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**Address:** No. 90-2, Huaining St., Zhongzheng Dist., Taipei City, Taiwan

**Tel:** 02-2381-7995

**Fax:** 02-2361-8500

**Website:** http://www.tsos.org.tw

**Email:** tsos@tsos.org.tw

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# Transforming Post-COVID Suicide Challenges into Opportunities

**Chia-Yi Wu**

Throughout the COVID-19 period in Taiwan during March 2021 and May 2023, suicide rates have been reported at a modest reduction trend. However, according to the most updated government statistics in June 2023, the overall suicide death tolls of the year 2022 have been climbing to 3787, with 202 more people died by suicide compared to the preceding year. The general public in all age groups have increased their suicide numbers, particularly among the youths aged 15-24 (10.7 per 100,000) and the elderly (28.4 per 100,000) populations (Taiwan Society of Suicidology, TSOS, 2023).

What implications have appeared from this change? After the worldwide pandemic challenges and in the post-COVID era, the local and national suicide risks have drawn much attention in Taiwan. Given the concerns that the advent of COVID-19 pandemic may exacerbate mental disorder and its relation with suicidal behavior (Barlattani et al., 2023), the role of multiple risk factors including physical, mental, social, spiritual, or other related aspects remain critical, with further strategies needed to prevent the increasing trend. However, the high-risk populations may not just involve the young and the elderly people, the middle-aged sandwich cohort under stress or trauma derived from either proximal or remote major events should be identified in the communities.

In this volume of the Journal of Suicidology, we keep collecting a variety of evidence-based research from multiple perspectives in suicide-related topics. In terms of the young populations, a population-based study in Taiwan from 2006 to 2015 revealed the prevalence of medical diagnoses before suicide among the adolescents and young adults. Another study was a case report regarding a 15-year-old male with Attention Deficit Hyperactivity Disorder (ADHD) and recent suicide attempt. Both reports suggested that mental disorders should be a target for early detection and treatment among the young people.

Moreover, the TSOS collected big data in representative samples in Taiwan before and during COVID-19 to reveal more evidence of suicide-related risk factors. The titles were inclusive of psychosocial correlates and suicide crisis syndrome, psychological distress and one-year non-fatal re-attempts, utilization of mental health service and associated psychopathology and suicidality, as well as the surveillance and interventions on websites instigating suicide.

Last but not the least, many novel and specific topics of suicide research will draw the attention of readers worldwide. These titles reflect important issues related to suicide risks, such as despair, diabetes, disaster, hidden suicide, and celebrity suicide. The richness of information and evidence provided in this volume will shed light on further directions of targeted suicide prevention strategies locally and internationally.

**Keywords:** Post-COVID era, multiple suicide risk factors, suicide prevention strategies.

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**Reference:**

Barlattani T., D'Amelio C., Capelli F., Mantenuto S., Rossi R., Socci V., Stratta P., Di Stefano R., Rossi A., Pacitti F. (2023). Suicide and COVID-19: a rapid scoping review. Annals of General Psychiatry, 22(1), Article Number 10.

Editor-in-Chief of the Editorial Committee of JoS, Taiwanese Society of Suicidology; School of Nursing, College of Medicine, National Taiwan University; Department of Nursing, National Taiwan University Hospital.

# Death of Despair – the Association with Suicides

**Jens Peter Eckardt**[1*]

**Abstract:** An arising field of substantial and widely accepted research and perspectives outline an increasing public and scientific interest in the term and narrative despair or death of despair in which is often associated with i.e., mortality attributable to suicides. This highly valuable and possible construct points to the importance of continued emphasis on despair as a fundamental underlying mechanism in population health and particularly appears to be predominantly significant for suicidal ideation – and thus suicide. Despite theoretical and empirical questions remain within this construct, death of despair associated with suicides still constitutes a hypothesis that deserves more scientific interest.

**Keywords:** suicide, despair, etiology, research.

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Emerging studies and perspectives outline an increasing public and scientific interest in the term and narrative despair or death of despair in which is often associated with i.e., mortality attributable to substance use and suicide [1-9]. A narrative that has established itself as a valuable and possible "mediator in a complex causal field that links economic troubles with diverse forms of morbidity and mortality" according to Shanahan et al 2019 [2]. A narrative for which also implies that pathways to deaths of despair may even stretch across multiple years and decades [2]. Regardless of continuing discussions in defining, measuring, operationalizing, conceptualizing, testing empirically, and understanding of despair, it is driven by an arising field of substantial and widely accepted research. Notwithstanding a current debate regarding its etiology, underlying causes, its association with different health behaviors and outcomes combined with discussions about required interventions, it points to the importance of sustained emphasis on despair as a fundamental mechanism in population health and particularly appears to be predominantly significant for suicidal ideation – and thus suicide [1]. A so-called risk pathway to suicides.

According to Shanahan et al 2019 despair or death of despair is hypothesized as a multidimensional construct of different factors, that might all be subsequent for understanding this elusive latent construct [1,2]. While emotional despair reflects such as excessive sadness, negative feelings, depression, irritability, anhedonia, apathy and isolation, and inability to experience pleasure and reward and the resulting lack of motivation and action, cognitive despair reflects thought patterns suggestive of learned hopelessness, defeat, guilt, worthlessness, pessimism, and a negative or limited future orientation combined with repeated mistakes in perceiving and interpreting others as antagonistic and hostile. While behavioral despair reflects such as risky, reckless or unhealthy acts or harmful behaviors that are self-destructive and reflect limited consideration of the future e. g. a possible maladaptive attempt to cope with distress, biological despair reflects a wear-and-tear on the body's stress-reactive systems and ensuing disruptions of homeostatic processes across biomarkers, physiological markers, downstream physiological consequences and body function such as sleep, appetite, concentration, restless-ness and pain [1,2]. Furthermore, despair can even permeate social relationships, networks, institutions, and communities [2]. The domains of despair are therefore both related to the individual and may permeate social contexts, despite their connection to each other is not fully understood [2]. Despair it is somehow a new construct and associated DSM-based depressive disorders, nonetheless an association not reciprocal according to Copeland et al. 2020 [3].

Even though it is not a simply denoted term or narrative, suicide is highlighted with the assumption that despair might be an underlying mechanism to the end point of a process in which hope is lost. According to Copeland et al. 2023, "suicidal ideation seems to have the most consistent and strongest association with most of the individual dimensions of despair, as well as overall latent despair" [1]. Additionally, it is noted that despair might represent a negative and harmful psychiatric construct "implicated in suicidal ideation and attempts as behaviors rooted in negative and harmful thought patterns and beliefs" [1]. In a study by Copeland et al. 2020, despair among adolescents was longitudinally associated with higher rates of suicidal thoughts and behavior even after adjusting for sociodemographic factors, prior outcome status, and prior depressive disorder status [3]. The study presents an empirical core for despair linked to suicidality and suicides, which is consistent with evidence from other studies and in addition suggesting that the pathway from despair to diseases of despair is unidirectional [3].

However, questions remain within this new construct. Based on existing literature and studies, researchers have pointed out further perspectives, that

[1] Research Unit, Bedre Psykiatri, Copenhagen, Denmark.
[*] **Correspondence to:** Jens Peter Eckardt, Bedre Psykiatri, Laederstraede 34, 4, 1201 Copenhagen, Denmark; Tel: 0045-28943288; E-mail: Jp-mail@hotmail.com
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need to be explored. Is the trend of despair a crisis within the society? Is despair practical or is it a modern framing of an old condition or situation? Should we concentrate more on financial and social functioning and physical health? How is despair associated to race, ethnic, and socioeconomic differences? How can we accelerate further research on operationalizing despair and how do we improve the theoretical framework? How do we respond to death of despair and who may be resilient or what are the protective factors? Should public policy strategies emphasis on population-level interventions and strategies rather than aiming specific subgroups to reduce despair? [1-3,9]

Taking the emerging field of research into consideration, the term and narrative despair and death of despair is a moderately new and essential construct within suicide research as well as within the field of suicide prevention. All together it is a concept associated with risk factor for diseases and destructive behaviors that may or may not lead to suicide ideation and suicide. Obviously additional research is highly needed to comprehend the nature of despair combined with the vital policy strategies and intervention programs. That being the case, death of despair associated with suicides constitutes a hypothesis that deserves future scientific interest and theoretical and empirical studies.

