of suicidal behavior still has some unanswered gaps, such as the threshold for acquired

capacity to lead to suicide attempts and death by suicide. However, evidence-based research shows the potential of this theory, for understanding pathways to suicide from risks for suicidal behavior (Barzilay et al. 2015).

World Health Organization (WHO) Socioecological Model

The WHO report *Preventing suicide: A global imperative* (2014) offered evidence-based recommendations and actionable steps to improve suicide prevention, as well as to support countries within public health strategies. The WHO used a socio-ecological model, built on risk and protective factors identification of socio-ecological contexts, to help build resilient suicide prevention.

This theory assumes that the cause of suicidality is multifactorial, and that the accumulation of risk factors increases suicide as a potential outcome. Risk factors are grouped into the following categories: systemic (society and health system), community, relationship, and individual. Suicide prevention needs to address these risk factors while strengthening protective factors through effective suicide prevention programs.

The aforementioned models highlight that suicidal behaviors are multifactorial; thus, to reduce them, there is a need for a joint effort from public health and healthcare strategies which are described later in this chapter. Vision Zero for suicide is influenced by the theoretical models and uses multidisciplinary and multileveled approaches to combat suicidal behaviors.

Vision Zero for Suicide

Definition of Vision Zero for Suicide

Vision Zero for suicide is an approach emerging in the last two decades that aspires to bring suicide prevalence as close as possible to zero. It assumes that no one should end up in a situation where suicide is the only option. Considering that suicidal behaviors, as previously explained, stem from biological but also social, environmental, and cultural factors, Vision Zero initiatives look to bring resources together in a multiphased plan that uses evidence-based knowledge to cause a system change (Kristianssen et al. 2018). Vision Zero can be implemented through policies on nation-, region-, or organization-based levels. Vision Zero is more than an approach guiding suicide prevention initiatives; it is an aspirational goal bringing healthcare and public health sectors together to decrease suicide rates.

When countries or regions implement Vision Zero policies, initiatives need to first involve programs not only at the public health level (policy-makers, politicians, research centers, and advocacy groups) but also at the community level (community-based organizations, NGOs, and minorities advocates), and then at the healthcare level. Developing a Vision Zero approach thus needs a multidisciplinary effort from fields such as political, policy, economics, public health, psychiatry, psychology, sociology, anthropology, education, and religion. Even when Vision Zero is implemented in

smaller settings, such as in a hospital, the different departments need to work together to organize procedures and communication that involve all staff members.

Advantages and Challenges of Vision Zero for Suicide

Advantages of Vision Zero for Suicide

Vision Zero provides a general goal to focus and gather resources (funding, research, monitoring, and evaluation). Implementing Vision Zero as a suicide prevention approach, rather than a mental health policy in general, provides a platform to allocate more funding focused primarily on suicide prevention. Similarly, this gives incentives as well as financial means and frameworks to organizations to commit to strategies and goals for suicide prevention and to pool resources to tackle suicide. Thus responsibility for suicide prevention will be shared with multidisciplinary approaches that have proven to be successful in many instances (Brooks et al. 2019; Kim et al. 2019).

Vision Zero also aims to decrease stigma about suicide by putting into practice a systemic approach and improved communication around suicide. Vision Zero strategies have been described as shifting the focus of policies from suicidal individuals and those bereaved by suicide to combating social determinants of suicide and improving protective factors (Swedish Legislation of 2007 translated by Kristianssen et al. 2018). This shift puts a stop to the blaming of suicidal individuals, their families, and medical practitioners to build a general understanding that suicide is due to the entire failure of the system. Tackling stigma is additionally linked to improved communication. Communication increases understanding of suicide, mental health disorders as well as bringing into light the work of public health and healthcare services to combat suicide. An additional perk of raising awareness with safe and positive messaging is that it promotes and increases help-seeking behaviors (Sisask and Kõlves 2018).

Vision Zero for suicide contributes to a broader understanding of suicidal behaviors and preventive measures, by giving more resources and opportunities (due to the increased number of programs) to accumulate evidence-based information. This has enabled researchers to better understand not only the course of mental disorders, the impact of risk factors, but also which protective factors work best to prevent suicides from happening. Initial organizations and healthcare systems that have started a Vision Zero initiative, such as the Henry Ford Health System in the United States, have inspired further programs. Similarly, the *Lex Maria* legislation in Sweden recommends investigations of all suicides that occur in relation to healthcare practices to learn from medical errors.

Challenges of Vision Zero for Suicide

The main challenge to Vision Zero for suicide is that this approach is interpreted differently and at different scales depending on the countries (this is further illustrated in section Vision Zero in the world). This has led to some criticisms which are addressed below.