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# Diabetes and Suicide: Risk Factors and Prevention Strategies

**Sahar Ashrafzadeh[1] and John H. Lee[1*]**

**Abstract:** Diabetes mellitus is rapidly growing in prevalence around the world. In addition to leading to numerous difficult-to-treat complications, diabetes is associated with worsening mental health and reduced quality of life. Furthermore, having a psychiatric illness or taking certain psychotropic medications increase one's risk of developing diabetes. While the relationship between diabetes and mental illness has been explored extensively in prior literature, relatively few studies have addressed the link between diabetes and suicide. In this narrative review, the authors describe current knowledge on the associations between suicidality and type 1 diabetes, type 2 diabetes, medication-induced diabetes, gestational diabetes, and diabetic complications. Existing literature suggests that patients with type 1 diabetes or dialysis dependence due to diabetic nephropathy have an especially elevated risk of mortality by suicide compared to the general population. Additionally, there is a bidirectional relationship between depression and type 2 diabetes, contributing to higher suicide rates in these patients as well. Patients with pre-existing psychiatric illness also have increased suicide rates, and current pharmacologic treatment options for mental illness and suicidality cause significant weight gain and metabolic disturbances that can lead to the development or worsening of diabetes. Regular screening for depression and suicidal ideation is recommended for patients with diabetes. Diabetes devices and pharmacologic or non-pharmacologic weight loss strategies may improve mental health and glycemic outcomes in patients with both diabetes and suicidal ideation.

**Keywords:** diabetes, depression, suicide, self-harm, medication-induced diabetes, suicide prevention.

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## Introduction

Diabetes mellitus is one of the most common disorders in the world and is growing rapidly in prevalence. An estimated 9.3% of the global population had diabetes in 2019 [1]. While diabetes rates have traditionally been greatest in high-income countries, low- and middle-income countries are currently experiencing a faster rise in diabetes prevalence as well as increased diabetes-related morbidity and mortality due to limited access to treatment [2].

Approximately 95% of cases of diabetes mellitus are attributed to type 2 diabetes (T2D) [2]. Type 1 diabetes (T1D), gestational diabetes (GD), and medication-induced diabetes are additional forms of diabetes with different pathophysiological mechanisms that can similarly lead to medical complications and reduced quality of life [2, 3]. Each diabetes type has unique predisposing factors, disease management requirements, and psychosocial considerations that impact patients' risk of mental illness and suicide.

Previous studies have demonstrated a strong, bidirectional relationship between diabetes and depression. Patients with a diabetes diagnosis are almost twice as likely to be diagnosed with depression and are at increased risk for worsening depressive symptoms [4]. Concurrently, patients with a history of depression are more likely to develop diabetes later in their lifetime [5]. This is due in part to depressive symptoms such as anhedonia, low energy, and appetite changes having an adverse impact on patients' lifestyle behaviors, self-care, and blood glucose management, contributing to the depression-diabetes cycle.

Both diabetes and depression increase one's risk of attempting suicide. Patients with diabetes have a suicide risk that is 1.5 to two times that of non-diabetic patients [6, 7]. A prospective cohort study evaluating almost 500,000 people found that while depression and diabetes are independently associated with increased all-cause mortality rates compared to patients with neither condition, having both depression and diabetes simultaneously has a synergistic effect on one's risk of all-cause mortality [8]. Given these findings, there exists an important opportunity to prevent, screen for, and treat depression and suicidality in patients with diabetes.

As diabetes rates increase globally, further attention should be focused on targeting patients with diabetes and comorbid depression to reduce suicide rates in this high-risk population. In this review, we consolidate existing literature on the link between diabetes, depression, and suicide for various etiologies of diabetes and diabetic complications. Means of self-harm that are most frequently utilized by patients with diabetes are discussed. Additionally, strategies to improve quality of life and mental health outcomes are recommended for suicide prevention.

[1] Department of Psychiatry and Biobehavioral Sciences, Semel Institute for Neurosciences and Human Behavior, David Geffen School of Medicine, University of California, Los Angeles, CA, USA.

[*] **Correspondence to:** John H. Lee, MD, PhD, 760 Westwood Plaza C8-846, Los Angeles, CA 90024; Phone: 310-206-3754; E-mail: JohnHLee@mednet.ucla.edu

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## Methods

We conducted a thorough literature review of studies that evaluate the relationship between diabetes, depression, and suicide. Each manuscript was categorized based on the study population's diabetes type or diabetic complication type. Based on a preliminary search of existing literature, inclusion criteria for this narrative review were narrowed to studies that evaluate suicidality in patients with T1D, T2D, gestational diabetes, medication-induced diabetes, or hemodialysis dependence. The dialysis patients were included in this study due to high rates of comorbid mood disorders in this patient population. Exclusion criteria for this review included studies focusing on diabetic complications besides dialysis dependence due to a scarcity of literature on suicidality in these populations. Study findings are synthesized to discuss the medical and psychosocial factors unique to each diabetes and complication type that elevate patients' depression and suicide risk. We provide pharmacologic strategies to reduce the risk of diabetes in patients with psychiatric disorders and suicidal ideation. Additionally, interventions for depression management and suicide prevention in patients with diabetes are recommended.

## Type 1 Diabetes and Suicide

T1D is an autoimmune condition that targets pancreatic beta islet cells. Over time, the pancreas has reduced insulin-producing capabilities, leading to a chronic hyperglycemic state and volatile blood glucose levels. The primary management strategy for T1D involves frequent blood glucose checks, multiple daily insulin injections, and careful dietary and physical activity planning. This intensive and time-consuming treatment regimen can create significant disruption in patients' lives as well as anxiety surrounding managing blood glucose levels due to the risk of developing dangerous hyperglycemic or hypoglycemic episodes.

A diagnosis of T1D typically occurs during childhood or adolescence, a period that already comes with many social pressures, family stressors, and worries about acceptance by school classmates and friend groups. In adulthood, the disease can interfere with work and relationships. Managing T1D thus is not only medically challenging for patients but can also produce psychological distress during daily activities [9].

Diabetes burnout is a common occurrence in T1D. It is characterized by physical and emotional exhaustion and feelings of detachment from diabetes management [10]. This results in a patient "giving up" on controlling their blood sugar levels, eating a healthy diet, taking their medications, or adhering to medical appointments. Studies on both adolescents and adults with T1D have found that 36% of patients with T1D experience burnout, and that burnout was the most frequent barrier to treatment adherence among adolescents [11, 12]. While distress and burnout can occur with any form of diabetes, patients with T1D are at especially increased risk since their chronic illness typically starts earlier in life and requires more frequent blood glucose monitoring and invasive treatment with insulin injections. Burnout and the resulting detachment from blood glucose control can lead to increased risk of diabetic ketoacidosis or potentially fatal hypoglycemic episodes. While diabetes burnout is a separate phenomenon from depression, patients with T1D who experience diabetes burnout are significantly more likely to also have comorbid depression [13].

Mental illness and suicide risk is a serious concern among patients with T1D. A systematic review found that T1D was associated with over threefold greater likelihood of having depression [4]. Furthermore, patients with T1D have between a 1.7 to 2.25 greater risk of attempting suicide compared to people without diabetes [6, 14, 15]. Suicide is a major cause of mortality in this population; an alarming 7.7% of deaths in patients with T1D are due to suicide [6].

Given that the mainstay of T1D management is exogenous insulin, patients have easy access to a highly lethal means of self-harm. The first reported cases of suicide by intentional large-dose insulin injection were published in 1934 and 1949 [16, 17]. Since 2001, the number of articles published on cases of suicide among patients with diabetes has increased dramatically [18]. The use of insulin for self-harm appears to be more common in patients with T1D than in those with T2D, likely due to patients with T1D have greater access to insulin [19]. Additionally, one study found that almost half of patients with T1D who attempted suicide were under the influence of alcohol [19], highlighting the role of alcohol and substance use as a mediator for increased suicidal behavior.

Given their elevated risk of suicide, patients with T1D should be regularly screened for depression and suicidal ideation. If a patient has new or worsening depressive symptoms or other signs of mental illness, appropriate mental health referrals and treatment should be initiated. If a patient has passive suicidal ideation, safety planning with the patient and any family members or friends should be performed. When possible, these patients may benefit from having a family member or close contact supervising the use and storage of insulin, oral medications, or sharps. Patients with active suicidal ideation should be hospitalized or admitted to a psychiatric urgent care setting for further evaluation and monitoring.

## Type 2 Diabetes and Suicide

People with T2D have insulin resistance that develops over the course of years due to diet, excess weight, sedentary lifestyle, environmental factors, and genetic predisposition. Previously, the condition was diagnosed almost exclusively in older adults, but it is now frequently diagnosed in younger adults and even in children due to increasing rates of obesity and sedentary lifestyles [2].

T2D management typically begins with lifestyle modification and oral medications. Thus, initial disease management in T2D is less intensive than in T1D. However, insulin resistance and pancreatic function may worsen over time and diabetic complications may arise, potentially resulting in dependence on exogenous insulin. Like patients with T1D, patients with T2D are at risk of developing diabetes burnout due to burdensome dietary

restrictions, exercise adherence, medication management, and frequent follow-up appointments with numerous specialty clinics.

People with T2D have twice the prevalence of depression as those without diabetes [4], and an estimated 18-25% of people living with T2D meet criteria for a depressive episode [20]. Being diagnosed with T2D increases one's risk of having worsening depressive symptoms [4]. Furthermore, pre-existing depression, bipolar disorder, and schizophrenia are all associated with increased risk of developing T2D later in life [21]. Thus, there is a strong bidirectional relationship between T2D and depression and other mental illnesses [5, 21–23].

While there are numerous studies clearly demonstrating increased suicide rates among patients with T1D, published literature on suicide rates among patients with T2D has been less conclusive. A meta-analysis found that patients with T2D had a possible 1.65-fold greater suicide risk than patients without diabetes; however, the results did not reach statistical significance [6]. Suicide accounts for 1.3% of deaths among people with T2D [6]. Additionally, having major depression is associated with increased all-cause mortality among people with T2D [24]. This may be attributed to depressive symptoms preventing patients from managing their medical conditions or adhering to follow-up appointments, leading to worse physical health outcomes. With the growing prevalence of diabetes around the world, interventions addressing depression and suicidality in patients with T2D would have a significant impact on preventing unnecessary deaths.

The use of non-insulin anti-diabetic medications for suicide attempts is more common in patients with T2D, with biguanides such as metformin being mostly commonly implicated [25–29]. Metformin is the first-line pharmacologic treatment of T2D in most patients. However, metformin overdose results in dangerous lactic acidosis and may require hemodialysis to prevent cardiac arrest and death. Other anti-diabetic medications including gliclazide, glipizide, liraglutide, and sitagliptin having also been reported in mostly non-fatal suicide attempts [29].

Like patients with T1D, patients with T2D should be screened for new or worsening depression or suicidal ideation and triaged to outpatient mental health services or potential inpatient hospitalization as appropriate.

## Psychotropic Medication-Induced Diabetes

Patients with a psychiatric illness who take antipsychotic medications are often at risk of side effects including insulin resistance, hyperglycemia, weight gain, and metabolic syndrome. Some patients may even progress to being diagnosed with medication-induced type 2 diabetes and can develop diabetes-related complications because of their prescribed medications. A meta-analysis determined that patients taking any individual antipsychotic, except for aripiprazole and amisulpride, had significantly greater risk of T2D compared to patients who were antipsychotic-naïve [21]. Another meta-analysis on antipsychotic side effects identified that zotepine, olanzapine, sertindole, chlorpromazine, iloperidone, quetiapine, and clozapine led to the greatest weight gain, which may be used as a proxy for risk of metabolic syndrome and diabetes [30].

Clozapine is the only antipsychotic approved by the United States Food and Drug Administration for preventing suicide in patients with schizophrenia [31]. It is also the most effective antipsychotic medication for managing patients with psychotic disorders [30]. However, its use is limited by profound metabolic side effects. An observational study on 82 patients who were initiated on clozapine identified that 36.6% of patients were diagnosed with diabetes within five years [32]. Furthermore, current literature suggests that the risk of developing clozapine-induced hyperglycemia is not dose-dependent [32, 33]. Thus, it is important for healthcare providers to monitor patients taking clozapine closely for signs of hyperglycemia from the time of medication initiation. Given that people with schizophrenia have approximately a 10% risk of dying by suicide and an 18-55% rate of suicide attempts [34], the long-term use of clozapine may still be warranted on a case-by-case basis if other antipsychotic medications and suicide prevention strategies have not been effective.

The other psychotropic medication with the most evidence for preventing suicide is lithium, a mood stabilizer used to treat bipolar disorder. Bipolar disorder is associated with the highest suicide rate among all major psychiatric conditions; approximately 15-20% of patients with bipolar disorder die by suicide [35]. A meta-analysis found that patients with mood disorders who were prescribed lithium had significantly lower rates of suicide, self-harm behavior, and all-cause mortality [36]. However, weight gain is one of the most frequent reasons that lithium is discontinued by patients [37]. Lithium-induced weight gain is believed to be due to metabolic changes in addition to side effects of increased thirst or, more rarely, hypothyroidism [37]. To mitigate weight gain and metabolic syndrome in patients being prescribed lithium, it is important to counsel patients on the possibility of weight gain prior to initiating the medication. Patient-specific dietary and physical activity recommendations should be discussed before and during lithium treatment. To alleviate increased thirst, patients should be advised to avoid sugar-sweetened beverages and to drink water or low-calorie beverage alternatives. To prevent weight gain due to lithium-induced hypothyroidism, patients should have their baseline thyroid function checked before starting lithium, at three to six months, and again every six to 12 months [37]. If thyroid-stimulating hormone (TSH) levels are slightly elevated and the patient has refractory depression or fatigue, or if TSH is greater than 10 mU/L, it is advised to treat with l-thyroxine until TSH normalizes [37].

Several pharmacologic options exist to reduce psychotropic medication-induced weight gain and metabolic syndrome. Metformin prescribed prior to or soon after initiating clozapine was associated with decreased weight gain at six and 12 months as well as lower fasting glucose levels compared to patients taking clozapine alone [38, 39]. It should be noted that metformin is lethal in high quantities due to risk of lactic acidosis, so providers should cautiously prescribe it in patients who are actively suicidal.

Additionally, opioid receptor antagonists have shown promise for reducing metabolic disturbances due to antipsychotics. Naltrexone, a long-acting opioid receptor antagonist, was found to prevent antipsychotic-induced weight gain and even led to net weight loss, likely by reducing food cravings [40]. Samidorphan is another opioid antagonist that has proven effective in reducing antipsychotic-induced weight gain when used in conjunction with olanzapine [41]. Patients who received olanzapine with samidorphan had less weight gain and smaller increases in waist circumference after 24 weeks when compared to patients who received olanzapine with placebo [41]. The study did not find significant differences in glycemic outcomes between groups at 24 weeks; however, since interim weight gain may mediate long-term diabetes risk, further research is warranted to explore long-term weight changes and metabolic outcomes of patients taking antipsychotics with opioid antagonists.

Glucagon-like peptide-1 (GLP-1) receptor agonists are another promising avenue for reducing glucose dysregulation and weight gain caused by psychotropic medications. These medications decrease blood glucose levels and increase satiety. Given their favorable metabolic effects, GLP-1 agonists have been used to treat T2D since 2005 and more recently were approved for obesity treatment as well [42, 43]. A randomized controlled trial studying patients with schizophrenia spectrum disorder on stable doses of clozapine or olanzapine found that daily liraglutide injections led to significantly improved glucose tolerance and weight loss after 16 weeks compared to placebo [44]. A smaller trial on patients with schizophrenia treated with clozapine found that adding on weekly exenatide injections was associated with significantly greater mean weight loss, decreased fasting blood glucose, and reduced glycated hemoglobin (HbA1c) levels at 24 weeks [45]. In contrast, another small trial on patients with schizophrenia taking various antipsychotic medications found that weekly exenatide injections did not result in greater weight loss than placebo after three months [46]. However, in this case, both the exenatide and placebo arms experienced statistically significant weight loss over the investigation period [46]. While larger and more long-term studies are needed, the current literature suggests that GLP-1 agonists may have a role in reducing psychotropic medication-induced weight gain and diabetes risk.

Electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), and ketamine are effective in reducing suicidality in patients with psychiatric illnesses without increasing their risk of diabetes. However, these therapies are not accessible to all patient populations due to high cost, limited resources, or increased government regulation. As emerging therapies become better studied and interventional treatments become more accessible to patients, individuals with major depression, bipolar disorder, or schizophrenia who are at high risk of suicide may have a broader array of options for suicide prevention.

## Gestational Diabetes

GD is a type of diabetes that frequently develops during pregnancy and that increases one's risk of being diagnosed with T2D later in life. Worldwide, an estimated 16.9% of pregnancies are complicated by hyperglycemia due to either GD or pre-existing diabetes [47]. GD is associated with up to a two-fold greater risk of depression during pregnancy and a 4.62-fold risk of subsequent postpartum depression [48–50]. Similar to T2D, the relationship between GD and depression is bidirectional; women with depressive symptoms at the start of pregnancy are more likely to develop GD [51].

Pregnant patients with psychiatric conditions are generally recommended to continue taking their psychotropic medications during pregnancy since the risk of untreated mental illness typically outweighs the risk of pregnancy complications [52, 53]. However, certain medications such as lithium and valproate are contraindicated during early pregnancy for teratogenicity. Patients planning to become pregnant may be switched to a mood stabilizer with a more favorable safety profile, such as lamotrigine, or to an antipsychotic medication [54, 55]. Quetiapine is a second-generation antipsychotic frequently used to treat schizophrenia and bipolar disorder during pregnancy given its relatively low rate of placental passage compared to other antipsychotic medications [56]. However, quetiapine is associated with significant weight gain and metabolic effects [30]. Women taking second-generation antipsychotics such as quetiapine were found to have twice the risk of developing GD compared to pregnant women not taking an antipsychotic [57]. It is thus important for mental health providers to emphasize adherence to GD screening and treatment for their pregnant patients who are taking antipsychotic medications. These patients may also benefit from nutritional counseling to prevent excess weight gain and to help with blood glucose control during pregnancy.