For example, Karlsson et al. (2018) interviewed Swedish psychiatrists to identify their arguments for and against Vision Zero. They found that most participants,

although being able to list some advantages, considered Vision Zero to be unachievable and leading to incentive-oriented practices toward patients with mental disorders and could lead to increased involuntary admissions. Similar arguments highlighted that this approach would take the focus away from learning to live with mental disorders to only preventing death by all means.

First, the findings of the Swedish study might be an artifact of the researcher's methodology which allowed respondents to themselves define Vision Zero for suicide rather than using the official parliamentary document describing the different strategies that should be implemented. Second, in Sweden, a study by Roos af Hjelmsäter et al. (2019) describing the results of healthcare provider examination after suicides evaluated that the state of healthcare, the treatment given to patients, and suicide risk assessments were deficient. These deficiencies occur at the organizational microlevel, and the authors called for sustainable improvement of healthcare (Roos Af Hjelmsäter et al. 2019). This is exactly what Vision Zero aims for. The goal of Vision Zero is to implement system responsibilities and healthcare practice improvements that would provide resources for public health and healthcare programs to tackle suicidal behavior and stigma. Thus, Vision Zero initiatives raise awareness of the magnitude of mental disorders in society and call for providing financial resources to tackle suicide.

Funding for an initiative of this capacity can be considered as a challenge. In national health policy, practice change in addition to training is costly at every scale, from a public health policy scale to a hospital department scale. Taking the Henry Ford Health System as an example, data showed that even though initial loans were required at the beginning of the initiative, the impact of Vision Zero reduced the cost from the burden of suicide in recent years (Hampton et al. 2010; Coffey 2015).

There has also been a debate on whether aiming for zero suicide would hinder ongoing discussion about euthanasia and physician-assisted suicide (Holm and Sahlin 2009). The authors consider that having a goal of zero suicide would make it difficult to enable euthanasia (2009). Although others would argue that physician-assisted suicide and suicide decided independently by an individual are different and thus should not impact the target number of Vision Zero policies.

In summary, Vision Zero for suicide drives suicide prevention policies through a multidisciplinary approach by directing awareness, training, and resources toward a concrete goal of having zero suicide. It teaches and empowers individuals in all of society – not just suicide survivors, victims, and medical practitioners – as well as removing guilt and responsibility by proving that suicide prevention needs the support of the entire system to be effective (Mokkenstorm et al. 2018a). Vision Zero is also a support and provider of evidence-based research which improve suicide prevention programs.

Vision Zero in the World

Vision Zero for suicide approaches has been implemented at different scales, i.e., national, regional, and organizational levels. Initiatives share common approaches, such as using evidence-based information to raise awareness, support and guide

individuals, families, medical workers, and in some cases public health practitioners. Approaches are systematic and aimed at improving suicide prevention at multiple levels and often through a healthcare approach.

Vision Zero in Sweden

Sweden has a national countrywide approach to Vision Zero. In 2008, the Swedish Parliament launched the *National Action Programme for Suicide Prevention* which presented Vision Zero for suicide approach. Many of the documents were inspired from Vision Zero for road traffic that Sweden successfully implemented by aiming to reduce the road toll to zero (Kristianssen et al. 2018). Vision Zero aims to implement a systematic approach based on preventive measures with the aim that no one should be in a situation where suicide is the only solution (Karlsson et al. 2018; Kristianssen et al. 2018). Vision Zero targets individuals using healthcare services, and also the wider populations to encourage stakeholders to create supportive environments.

The plan is based on nine main areas of action (Folkhalsomyndigheten 2016):

- Promote good life opportunities for less privileged groups.
- Reduce alcohol consumption in the population and in groups at high risk for suicide.
- Reduce access to means and methods of suicide.
- View suicide as a psychological mistake.
- Improve medical, psychological, and psychosocial initiatives.
- Distribute knowledge about evidence-based methods for reducing suicide.
- Raise skill levels among staff and other key individuals in the care services.
- Perform "root cause" or event analyses after suicide.
- Support voluntary organizations.

As mentioned previously, Sweden has a legislation entitled the *Lex Maria* about the healthcare system's responsibility to investigate incidents to improve patient safety (Karlsson et al. 2018). Vision Zero emphasized (2008) the current usage of this legislation and recommended that if a suicide occurs due to a medical error in the healthcare setting, the case should be evaluated under the *Lex Maria* legislation. This would then allow these suicides happening in healthcare setting and during outpatient procedures to be further studied for future prevention (Hadlaczky et al. 2012). However, *Lex Maria* application to suicides happening within a short time after a healthcare contact was mandatory until 2017 and is presently only implemented based solely on the healthcare provider's decision.