While there is limited data on the association between GD and suicide rates, the strong positive correlation between GD and depression during and after pregnancy justifies further research on suicidality among pregnant patients with GD and postpartum patients with a history of GD. Screening patients with GD for depression and suicidal ideation both during pregnancy and in the postpartum period is recommended.

## Diabetes Complications

Regardless of diabetes type, poor glycemic control is associated with numerous long-term complications that can progressively worsen quality of life. Chronic hyperglycemia leads to inflammation and damage of various body tissues. Diabetic retinopathy is one of the leading causes of blindness in the world. Diabetic neuropathy causes limb numbness, tingling, and/or burning pain and increases susceptibility to foot ulcers and difficult-to-treat infections that, when severe, may necessitate limb amputation. Diabetic nephropathy, while initially asymptomatic, can eventually lead to advanced chronic kidney disease that requires frequent dialysis sessions or kidney transplantation for survival. Diabetes is also closely associated with cardiovascular disease and increased risk of myocardial infarctions and strokes, which independently can cause physical impairment and psychological distress.

Collectively, the various complications of diabetes

lead to significant morbidity and reduced quality of life, which can contribute to depression and suicidality.

### Dialysis dependence and suicide risk

While there is limited research on suicide rates associated with most diabetic complications, there is compelling evidence for increased suicidality among patients who have end-stage renal disease (ESRD) and are dependent on dialysis. Diabetic nephropathy is the leading cause of ESRD in high-income nations and is increasingly common in countries with developing economies [58].

People who depend on dialysis have long experienced higher levels of psychological distress and reduced quality of life, leading to increased depression and suicide rates. A study published in 1971 reported that the rate of suicidal behavior among patients with dialysis in the United States was over 100 times that of the general population [59]. In that report, however, withdrawal from dialysis was also considered to be suicidal behavior [59]. More recently, a study estimated that the rate of death by suicide among patients on dialysis was almost twice that of the general United States population [60]. Researchers in Ireland found that over 26% of patients with chronic kidney disease experienced suicidal ideation, and over 9% had attempted suicide [61]. The study also found that patients on dialysis were more likely to be depressed than those who had received a kidney transplant or were not on dialysis [61], suggesting that dialysis treatment itself contributes to increased burden of mental illness in patients with ESRD. In Japan, patients on dialysis had a suicide rate almost three times that of the general population [62]. A large population-based cohort study in Taiwan identified that patients on dialysis had a suicide rate almost 2.4 times that of the general population and that the rate of suicide by cutting in particular was 20-fold [63]. Means of self-harm unique to patients on dialysis include exsanguination by cutting of vascular access for hemodialysis, massive food or fluid intake, or withdrawal from dialysis treatment with the intention of suicide [59, 63].

In addition to increasing suicide risk, depression is associated with poorer overall health outcomes in this population. One study found that patients on dialysis with comorbid depression had twice the rate of hospitalization or all-cause mortality over a five-month period compared to patients on dialysis who were not clinically depressed [64]. Higher depression scores are also associated with significantly greater likelihood of a patient withdrawing from dialysis treatment [60, 65].

There are numerous potential etiologies leading to depression in patients on dialysis. The largest contributor is likely deterioration in quality of life due to the intensive nature of dialysis treatment as well as poor physical health since most patients are living with multiple comorbidities. Individuals with ESRD due to diabetic nephropathy often also have cardiovascular disease, diabetic retinopathy, diabetic neuropathy, and/or amputations [66]. Depression and kidney disease are both associated with increased levels of inflammation [66]. Patients with ESRD are also prone to malnutrition and anemia, which can contribute to fatigue and frailty [66]. Cognitive decline is common in patients with ESRD due to older age, sleep disturbances, anemia, depression, and uremia that results from poor renal function [67]. Uremia can also lead to fatigue, gastrointestinal symptoms, sexual dysfunction, pruritis, muscle cramps, restless leg syndrome, and sleep disorders [68]. In addition to psychotherapy and pharmacotherapy for depression, patients on dialysis should be offered palliative treatments that target their specific somatic symptoms to improve their quality of life.

## Strategies for Depression Management in Patients with Diabetes

Given that diabetes is associated with elevated rates of depression and suicidality, patients should be regularly screened for depression and asked about suicidal ideation. The Primary Health Questionnaire-2 (PHQ-2) is an efficient two-question survey with 96% sensitivity for depression in adults [69]. However, initial screening with the Primary Health Questionnaire-9 (PHQ-9) may be more appropriate for patients with chronic diseases such as diabetes since this tool provides diagnostic validity of a major depressive disorder and can be used to monitor depressive symptoms and treatment response over time. For adolescents, the PHQ for Adolescents or the Beck Depression Inventory are alternative screening options [70]. For women in the postpartum period, the Edinburgh Postnatal Depression Scale has higher sensitivity and specificity for postpartum depression [71]. For elderly patients, the five-item or 15-item Geriatric Depression Scales may be preferred since they use simple binary answer choices unlike the four-point Likert-type scales used in PHQ forms [70].

Any patients who screen positive for depression should be offered a mental health referral and initiated on appropriate treatment. Both psychotherapy and pharmacotherapy are options for depression management. Selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) are first-line antidepressants for patients with depression and diabetes. Patients who have diabetic neuropathy may simultaneously benefit from the analgesic effects of SNRIs [72]. Tricyclic antidepressants (TCAs) are also effective for treating both depression and diabetic neuropathy [72]; however, TCAs should be cautiously prescribed in elderly or suicidal patients due to side effect burdens and risk of cardiac toxicity. Mirtazapine should be avoided in patients with diabetes due to risk of drug-induced appetite, altered eating behavior, weight gain, and metabolic dysregulation. The use of antidepressants, with the exception of monoamine oxidase inhibitors, has been associated with significantly reduced all-cause mortality in patients with comorbid diabetes and depression [73].

### Diabetes devices

Alleviating the burden of diabetes management on patients is an important approach to preventing burnout, improving quality of life, and potentially reducing depressive symptoms. Modern diabetes technologies including insulin pumps, continuous glucose monitors

(CGMs), and hybrid closed-loop insulin delivery systems hold promise for serving this role.

Insulin pumps were among the first innovations that used technology to help patients with T1D self-manage their blood glucose levels. Interestingly, studies are mixed on the extent to which insulin pumps have improved quality of life or depression rates in patients with diabetes. A cross-sectional study on 301 adolescents with T1D found that patients who were clinically depressed were significantly less likely to be using an insulin pump than patients with lower depression scores, despite both groups having similar demographic characteristics [74]. However, a different study on 42 adolescents with T1D found no significant difference in depression rates after 12 months of using an insulin pump compared to baseline prior to initiating the pump [75]. Among adults, a study on 297 patients with T1D found that adults who used an insulin pump reported reduced food-related diabetes distress but otherwise had no differences in levels of burnout or job satisfaction compared to those who used an insulin pen [10].

CGMs allow patients to monitor glucose levels in real time without repeated, painful finger pricks. They also alert patients when their glucose levels become too high or low. The RESCUE Trial in Belgium investigated the long-term impact of CGMs on glycemic outcomes and quality of life in 441 adults with T1D on insulin pump therapy [76]. The study found that patients sustained lower HbA1c levels after 24 months of using a CGM while also having significantly fewer hypoglycemic events than at baseline [76]. With regards to quality of life, patients reported significantly lower fear of hypoglycemia while using a CGM [76]. This benefit was most prominent among patients with impaired awareness of hypoglycemic events (i.e. those with diminished ability to perceive of the onset of hypoglycemia) [76]. Another study compared quality of life in patients with poorly controlled T1D who received a CGM compared to those who continued self-monitoring their blood glucose (SMBG) [77]. Patients who used a CGM had a significant reduction in diabetes distress and improvement in hypoglycemic confidence compared to the SMBG group at 24 weeks [77]. While satisfaction rates with CGMs were high, there were no significant differences in broader quality-of-life measures including patient-perceived wellbeing and health status, suggesting that people with T1D still have barriers to optimal quality of life even with the aid of CGMs [77].

The hybrid closed-loop insulin delivery system, sometimes referred to as the "artificial pancreas", is a more recent innovation designed to reduce the burden of blood glucose monitoring and insulin delivery. These technologies integrate both an insulin pump and a CGM and use an algorithm to automatically deliver insulin based on real-time glucose readings. A randomized controlled trial on 120 adults with T1D found that patients who received the hybrid closed-loop system had improved glycemic control, HbA1c, diabetes-specific positive wellbeing scores, and diabetes-specific quality of life scores but did not experience significant differences in diabetes distress or sleep quality compared to the usual care group after six months [78]. Another study on 53 patients with T1D who were initiated on a hybrid closed-loop system found that patients experienced a significant decrease in HbA1c levels, improved physical functioning, and reduced fear of hypoglycemia after 12 months of use [79]. A shorter study on 58 adults and children similarly found that HbA1c, glycemic variability, fear of hypoglycemia, diabetes quality of life, diabetes treatment satisfaction, diabetes distress, and sleep quality all improved after three months of use [80].