Vision Zero in the United States

Several Vision Zero initiatives are implemented in healthcare systems in the United States. In 2000, the first United States national suicide strategy was launched, and in 2010, the National Action Alliance for Suicide Prevention was created. National Action Alliance for Suicide Prevention (NAASP), a public-private partnership, identified healthcare systems as paramount for suicide prevention and launched several task forces focusing on a comprehensive system approach to detect and

manage suicide in the healthcare setting (Labouliere et al. 2018). To reach the aspirational Vision Zero goal, the National Institute of Mental Health and NAASP committed to reduce suicide by 20%, a first step in the joint effort to prioritize research and resources to lower suicide in the United States (Gordon et al. 2020). The implementation of Zero Suicide practices is recommended by both national governmental offices such as the United States Office of the Surgeon General (2012), and countrywide nonprofit organizations such as the Joint Commission, a United States healthcare accreditation program (2016). Initial data from studying Zero Suicide initiatives in the United States show that these initiatives are effective and should be replicated more widely (Hogan and Grumet 2016; Brodsky et al. 2018).

One example of large-scale prevention program under Zero Suicide in the United States is the Perfect Depression Care program at the Department of Psychiatry at the Henry Ford Health System, launched in 2002 in Detroit, Michigan (Hogan and Grumet 2016). The program focused on evidence-based approaches to improve healthcare chain of care: effectiveness, safety, patient-centered, timeliness, efficiency, and equity among patients (Hampton 2010). One of the key approaches to minimize suicide has been to increase screening of patients that enter the healthcare system for suicide (Coffey 2015). Another component is to tackle concerns from primary care physicians when it came to treating suicide, such as providing guidelines on how to deal with potentially suicidal patients and direct access to knowledgeable psychiatrists (Coffey 2015). The system has been deemed a huge success, with a 75% reduction in suicide rates in the first 4 years of implementation, and has been sustained each year since 2001 (Hampton 2010; Covington and Hogan 2019).

Vision Zero in the United Kingdom

The United Kingdom has also embraced the Vision Zero approach for healthcare practice. The United Kingdom government launched across the National Health Service (NHS) a zero-suicide ambition in January 2018 targeting mental health patients in care and aiming to expand to all mental health patients (Department of Health 2019). This led to two international conferences on zero-suicide where some of the programs launched by the NHS were presented (Henden 2017).

The Mersey Care NHS Foundation Trust, for example, aims toward zero suicides inspired by the Henry Ford Hospital system in the United States. The core strategy lies in quality improvement, universal staff training, and support for victims of suicide. Mersey Care established several public campaigns to tackle stigma and funded digital innovations to improve health outcomes. The program is also being scientifically evaluated, and future results will direct both subsequent improvements of the system and adaptions of their approach to other systems (IIMHL 2016). Additionally, the NHS trust launched the Zero Suicide Alliance which is supported by and partnered with many organizations. The alliance plans to both raise awareness and promote accessible training in suicide prevention. According to them, if the general public learns to identify signs of suicidal behavior and how to direct the individual to services and care, then everyone can be empowered to help prevent suicide (Zero Suicide Alliance 2020).

Vision Zero in Other Countries

In several countries, most of the Vision Zero projects target healthcare settings and follow the example of implementation of the United States framework titled Zero Suicide. In the Netherlands, mental healthcare institutions were targeted by the Dutch National Prevention Strategy to investigate and assess the practice and variation of suicide prevention strategies. The study highlighted that several institutions gathered together under the name SUPRANET Care and publicly announced pursuing a Zero Suicide aim (Mokkenstorm et al. 2018b). Additionally, the New South Wales (NSW) state in Australia launched an initiative called Zero Suicides In Care to create a blame-free working environment in addition to several other initiatives such as postvention service for people bereaved by suicide, resilience building in local communities, or gatekeeper training (NSW Ministry of Health 2019). This NSW program combines both public health and healthcare initiatives which demonstrate that the objective of Vision Zero for suicide needs a consensus of actors to be reached.

Toward a Vision Zero for Suicide Label?

The above-mentioned examples on Vision Zero for suicide initiatives show that most of the existing implementations of Vision Zero revolve around healthcare prevention in hospital settings. This can be explained by the influential Zero Suicide organization and its framework used worldwide (in the United Kingdom, Netherlands, Australia, and more) after proving successful in the United States. This even led to the international declaration for better healthcare signed by Australia, Canada, China, Denmark, French Polynesia, Hong Kong, Japan, Malaysia, the Netherlands, New Zealand, Taiwan, the United Kingdom, and the United States (IIMHL 2016). This declaration provides a strong action plan implementable in any organization wanting to reach zero suicide in healthcare. Healthcare-setting improvements are a crucial interpretation of the systemic approach to improve suicide care in the medical system. However, the general aim of Vision Zero for suicide calls for more implementation in the public health system.

There are many suicide prevention programs, presented in the next section, built on evidence-based approaches that reduce suicide in societies worldwide. These interventions involve multidisciplinary actors and not only target at-risk groups but also target society as a whole, in addition to often being implemented at different levels (Zalsman et al. 2016). This resonates with the Vision Zero aim described earlier, but they are not labeled as such.

An example of what can be called international aspirational label is the Sustainable Development Goals (SDGs), a high-level concept to enable coordination between governments and international organizations and place emphasis on partnerships in implementation (Nilsson et al. 2018). Although criticized about their indicators, top-down approach, and feasibility, the SDGs, once adapted locally and taken as a general guideline for development institutions to create policies and attribute funding to local initiative, are impactful. Judging by the number of projects and papers

published in relation to the SDGs, the use of the SDGs as a label stamped on papers, funding proposals, media communication, and policies improves society's awareness and increases communication about a much-needed field of intervention.

Like the SDGs, Vision Zero for suicide could be an overarching label by which programs and organizations can identify themselves with the aspirational goal of zero suicide, even though their strategies and scales of operation may differ. This would improve the visibility of such projects, would create a strong link between international programs, and would create a research consensus among multidisciplinary actors, as well as provide a clear funding platform to catalyze efforts from governments and funding bodies.

What Does the Evidence Say about Suicide Prevention

Evidence-based suicide prevention programs are often organized around the conceptual framework called the Universal, Selective, and Indicated model (USI) (Wasserman and Durkee 2009). This framework is used internationally, especially by the WHO for its suicide prevention activities (Cerulli et al. 2019; World Health Organization 2014; Wasserman 2019).

These three strategies are aimed at target populations. Universal prevention is aimed at general population. Examples of strategies could be increasing access to mental health care, restricting access to means of suicide, or encouraging responsible reporting of suicidal behaviors. Selective prevention is aimed at groups who have an above-average risk to develop disease or risk behavior (for example, immigrants, substance users, or children coming from at-risk families). A selective strategy would focus on community support and strengthening protective factors, such as building strong personal relationships or teaching positive coping strategies. Indicated prevention is directed at persons who have already experienced symptoms of a disorder. These strategies target specific risk groups, such as individuals with mental health disorders and substance use, individuals who are bereaved by suicide, or individuals who have experienced some form of trauma or use.

Suicide prevention requires a multiphased and multilevel approach, drawing strategies from both the healthcare and public health perspectives (Hegerl et al. 2009; Zalsman et al. 2016). Preventive intervention strategies can be implemented according to the healthcare approach and the public health approach which are complementary of each other (Wahlbeck et al. 2017; Wasserman and Durkee 2009; Wasserman 2019; Zalsman et al. 2016, 2017). The public health perspective focuses on population-based initiatives and aims to decrease risk factors and strengthen protective factors (Wasserman and Durkee 2009). The healthcare perspective targets patients, relatives, and healthcare professionals, as well as different healthcare settings and fields. A comprehensive overview of all evidence-based strategies is published in *Suicide: an Unnecessary Death* (Wasserman 2016) and *Oxford Textbook of Suicidology and Suicide Prevention: a Global Perspective* (Wasserman 2009, 2020) presently updated. A summary of the evidence-based strategies is presented below.

Public Health Approaches

Public health prevention strategies target the general public and draw resources from governmental bodies as well as nongovernmental organizations. These strategies with strong scientific evidence include increase in public awareness, restriction of access to lethal means, and school-based universal prevention. Strategies that need more research are gatekeeper training, media guidelines, internet-based interventions, helplines, and indigenous preventive programs.

Increase Public Awareness

Public information campaigns are aimed at the whole population to promote health and prevent suicide. Public information campaigns disseminate knowledge about mental health, about the treatable aspects of suicidal behavior and depression, and about the importance of communication about these issues. Information campaigns also provide crucial information on helpline numbers and who to contact. Many Vision Zero for suicide initiatives described earlier, such as the NSW one in Australia, have programs including the raising awareness approach. The NSW Australian initiative aims to build resilience to support the suicide prevention of local communities including people with lived experience, health organization, and others to raise awareness (NSW Ministry of Health 2019). Awareness campaigns can be shared through several media platforms such as television, newspapers, radio, YouTube, advertising posters, social media, brochures, websites, etc., in order to increase public awareness (Barker et al. 2017; Kreuze et al. 2017; Zalsman et al. 2016). Campaigns that were part of a larger multicomponent approach, with other public health interventions, produced better and more lasting results than campaigns implemented without complementary interventions.