While there are still few long-term studies investigating how closed-loop systems and other diabetes devices impact psychiatric outcomes, these technologies have been shown to improve glycemic control, and lower HbA1c levels are associated with decreased depressive symptoms [22, 81]. While these devices are primarily available to patients with T1D, they also are feasible options for improving quality of life in patients with T2D or other forms of diabetes. However, access to diabetes technologies including insulin pumps, CGMs, and hybrid closed-looped systems is mostly limited to high-income countries, patients with adequate health insurance coverage, or those who can afford out-of-pocket expenses. As diabetes devices continue to make strides in functionality and accessibility, more research is needed on the impact of adopting these technologies on depression scores and suicide risk.

## Physical activity and weight loss

Weight loss and physical activity are strategies at the forefront of diabetes prevention and treatment. Many studies have also recommended physical activity as an evidence-based therapeutic approach for psychiatric conditions including depression, anxiety, stress, and schizophrenia [82].

In studies evaluating the effect of exercise in clinically depressed adults, a meta-analysis revealed that exercise produced a statistically significant reduction in depressive symptoms [83]. Notably, a study found that patients who engaged in high levels of aerobic physical activity (at least 30 minutes of moderate-intensity exercise on three or five days per week) experienced a significant improvement in depression, while patients who engaged in lower amounts of exercise showed improvements comparable with placebo [84]. The mechanisms through which exercise affects depression are multifactorial. Physical activity may provide a distraction from depressive thoughts, promote social and environmental contact, improve strength and physical well-being, increase beta-endorphin and monoamine concentrations, and release BDNF, a neurotrophic factor associated with cognitive improvement and neurogenesis in the hippocampus [82, 85–88].

In the context of diabetes treatment, exercise and weight loss are highly effective in improving health outcomes and can even result in T2D remission [89]. In patients with diabetes and obesity, a sustained 7% weight loss after lifestyle modification led to significantly lower HbA1c levels five years later [90]. The Look AHEAD trial found that a 10% weight loss in patients with T2D was associated with fewer cardiovascular events and decreased mortality over 10 years [91].

Exercise interventions may be even more effective in treating both diabetes and depression when combined with cognitive behavioral therapy (CBT). A multi-center randomized controlled trial studying clinically depressed individuals with uncontrolled diabetes compared HbA1c changes among participants who were assigned to a 12-

week intervention of exercise only, CBT only, or exercise plus CBT compared to patients who received usual diabetes care [92]. Interestingly, the researchers identified a synergistic effect between exercise and CBT in improving HbA1c levels; the group demonstrated a 1.1% improvement in HbA1c at 12 weeks [92]. Additionally, patients in the exercise only, CBT only, and exercise plus CBT intervention groups had a significantly greater reduction in depressive symptoms, negative automatic thoughts, and diabetes distress compared to the control group [92].

Exercise is a low-risk therapeutic strategy with both positive diabetes outcomes and antidepressant effects. We recommend at least 150 minutes per week of moderate-intensity physical activity, as tolerated by the patient, as a component of a holistic treatment plan for patients with diabetes and mild-to-moderate depression [93].

# Conclusion

Suicidality is a growing concern among patients with diabetes. Notably, suicide is a major cause of mortality among patients with T1D and those with dialysis dependence due to diabetic nephropathy. Diabetes medications and exogenous insulin unfortunately provide patients who are suffering from depression with a lethal means that is easily accessible. Thus, it is critical to increase screening for and treatment of depression and suicidality among patients with diabetes.

Addressing each patient's causes of diabetes distress may reduce diabetes burnout and depression in a patient-centered manner. When available, devices such as insulin pumps, CGMs, and hybrid closed-loop systems may improve glycemic outcomes and quality of life in some patients. Promoting weight loss through physical activity, nutrition counseling, GLP-1 agonist use, or enrollment in a weight loss program can also be used to effectively treat diabetes and depression.

For patients with pre-existing mental illnesses including schizophrenia, treatment-refractory depression, or bipolar disorder, it is imperative to weigh the benefits and risks of psychotropic medications, many of which lead to weight gain and hyperglycemia, and to choose the most weight-neutral options when possible. Patients with decreased functioning and/or high risk of suicidality would still benefit immensely from clozapine, lithium, or other psychotropic medications despite the significant metabolic liability. Pairing antipsychotics or mood stabilizers with metformin, opioid antagonists, or the new GLP-1 agonists may reduce side effects of weight gain and metabolic syndrome. To avoid the metabolic risks, providers may opt for neuromodulation procedures such as ECT, TMS, or ketamine treatment when these treatments are accessible and clinically indicated.

Further research is needed to understand the biological origins of depression and diabetes. Immunocytokine dysregulation, aberrant circadian cycle, hypothalamic inflammation, and hypothalamic-pituitary-adrenal axis dysregulation have all been implicated in the pathophysiology of depression in patients with diabetes [94–96]. A greater understanding of the roles of innate immunity and inflammation in the pathogenesis of depression in T1D and T2D would pave the way for future therapeutic development and treatment.

Patients with diabetes who screen positive for depression or suicidal ideation should be promptly referred to a mental health professional. Regular screenings for depression and suicidality in people with diabetes is necessary to ensure that patients receive appropriate psychiatric treatment, timely safety planning, and potentially life-saving interventions for suicide prevention.

## Conflicts of Interest

The authors report no relevant disclosures.

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Review Articles

# Disaster and Suicide Prevention Activities: A Literature Review Focused on Suicide-Related Outcomes

**Masatsugu Orui[1,2*]**

**Abstract:** ***Background:*** Numerous epidemiological studies regarding suicide after disasters exist, but there are few comprehensive reviews pertaining to suicide prevention activities after disasters. Therefore, this review aimed to consider the kinds of suicide prevention activities that have been implemented and which may be effective. ***Methods:*** A search was carried out to find articles that mentioned the implementation of suicide prevention activities after natural, human-made, and infectious disasters. ***Results:*** Twenty-nine articles were reviewed from 492 identified articles and were categorized into the following: suicide prevention interventions in community and school settings, telephone and online interventions, and suicide prevention guidelines. One-third of the reviewed articles included the outcomes of the activities, revealing no steep increase in suicides in the affected area and a decreased rate of suicidal ideation during interventions. Some of activities were 1) targeted vulnerable individuals like those who were strongly affected by the disaster, the elderly, and the needy, and 2) continued as interventions over a long-term period while building a more sustainable and intensive community mental health system, which is considered a difference from non-disaster times. ***Limitations:*** There is a risk of selection bias. There were less than half of the research articles examined suicide prevention interventions with outcomes, and these articles did not have a high evidence level. ***Conclusion:*** Although only a limited number of articles have examined suicide prevention activities with outcomes, the key point may be the continuation of interventions in the long term for vulnerable individuals and the strengthening and rebuilding of the community mental health system for suicide prevention. Moreover, it is necessary to identify the best ways to engage to contact vulnerable individuals in post-disaster settings.

**Keywords:** disaster, suicide, suicide prevention, activity, literature review.

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## Introduction

Those who have been affected by devastating disasters have faced traumatic experiences, including the loss of family, relatives, friends, housing, or jobs. Additionally, the aftermath of such events can involve the mandatory evacuation of people from the affected area; consequently, residents are forced to live under very stressful conditions while adjusting to new circumstances—a phenomenon known as secondary stress. This may, in turn, give rise to an increase in mental health issues, including post-traumatic stress dis-order (PTSD), depression, and suicide [1–3]. The coronavirus disease 2019 (COVID-19) pandemic is considered a disaster of unprecedented proportions, yielding global repercussions. With states of emergency declared and stay-at-home orders issued worldwide, the COVID-19 pandemic vastly impacted citizens, both psychologically and socioeconomically.

Previous epidemiological studies and review studies regarding suicide after disasters have been conducted, and it was found that the suicide rate increased after large-scale disasters, including the COVID-19 pandemic, although the increase in the suicide rate differed across time and gender [4–10]. Therefore, it is essential to promote suicide prevention activities after disasters while victims are trying to recover from the psychological damage inflicted by such events. Many studies regarding mental health interventions that may contribute to suicide prevention after disasters have been conducted. With this said, however, only a limited number of studies have examined how these suicide prevention interventions could affect suicide rates and suicidal behavior after disasters, which it was mentioned immediate, appropriate, and target focused interventions including psychological first aid and crisis counseling could reduce long-term suicidal behaviors [11]. Whereas in non-disaster times, there are many suicide prevention intervention programs that examine the effectiveness of suicide prevention [12–20]. There were few review studies while summarizing actual suicide prevention activities in the post-disaster period.