Restrictive Access to Lethal Means

Limiting the availability of means by which a person can commit suicide is supported by strong evidence in many studies in suicide prevention. A means restriction is a preventive approach adapted to different lethal means and several environmental and cultural contexts. The restricting access to lethal means' methods that have the strongest evidence of efficacy is: limiting access to medication, restricting firearms, and limiting pesticide access; barriers implementation; and control of carbon and gas, preventing hanging, and alcohol restriction (Värnik et al. 2007; Barker et al. 2017; Das et al. 2016; Dodd et al. 2016; Gunnell et al. 2017; Pirkis et al. 2015; Riblet et al. 2017).

The theoretical standpoint for this approach is that the longer it takes and the more difficult it is for a person to access means to commit suicide, the more time there is for the person to be interrupted by others or to change their mind (Zalsman et al. 2016). For the same reason, these restrictions have a greater chance of decreasing the mortality rate in impulsive suicide attempts compared to the planned ones.

Medication

Self-poisoning via medication is often a lethal mean of suicide (Ho et al. 2016; Sinyor et al. 2019). Restricting access to medication (analgesics, barbiturates,

opiates, and caffeine tablets) is linked to a reduction in the number of deaths by suicide. Methods for restricting access to medication include restricting and monitoring prescriptions, prescribing alternative medication, taking precautions against forgery, recalling unused drugs, and creating blister packs (reducing the size of the packaging of drugs) (Zalsman et al. 2016; Hawton et al. 2018).

Firearms

Firearms are a fatal mean of suicide in countries where they are easily accessible. Restrictions of domestic firearm availability with control legislation have mostly positive results. Regulations of firearms have also resulted in a decrease of suicide by firearms in Norway, Switzerland, Israel, New Zealand, and Australia (Zalsman et al. 2016).

Pesticides

In low-income and middle-income countries, pesticides are a common means of suicide (Eddleston and Gunnell 2020). Therefore, governmental actions aim to remove dangerous pesticides from agriculture practice (WHO 2019). Measures to restrict pesticides include reducing their toxicity, controlling sales of pesticides, raising awareness toward safe management and storage practices, and improving healthcare practices of pesticide overdoses (Mann et al. 2005). Such policies to control toxic pesticides have shown to be successful in suicide reductions in Sri Lanka, India, and Western Samoa (Gunnell et al. 2017; Zalsman et al. 2016).

Barriers

Suicide by jumping plays an important role in urban societies (Hemmer et al. 2017). Barriers to jumping sites, as well as railways and subways, have strong evidence in reducing suicides (Zalsman et al. 2016). For bridges, installing high altitude barriers or safety nets has proven effective, with little evidence of substitution to other jumping sites (Perron et al. 2013). For subways, restricting access to railways, installing platform doors, creating "suicide pits" (areas with suspended rails resulting in trains passing above a person fallen on the rails without risk of hurting them), and increasing surveillance systems can prevent suicide (Ratnayake et al. 2007).

Control of Carbon Monoxide: Charcoal and Gas

Detoxification of domestic gas and restricting the purchase of charcoal are effective in preventing suicide (Zalsman et al. 2016). Suicide by poisoning from car exhausts decreased due to the push for cleaner air, leading to the introduction of catalytic converters and suicide with domestic gas decreased due to its detoxification (Mann et al. 2005). Charcoal burning has been a suicide method especially carried out in Asia (Wong et al. 2009; Yip et al. 2010). Limited access to charcoal for the general population was highlighted as an effective way of preventing charcoal-burning suicide (Yip et al. 2010).

Hanging

Only a small amount of evidence exists regarding prevention of hangings (Zalsman et al. 2016). Controlled environments and institutions, such as psychiatric hospitals and prisons, can enforce the implementation of hanging prevention because of the supervision occurring there. Proposed implementations are safe clothing that cannot be used as means of suicide, windows adjustment, and installation of antisuicide shower heads (Reisch et al. 2019).

Alcohol

Alcohol generally increases impulsiveness and aggression which can lead to premature or rash decisions in a crisis. In addition, alcohol use is particularly common in many cases of suicide among men (Gvion and Apter 2011). Drinking habits are embedded in the culture as well in society. In some societies where alcohol consumption is not culturally acceptable, restrictions may not have the same effects as in countries where alcohol consumption is pervasive. Some examples of legislations and policies aimed at reducing alcohol consumption of the population are increased taxes, ban on alcohol imports, decreased availability of alcohol through alcohol license sale restrictions, and zero-tolerance when driving (Xuan et al. 2016).

Several examples of significant decrease of suicide rates due to alcohol reduction include the prohibition in the United States in 1910–1920 (Wasserman I 1992), price increases in Denmark in 1911–1924, and restriction of sales in Sweden starting in the first part of the twentieth century (Norström 1988). However, one of the best-studied examples of alcohol restriction on suicide rates can be found during 1984–1990 in the former Union of Soviet Socialist Republics (USSR), during the time of the *perestroika* (Wasserman et al. 1994).

Perestroika was a period of major political change, which developed into a time of increased freedom. Policies limiting the sale of alcohol were administered, which resulted in an attitude that also encouraged the restrictive consumption of alcohol in the population. It was also around this time that the USSR national archives were opened, making them available for research to study topics such as societal factors that may affect suicide rates (Wasserman and Värnik 1998). Studies of the archives showed differences of suicide within the country. The Slavic (25.6 per 100,000) and Baltic (28) region had higher suicide numbers than the Caucasian states (3.5); this is understood to be due to the cultural differences between these populations (Wasserman et al. 1998a, b). Even so, after the introduction of the *perestroika* movement, all states witnessed a fall in suicide rates, with a decrease among men approximatively by 40% for suicides from 1984–1988, in comparison with the decrease by 3% in 22 European countries at the same time (Wasserman and Värnik 1998). Further, a study that examined the alcohol levels, at the time of death in suicide victims before, during, and after the launch of the antialcohol movement during *perestroika*, confirmed that the use of alcohol consumption was a common precursor to suicide and that strong alcohol restrictions were accompanied particularly by a decrease in suicide mortality among persons of both sexes who screened positively for alcohol (Värnik et al. 2007).

School-Based Universal Suicide-Prevention

Suicide is the second leading cause of death among young people of age 15–29 years, globally (WHO 2016). School-based suicide-prevention programs can be used as an important tool to support vulnerable people and provide them with education on how to effectively cope with stress and mental health issues. In general, research shows that school-based interventions are effective concerning increased knowledge and changes in attitude (Zalsman et al. 2016). Moreover, evidence shows that some school-based mental health and suicide awareness programs are followed by a reduction in suicide attempts and ideation. The three universal school programs with the strongest evidence which are briefly described are Good Behavior Game, Signs of Suicide, and Youth Aware of Mental Health studied in the Saving and Empowering Young Lives in Europe (SEYLE) study (Zalsman et al. 2016).

The Good Behavior Game (GBG) was developed in 1969 in the United States and is designed as team-based behavior management to control aggressive and disruptive behaviors in the classroom setting. With the design of the game, the pupils are being taught two important skills: learn what maladaptive behavior is, and how to be part of a social setting and work toward common goals (Wilcox et al. 2008). The GBG program, although not primarily developed as a suicide prevention program, was successfully linked to lower suicidal behavior from childhood to young adulthood. This is believed to be related to the decrease in aggressive and disruptive behavior, as both these behaviors are correlated to suicidality (Newcomer et al. 2017). The program has primarily been linked to a long-term impact in lowering alcohol and substance use.

Signs of Suicide (SOS) is a school-based universal intervention aimed at secondary school pupils and was successful in reducing self-reported suicide attempts. The program was designed in relation to the theoretical standpoint that suicide is the outcome of mental illness and not solely a response to life stressors and emotional distress (Aseltine et al. 2004). The program aims to communicate knowledge of the warning signs of suicide risk and what to do if they are discovered by others or oneself. The intervention, however, was not followed up after 3 months and was limited by follow-up dropout (Schilling et al. 2016).

Saving and Empowering Young Lives in Europe (SEYLE) project was implemented in 11 European countries with Sweden as a scientific coordinating center. Its goal was to study the mental health of 15-year-old school-based youth and to evaluate three different school-based suicide-prevention programs compared to a control group (Wasserman et al. 2010). The project included three programs: *QPR* (Question, Persuade, and Refer), *ProfScreen* (the Screening by Professionals), and *YAM* (Youth Aware of Mental Health). Of the three SEYLE programs, YAM was the most effective in reducing the number of suicide attempts and suicidal ideation (Wasserman et al. 2015).

- The QPR program is designed by Paul Quinnett to train teachers and other school staff to act as gatekeepers (Quinnett 2007). The goal was for staff to learn how to identify risk and suicidal behavior in students and to motivate them to help

students seek professional help if in crisis. Teachers also distributed contact information of local healthcare services to students who seemed to be at risk (Wasserman et al. 2015).
- The ProfScreen program screens and identifies at-risk students through the SEYLE baseline questionnaire. This enabled referral to clinical services if needed (Kaess et al. 2014).
- The YAM program is a 5-hour universal intervention targeting all students in the classroom. This program consists of interactive role-play workshops teaching skills to cope with dilemmas in life, stress, anxiety, depression, and suicidal behavior. A booklet regarding these topics with contact information to local healthcare services is also provided (Wasserman et al. 2010).