Therefore, along with summarizing suicide prevention activities after disasters, the current literature review study aimed to examine the kinds of actual suicide prevention activities that may be effective. The goal was to summarize the findings of the literature review and thereby contribute to the response, recovery, and preparedness for future disasters.

[1] Tohoku Medical Megabank Organization, Tohoku University, Miyagi, Japan; [2] Department of Public Health, Fukushima Medical University School of Medicine, Fukushima, Japan.

[*]**Correspondence to:** Masatsugu Orui, MD, PhD, Tohoku Medical Megabank Organization, Tohoku University, Sendai 980-8573, Miyagi, Japan;Tel:(+81)22-717-8104;E-mail: masatsugu.orui.e5@tohoku.ac.jp

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# Methods

## Definition of the disaster and study design

In this literature review study, disasters are defined as 1) any natural disaster such as earthquakes, tsunamis, hurricanes/typhoons, floods, 2) human-made disasters, and 3) infectious outbreaks like the COVID-19 pandemic.

This literature review study was searched by "PubMed", "Scopus", "Web of Science", and "Ichushi-Web", the last of which is a database with an exhaustive collection of Japanese biomedical literature. Searched articles were written in English or Japanese and were related to suicide prevention activities following any natural, human-made, or infectious disaster, published by 31 December 2022. The search strategy was as follows: (1) English articles were searched using PubMed, Scopus, and Web of Science using the following keywords: "Disaster", and "Suicide Prevention"; (2) Japanese articles were searched via the "Ichushi-Web" using the following keywords: (1) "Saigai (Disaster)" and "Jisatsu-Yobou (Suicide Prevention)".

Original articles, short reports, communications, letters, practical, activity reports, and commentary that included actual suicide prevention activities following any disaster met the criteria for selection. If an article did not contain sufficient information on suicide prevention activities, it was excluded. Duplicate articles listed in the PubMed, Scopus, Web of Science, and Ichushi-Web databases were also excluded.

## Inclusion/Exclusion criteria

The current literature review focused on whether or not the articles included any reports of suicide prevention activities. Consideration was also given to any outcomes regarding suicide and suicidal ideation for the purpose of examination suicide prevention activities after disasters. Therefore, articles that included any reports of suicide prevention activities after disasters were selected for inclusion in this literature review. Articles without a direct relation to any natural, human-made, or infectious disaster were excluded.

## Plan of summarizing articles of suicide prevention activities in the post-disaster period

Referring to previous review studies on suicide prevention activities implemented in non-disaster times [15,18], it was categorizing the suicide prevention activities in the post-disaster period of the selected articles in this literature review. Additionally, articles containing information on outcomes of suicide-related problems (e.g., suicidal ideation and attempt suicide) were summarized separately to consider suicide prevention activities after disasters. Moreover, it summarized the actual status of the suicide prevention activities that may have led to any suicide-related outcomes if there were outcomes. In case of no suicide-related outcomes, it was summarized the description of the suicide prevention activities in the post-disaster period.

## Ethical considerations

Ethical approval was not required, as this was a literature review study, and all selected articles had already been published on open-access database websites.

# Results

The initial search was conducted on March 8, 2023, using proper combinations of the keywords ("Disaster" and "Suicide Prevention" in PubMed, Scopus and Web of Science, and "Saigai" and "Jisatsu-Yobou" in Ichushi-Web), which led to the identification of 492 articles (PubMed: 205, Scopus: 97, Web of Science: 102, and Ichushi-Web: 88). Subsequently, after a brief review of the identified articles, 441 articles were excluded based on the criteria because they did not involve a direct relation to any disaster or actual suicide prevention activities. Twenty-two duplicate articles were excluded, leaving twenty-nine articles to be reviewed in this literature review study. (Figure 1).

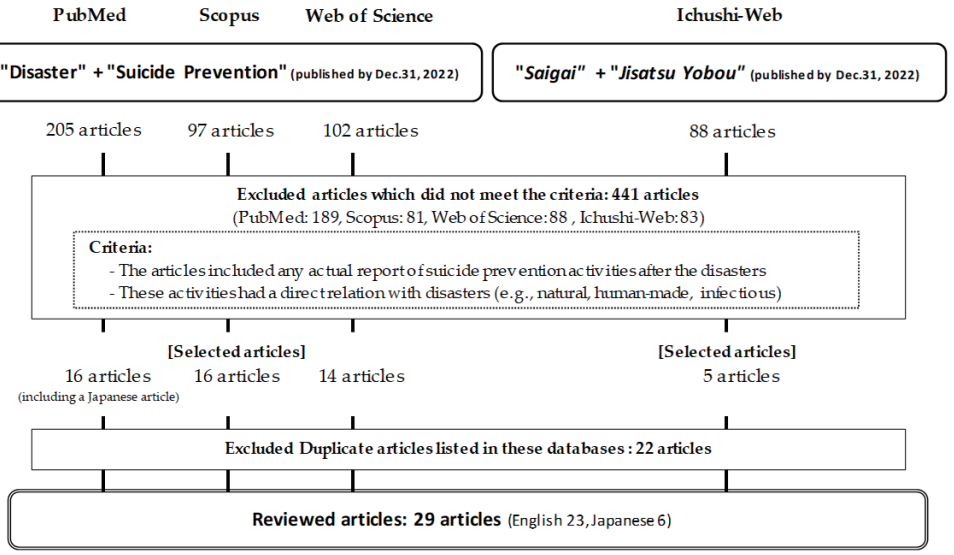


**Figure 1.** Flow chart of process of selecting articles for the review.

## Results of actual suicide prevention activities after disasters

In this literature review, the following types of disaster were reported: (1) natural disasters, 14 articles (earthquake: 11, flood: 1, any natural disaster: 2); (2) human-made disasters, 2 articles; (3) infectious outbreak, 9 articles; and (4) any disaster or crisis, 4 articles. Referring to previous review studies on suicide prevention activities implemented in non-disaster times, the selected articles that included actual suicide prevention activities were categorized as follows: (1) targeted suicide prevention activities in community or school settings; (2) types of activities, such as direct interventions, public awareness, training for supporters and professionals, and online interventions; and (3) guidelines for suicide prevention activities. Moreover, due to the large number of articles on activities in the community, these articles were reclassified into (a) interventions implemented immediately after a disaster and (b) continuous interventions and community approaches to suicide prevention (Table 1- Table 5). Since there were no significant differences in suicide prevention activities by type of disaster, it would be explained the results without dividing by type of disasters.

### Suicide prevention activities in the community settings

Twenty articles were reviewed, which targeted residents affected by disasters. Some involved a community approach and rebuilding the community mental health system to prevent suicides after the disasters.

Eight articles reported suicide prevention activities regarding interventions made immediately after disasters [11,21–27]. The types of disaster were as follows: (1) human-made disasters, (2) natural disasters (including Fukushima Daiichi Nuclear Power Plant (FDNPP) accident because of causing by severe earthquake and tsunami disaster), and (3) infectious disasters. The main target of most interventions that were implemented immediately after a disaster was vulnerable people, such as psychiatric patients with PTSD, depression, and alcoholism; those who were affected strongly by direct disaster exposures; the young and elderly generations; the needy; and the homeless [11,21,22,25,26]. After the devastating earthquake and tsunami disaster in Thailand and the flood disaster in Japan, an intervention team was formed immediately to provide outreach services, including home visits and counseling, and information to the affected residents [22,23]. During the initial phase of the COVID-19 pandemic, the main intervention target was quarantined people [24,27].

In addition, seven articles have reported continuous intervention and community approaches to prevent suicide in the mid-to the long-term period after a disaster implemented by local governments and non-governmental organizations [28–34]. To maintain the community mental health care system after a disaster, the existing community system was rebuilt to provide comprehensive care using methods such as (a) continuing screening and counseling for affected residents, (b) support for practitioners and mental health professionals in the affected area, and (c) the prevention of isolation through community development [28–33]. Moreover, several articles detailed suicide prevention activities that were implemented taking into consideration social connections [30,32,34].

Moreover, two articles reported public awareness to promote the understanding of mental health well-being after disasters [35,36]. Additionally, three articles involved training and education for practitioners and mental health professionals through developed training program, such as the gatekeeper training (GKT) program, which improves mental health literacy and develops skills to better recognize and support vulnerable people and is a widely recommended suicide prevention intervention [37–39].

### Suicide prevention activities in school settings

Three articles that implemented suicide prevention activities after disasters in school settings were reviewed. All of the articles conducted in school settings mentioned identifying the mental health status of high-risk students, and subsequently, providing counseling by professionals such as psychologists and social workers and referral to mental health expert facilities [40–42]. Additionally, through annual questionnaire surveys on mental health among high school students, high-risk approach efforts were made to identify high-risk students and connect them with mental health professionals for counseling [41]. Furthermore, there were also efforts to educate school social workers using vignettes regarding suicidal behaviors [42].

### Suicide prevention by utilizing telephones and online devices

Four articles were reviewed regarding online interventions and helplines [43–46]. An article reported that online interventions such as the Internet and text-based therapy can be useful tools for providing immediate psychological interventions to people who have recently been exposed to large-scale traumatic events [43]. The other three articles reported activities during the COVID-19 pandemic [44–46]. Maintaining access to health services, such as an empathy-oriented telephone call programs, could reduce loneliness, depression, and anxiety, especially for vulnerable people, the needy, and women [44]. Suicide-related calls increased when containment restriction policies became more stringent and decreased when income support was extended [45]. Moreover, among veterans, the number of patients receiving ongoing telephone-based services for suicide attempts was stable, while the number receiving treatment for overdoses decreased by 17% [46].

### Suicide prevention guidelines

Report showed that suicide prevention activities should be enhanced in disaster-affected areas, as it is important to monitor the mental health (including suicide) of victims, volunteers, and support staff [47]. Another finding was that it is necessary to develop and apply disaster mental health guidelines that are tailored to each country from the findings based on the review study [48].

**Table 1.** Suicide prevention in community settings: suicide prevention for affected residents and the community - interventions for affected residents, mainly implemented immediately after a disaster.

| Disaster (type) | Authors | Article type | Outcomes of suicide prevention | Suicide prevention activities following disasters |
|---|---|---|---|---|
| Any wars or combat after 9.11, 2001 (Human-made) (USA) | Inoue et al. (2022) [21] | Book | Military service members with family and friends with whom they can discuss deployments are less likely to experience suicidal ideation. | Vulnerable groups among US veterans should be identified and interventions (e.g., reduction stressor, contact to professional) and be provided for patients with conditions such as PTSD and major depressive disorder, and vulnerable veterans with combat exposure and combat-related injuries. Additionally, these individuals should be encouraged to reach out to social contacts or visit locations that serve as distractions, contact a family member or friend for help, and contact a professional or agency. |
| Sumatora earthquake and tsunami disaster, 2004 (Thailand) | Bronisch et al. (2006) [22] | Practical report | The intervention teams were not aware of any actual or attempted suicides. | The German government set up a crisis task force that implemented crisis-intervention teams covering Thailand, whose teams consisted of physicians specialized in emergency medicine, psychiatrists and psychologists. Their tasks were planned as follows: (1) crisis intervention like providing information and counseling for the victims; (2) psychological care for the members of the rescue groups; (3) the gathering of information for further planning of crisis interventions; and (4) the provision of informational material and care for relatives traveling into the country to look for missing relatives and friends. |
| Joso flood, 2016 (Flood) (Japan) | Tachikawa (2019) (In Japanese) [23] | Practical report | No increase in suicide cases has been shown since the intervention. | Immediately after the Joso flood disaster, outreach—home visits and consultation activities—were implemented in to prevent suicides. A total of 19 outreach teams were formed, with each team comprising 3–4 people, including doctors, nurses, social workers, and clinical psychologists; these teams gave intensive support, especially to the elderly, and thus 80% of the affected elderly were encouraged to receive medical treatments, long-term care insurance and community-based care. |
| Any natural disaster | Ross, et al. (2016) [11] | Review | (-) | Many suicide risk factors, like previous and current mental health and social issues, increase after natural disasters. Early psychosocial interventions including psychological first aid (PFA)* and crisis counseling have been reported. The authors suggested that immediate, targeted, and culturally appropriate actions in response to natural disasters are critical for reducing long-term mental health problems and suicidal behaviors. |
| COVID-19, 2020 (Infection outbreak) (Japan) | Tachiwaka (2021) (In Japanese) [24] | Practical report | (-) | The following interventions were conducted during the COVID-19 pandemic: (1) mental health support for those affected by the pandemic; (2) screening and online counseling at quarantined facilities for affected people; and (3) mental health interventions such as proactive counseling for staff working at the hospitals responding to COVID-19 patients. These interventions were conducted through cooperation with local government. |
| COVID-19, 2020 (Infection outbreak) (Slovenia) | Alibegović, et al. (2020) [25] | Case report | (-) | Mental health problems are more likely to occur in vulnerable groups, such as people with mental disorders, migrants, and people on the frontline of an epidemic crisis. Long-term isolation or quarantine exacerbates the symptoms of anxiety, depression, and suicide. Three presented cases were connected to deteriorating depression and alcoholism, eventually leading to suicide, even though these problems were not directly caused by the health crisis during the COVID-19 epidemic. |
| COVID-19, 2020 (Infection outbreak) (USA) | Dotson et al. (2020) [26] | Commentary | (-) | The Boston Hope Field Hospital (Boston, MA, USA) implemented a mental health disaster response at a 1000-bed facility for patients testing positive for COVID-19. Of the available beds, 500 were set aside for homeless patients to be prevented undesirable outcomes such as overdoses and suicide attempts. Using a psychological first aid (PFA*) framework, the following standard-of-care framework was provided: (1) contact and engagement, (2) safety and comfort, (3) stabilization, (4) information gathering, (5) practical assistance, (6) connection with social supports, (7) coping information, and (8) linkage with collaborative services. |
| COVID-19, 2020 (Infectious outbreak) (Japan) | Tachikawa, et al. (2022) [27] | Practical report | Among 3711 people onboard the cruise ship, there were no cases of actual suicide attempts. | In February 2020, the Diamond Princess cruise ship was quarantined in Yokohama port, Japan after a passenger tested positive for COVID-19. The Disaster Psychiatric Assistance Team (DPAT*) provided brief counseling to passengers and crew members if needed. As a result of the examination, several passengers experienced suicidal ideation, but there were no cases of actual suicide attempts during the quarantine period. |

Note:

* Psychological First Aid, PFA: an initial disaster response intervention with the goal to promote safety, stabilize survivors of disasters and connect individuals to help and resources.

* Disaster Psychiatric Assistance Team DPAT: conduct mental health and psychosocial support activities (e.g., medication, counseling, or casework) in disaster settings by a team consisting of a psychiatrist, nurse, and logistics staff.

**Table 2.** Suicide prevention in community settings: suicide prevention for affected residents and the community - continuous intervention for affected residents and community approach.

| Disaster (type) | Authors | Article type | Outcomes of suicide prevention | Suicide prevention activities following disasters |
|---|---|---|---|---|
| Former Yugoslav Wars, 1991 (Human-made) (Bosnia and Herzegovina) | Cerić, et al. (2001) [28] | Practical report | (-) | During and after the Yugoslav wars, most of the existing psychiatric systems have been integrated into the community-based mental health centers. These centers play the following roles: (1) community-based mental health centers are responsible for the prevention and treatment of psychiatric disorders, as well as for mental health well-being; (2) primary mental health care is administered by family practitioners, and specialized psychiatric care is undertaken by professional teams with specialized mental health; (3) through the implementation of comprehensive and accessible services for community mental health care. |
| Nagano Earthquake, 2011 (Japan) | Koizumi, et al. (2012) (In Japanese) [29] | Practical report | (-) | Actual activities carried out after this earthquake included: (1) promoting public awareness of mental health and acting as a gatekeeper for suicide prevention; (2) outreach (e.g., home-visiting and counseling, addressing social, life and health support) for high-risk groups; and (3) support for local government officials and counselors. This disaster triggered the rebuilding of the local mental health and welfare care system. |
| GEJE, FDNPP accident, 2011 (Japan) | Orui, et al. (2019) (In Japanese) [30] | Practical report | No steep increase in suicide cases in the municipality in which the intervention was conducted | Proactive suicide prevention and mental health activities were implemented as follows: (1) careful monitoring of suicide rates; (2) Screening and outreach counseling for evacuees with mental health and sleep problems and suicidal ideation; and (3) GKT* for community volunteers and mental health counselors working in the evacuation area to maintain the social network in the community. |
| GEJE, 2011 (Earthquake, Tsunami), [COVID-19, 2020] (Japan) | Orui, et al. (2021) [31] | Original article | The suicide rate showed a declining trend during the COVID-19 pandemic which may be an outcome of ongoing activities. | Long-term disaster-related mental health activities have continued to support residents who experienced the GEJE. These include screening residents with high psychological distress (Kessler 6: 13 points and over) and those engaging in binge drinking and providing continuous counseling with home visits. Additionally, as an integral part of disaster-related mental health activities, counselors illustrated the procedures of special cash payments for COVID-19 from the Japanese Government, especially to the elderly and needy. |
| GEJE, 2011 (Earthquake, Tsunami), [COVID-19, 2020] (Japan) | Orui, et al. (2021) [32] | Practical report | Suicide rates in the affected area did not exceed the national average, despite the rates in the nonaffected area rising steeply. | Disaster-related mental health interventions following the GEJE consisted of (1) annual screening of high-risk evacuees with high psychological distress (Kessler 6 score ≥ 13) or those engaging in binge drinking; and (2) visiting selected high-risk individuals and providing mental health and daily life support through outreach in the temporary housing and disaster restoration housing communities. This intervention was continued during the COVID-19 pandemic. Counselors addressed issues of “loneliness” or “isolation” among residents in public restoration housing who had little connection with society due to the pandemic. |
| GEJE, 2011 (Earthquake, Tsunami) (Japan) | Orui (2022) [33] | Review | The area in which intensive interventions were implemented did not show a steep increase in suicide cases after the GEJE. | Several articles have reported that intensive and continuous interventions combined with a high-risk and community-focused approach could prevent suicide following disasters. (1) As high-risk approaches, evacuees were screened for mental health issues such as depression, alcoholism, and suicidal ideation. Public health center staff visited them and, if needed, referred them to psychiatrists or mental health professionals. (2) As a community approach, GKT* was used to allow community volunteers to build a social network and ties. |
| Any natural disaster | Connerton, et al. (2019) [34] | Original article | (-) | To address the impacts of natural disasters on mental health and suicide, public health nurses helped to build strong and resilient communities by using a model developed by the Centers for Disease Control and Prevention. Increased awareness and the building of resilience will improve health outcomes. Strong social connections are a key component of community resilience. Therefore, strengthening the infrastructure of communities could mitigate against the impact of natural disasters. |