The YAM program decreased by 50% severe suicide ideation with plans and suicide attempts. This program was unique in that it not only provided knowledge on how to cope with stressful life events but also gave the students the chance to verbalize a variety of different issues concerning mental health and suicidal behavior (Wasserman et al. 2018). Additionally, it was also effective in diminishing impulsiveness as a coping strategy (Kahn et al. 2020). The YAM program is currently being culturally adapted and implemented in Australia, England, India, Norway, the United States, and Sweden. The cultural adaptation is pursued by the local researchers in collaboration with the founders of the YAM program. The adaptation is based on a back-and-forth translation of the materials, linguistic adjustments, and on the results of qualitative research using focus groups with young people, instructors, and facilitators. This procedure feeds in the program materials and aims to ensure the fidelity of the original YAM program, quality insurance, and outcome improvement for the schools (Lindow et al. 2019).

Gatekeepers

Gatekeeper training aims to increase knowledge of suicide prevention as well as the response and identification of at-risk individuals for people with a high chance of being in contact with at-risk population. They may be from the general population, or specific professionals (e.g., teachers, police officers). The training activities are focusing on warning signs, risk factors for suicide-related acts, and how to assist or refer a person in need to appropriate assistance. Quinnett with the QPR program highlighted that in addition to such activities, training should also aim to enhance mental health literacy and decrease stigma (Quinnett 2007). Examples of existing training activities include 113 Suicide Prevention, a Dutch gatekeeper training (Terpstra et al. 2018) and Mental Health First Aid (MHFA) training launched in Australia and adapted worldwide (Kitchener and Jorm 2002; Hadlaczky et al. 2014; Jorm et al. 2019).

Media Guideline

Media reporting of suicide-related events may have negative consequences if done incorrectly. The WHO published guidelines on how suicide should and should not be reported (WHO 2017). For example, Guidelines suggest avoiding sensational descriptions of suicide as well as not providing information about the means of suicide, location, or suicide notes, and to avoid the inclusion of pictures. Media

outlets should focus on educating the population about suicide (facts and myths), and their reporting should always include visible contact information to crisis helplines for people in need. Implementing such guidelines for media has a strong positive impact on the population (Torok et al. 2017). Additionally, media reporting may have a protective factor on the general population due to an emphasis on coping with suicide.

Internet Initiatives for Suicide Prevention

The Internet can be seen as a source providing counseling and psychological help that is accessible for everyone (Gilat and Shahar 2007; Lester 2008). Internet and Internet-based applications (on smartphones and computers) are increasingly utilized for suicide preventive programs (Perry et al. 2016). Internet-based information has several advantages regarding the low-cost of building Internet prevention and accessible nature of such media (Perry et al. 2016). It nonetheless is challenged by the uncontrolled nature of the Internet, the mental health impact on users, and the fact that only a few programs are systematically evaluated (Hökby et al. 2016; Larsen et al. 2016; Zalsman et al. 2016). The Internet is all-encompassing, but research has highlighted that search engines should, and can, improve their algorithms with a more positive and tailored approach to suicide prevention (Arendt and Scherr 2016).

The Suicide Prevention through Internet and Media-Based Mental Health Promotion (SUPREME) project was aimed to develop, share, and evaluate a web-based intervention on adolescent mental health and suicide prevention. The website was designed to increase knowledge and awareness of mental health and to offer direct professional support to users. The research had strong evidence that all mental health-related outcomes declined. The study revealed that participatory designs are paramount for Internet-based interventions to meet the preferences of the users (Carli 2016).

Another example of initiative implementing Internet initiative to pursue the Vision Zero for suicide aim is the Netherlands consortium of organizations called SUPRANET which launched 113Online program to empower and improve suicide prevention action network (IIMHL 2016).

Helplines

Telephone-based helplines for suicidal people are available in many countries. The aim of these helplines is for the suicidal, or otherwise concerned, person to feel heard, talk about their problems, and be encouraged to find constructive solutions to their problems and to, ultimately, continue being alive. Since many suicidal people avoid seeking formal help, this may be the only opportunity for some to talk to someone. Crisis centers have been involved in national strategies to tackle suicide (Gould et al. 2012; Gould et al. 2016). Challenges exist to gather evidence on the effectiveness of helplines, as these services are anonymous and there are no possibilities to follow-up with the user (Nelson et al. 2017; Zalsman et al. 2016).

Indigenous Suicide Prevention

Indigenous communities have a significantly higher rate of suicide than other communities (Pollock et al. 2018). Indigenous suicide prevention programs are

unique because they need to be culturally responsive to be efficient (Wexler and Gone 2012; Charlier et al. 2017; Allen et al. 2019). Most culturally responsive programs are multilevel, multidisciplinary, and include projects on community prevention, gatekeeper training, school-based programs, media, helplines, primary care providers training, etc. (Kirmayer et al. 2009; Wexler et al. 2015). All public health and healthcare initiatives described in this section can be adapted for indigenous populations. Challenges for indigenous suicide prevention, as highlighted by some systematic research (Clifford et al. 2013; Harlow et al. 2014), are that usual suicide program designs (randomized-control trials with large population), and their evaluations do not fit the needed approach for indigenous communities (holistic approach, community-level factors, suicide considered as a social issue, etc.) (Wexler et al. 2015; Hatcher 2016; Allen et al. 2019). However, some programs on quasi-experimental designs (based on strengths-based assessment and community-level variables) have seen an increase of protective factors and reduction of suicidal behavior (Kirmayer et al. 1999; Allen et al. 2009; Allen et al., 2019). Indigenous suicide prevention programs, in addition to following a similar holistic approach as Vision Zero, highlight the strengths of community-based prevention programs.

Healthcare Approach

Healthcare approach aims to improve healthcare services, early diagnosis, and identification and treatment of suicidal behavior, as well as training healthcare staff toward better practice and follow-up for suicidal patients. These prevention strategies target patients, families, and others affected by suicide in addition to healthcare setting (Wasserman 2004; Wasserman and Durkee 2009). The initiatives with the strongest evidence are treatment of depression and chain of care. Others with mixed-result evidences are education of primary care physicians and screening in primary care (Zalsman et al. 2016).

Treatment of Depression

Psychiatric disorders are a major risk factor for suicidal behavior; therefore, their treatments are essential to suicide prevention (Zalsman et al. 2016). Improvement in depression screening and recognition by general practitioners, as well as depression campaigns, have strong evidence on suicide prevention (van der Feltz-Cornelis et al. 2011; Hegerl 2016). Various medications and psychotherapies are effective and recommended in suicide prevention (Zalsman et al. 2016).

Chain of Care

The chain of care revolves around the idea that care must be consistent and coherent at every level during the screening, diagnosis, treatment, and follow-up of a patient. It is particularly important for serious mental illnesses and suicidal behavior, which usually require longer treatment and follow-up. The chain of care needs structural (internal communication and information sharing) and follow-up improvement.

Some interventions consist of phone-based patient follow-up (Noh et al. 2016) or crisis-coping cards (Wang et al. 2016). Crisis-coping cards have shown positive results in reducing suicidal behavior and severity of suicide risk (Wang et al. 2016). Evidence for chain of care is quite heterogeneous (Zalsman et al. 2016). In the United Kingdom, the NHS launched a plan for Zero Suicide which includes engaging staff through the creation of a Safe from Suicide Team comprising representatives from local services. This team monitors and ensures the implementation of the program through all services to strengthen the chain of care regarding suicide prevention (Public Health England 2016).

Education of Primary Care Physicians

Zalsman et al. (2016) highlighted that the training of primary care physicians is effective in preventing suicide. For example, studies have shown that primary caregivers face several challenges when working with mentally ill patients (i.e., lack of training on suicide management, competing health issues, and brief and inconsistent visits) (Jerant et al. 2019). As such, programs and guidelines need to support primary caregivers on how to talk about suicide and develop contact with suicide specialists and psychiatrists (Hogan and Grumet 2016).

Screening in Primary Care

In order to prevent suicides, screening must be combined with an effective response for those individuals who screen positively for suicide risk. Considering the cost of screening, and the insufficient evidence of its benefits in primary care populations, it is judged not to be the most effective strategy for suicide prevention (Zalsman et al. 2016). In the United States, the Henry Ford Health System to implement their Zero Suicide program first assessed and screened every patient going through the Behavioral Health Service. This first step enabled the prioritization of care and contributed to the improved communication between services by creating a targeted profile of patient accessible through shared records (Hampton 2010).

Conclusion

Like all Vision Zero policies, Vision Zero for Suicide should be seen as an aspirational goal bringing together several sectors at all levels of society. But in order to succeed, it must be ambitious. It aims to not only diminish the stigma around mental health and suicide but to also bring about systematic changes. Working toward this goal for zero suicide enables multiscale and multidisciplinary suicide prevention interventions as a label for stakeholders to rally together and pool resources. Despite criticisms, successful programs worldwide guide future Vision Zero implementations for suicide.

To achieve the goal of Vision Zero for suicide, evidence-based suicide prevention strategies need to be widely implemented, in both public health and healthcare settings. Substantial financial support is a prerequisite for the success of Vision Zero. These strategies need to be catered to the respective contextual environments and regularly evaluated to improve their quality and effectiveness.

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