Note:
* Gatekeeper Training, GKT: improving mental health literacy and developing skills to better recognize and support vulnerable people, a widely recommended suicide prevention intervention.

**Table 3.** Suicide prevention in community settings: public awareness for suicide prevention and suicide prevention for supporters and professionals.

| Disaster (type) | Authors | Article type | Outcomes of suicide prevention | Suicide prevention activities following disasters |
|---|---|---|---|---|
| **Public awareness for suicide prevention** | | | | |
| GEJE, 2011 (Earthquake, Tsunami) (Japan) | Moriyama, et al. (2013) [35] | Practical report | (-) | One year after the GEJE, the Office for Policy of Suicide Prevention of the Cabinet Office, Japan published pamphlets promoting the understanding of mental health care for those affected by natural disasters. These pamphlets contained brief messages like "Avoid too much alcohol", "Do not force someone to talk about disaster experiences when they don't feel like talking", and "Take it easy and consult with medical professionals". |
| COVID-19, 2020 (Infection outbreak) (Uganda) | Akena, et al. (2021) [36] | Research protocol | (-) | Severe psychological distress resulting from exposure to disasters may trigger the onset of common mental disorders, which predicts poor outcomes including a high mortality rate (mainly through suicide). Therefore, to enhance knowledge on mental health, the Ministry of Health distributed brochures containing information about (1) the signs and symptoms of COVID-19; (2) the fact that individuals may suffer from stress during the pandemic; (3) sources to access psychosocial help; and (4) the contact details of the research team should they need more information. |
| **Suicide prevention for supporters and professionals** | | | | |
| GEJE, 2011 (Earthquake, Tsunami) (Japanese) | Otsuka, et al. (2014) (In Japa-nese) [37] | Practical report | (-) | The gatekeeper training (GKT*) program for suicide prevention was developed to provide education to local medical personnel, consultation office staff, and people in fields related to mental health who are expected to support those affected by a disaster. More than 300 training workshops (9819 participants, including nonmental health professionals) have been conducted in Iwate prefecture, severe damaged by tsunami. |
| GEJE, FDNPP accident, 2011 (Nuclear) (Japan) | Orui, et al. (2021) [38] | Original article | (-) | Twenty-six life support advisers belonging to the Social Welfare Council in the evacuation area participated in a training program. The program contents regarding suicide covered specific ways to communicate with residents with suicidal thoughts, e.g., (a) questioning about suicidal ideation and (b) encouraging a person to seek appropriate professional help. As a result, counselors' confidence in coping with the resident's suicidal thoughts showed a significant increase. |
| COVID-19, 2020 (Infectious outbreak) (UK) | Cherepanov (2020) [39] | Practical report | (-) | Providing mental health support to humanitarian aid workers and guidance on how to manage severe job-related stresses during the COVID-19 pandemic while using the "Ten Lesson from the Humanitarian Response". One of the lessons of the Humanitarian Response, No. 9. Suicide Risk Among Frontline Workers Is Real!, states that exposure to massive suffering and mortality may change the perceived meaning and value of life, resulting in recklessness, taking unnecessary risks, and suicidal ideation. |

Note:
* Gatekeeper Training, GKT: improving mental health literacy and developing skills to better recognize and support vulnerable people, a widely recommended suicide prevention intervention.

**Table 4.** Suicide prevention in school settings and suicide prevention by telephone and online.

| Disaster (type) | Authors | Article type | Outcomes of suicide prevention | Suicide prevention activities following disasters |
|---|---|---|---|---|
| **Suicide prevention in school settings** | | | | |
| Any school crisis (USA) | Nickerson, et al. (2004) [40] | Original article | (-) | School crises include natural disasters, airplane crashes, terrorist attacks, and suicide attempts. Anger management/ social skills programs, police resource officers, crisis plans, crisis drills, peer mediation, and violence prevention programs are ordinal ways to address school crisis and prevention. School psychologists reported that several crisis intervention strategies with students are used, including (1) referral to mental health services and the provision of individual counseling and (2) psychological first aid (PAF*) for an initial response intervention to safety. |
| GEJE, 2011 (Earthquake, Tsunami) (Japan) | Inoue, et al. (2015) (In Japanese) [41] | Practical report | The rate of suicidal ideation declined after the intervention for high-school students. | An annual mental health questionnaire survey for all students from the three targeted high schools (approximately 2000 students) and subsequent interventions for high-risk students were implemented. As a result, depression scores and the rate of suicidal ideation significantly declined after the intervention like screening and referring teachers and counselors. These mental health surveys functioned as a means of effective screening and monitoring for high-risk students with depression and suicidal ideation. |
| Any disaster (USA) | Chock-Goldman, et al. (2021) [42] | Book | (-) | Crisis intervention is a major component of school social work practice. School social workers may face suicidal ideation after natural and human-caused disasters due to the amount of time children spend at school. Special attention should be given to addressing the disproportionate impacts that disasters have on communities of color and those who are economically disadvantaged. Education for school social workers through case vignettes can be used to strengthen suicide prevention. |
| **Suicide prevention by telephone and online** | | | | |
| Any disaster (Australia, Germany, Iraq, Israel, Netherlands, South Korea, USA) | da Silva, et al. (2015) [43] | Review | (-) | Online psychological treatments are computerized therapies that are usually software-based; Internet-based therapies using web tools like audio or video conferencing and forums; and text-based therapies, which are generally conducted by e-mail. The results of this systematic review show that online psychological crisis interventions do exist, and they have been widely developed in many countries around the world. Netherlands and Australia are emerging at the forefront of this kind of intervention, and the intervention platforms are being expanded to other languages, aiming to expand access to include users from other locations. |
| COVID-19, 2020 (Infection outbreak) | Ivbijaro, et al. (2021) [44] | Review | (-) | Thirty-nine papers were summarized: (1) The COVID-19 pandemic has caused an increased risk of suicide, particularly, the needy and women because they are more likely to lose their jobs. Moreover, the greater domestic burden caused an increased risk of domestic violence against women. (2) Any services regarding mental health and substance misuse are need. (3) Suicide is preventable, and during a pandemic, efforts should be made to find novel ways to maintain access to health services, such as an empathy-oriented telephone call program to reduce loneliness, depression, and anxiety, especially for vulnerable people. |
| COVID-19, 2020 (Infection outbreak) (14 European countries, USA, China, Hong Kong, Israel, Lebanon) | Brülhart, et al. (2021) [45] | Original article | Suicide-related calls increased when restriction policies became more stringent and decreased when income support was extended | The volume of helpline calls for mental health concerns including suicide-related problems peaked six weeks after the initial outbreak at 35% above pre-pandemic levels. The increase was driven mainly by fear (including fear of infection), loneliness, and, later in the pandemic, concerns about physical health. Relationship issues, economic problems, violence, and suicidal ideation, however, were less prevalent than before the pandemic. |
| COVID-19, 2020 (Infectious outbreak) (USA) | Zhang, et al. (2022) [46] | Original article | Early in the COVID-19 pandemic, patients receiving ongoing care for suicide attempts were stable, and overdoses decreased by 17% among veterans. | Tele-mental health (any mental health support utilizing telephone or clinical video) began to be used as a service for the assessment or treatment of depression, PTSD, substance use disorder, schizophrenia, overdose, and suicide attempts in a Veterans Health Administration facility in the early phase of the COVID-19 pandemic. As a result, the number of patients receiving ongoing care for suicide attempts was stable, and overdoses decreased by 17%. This may indicate that veterans are resilient to the effects of the pandemic, and as a population, they are less likely to attempt suicide when threatened by the pandemic. |

Note:
* Psychological First Aid, PFA: an initial disaster response intervention with the goal to promote safety, stabilize survivors of disasters and connect individuals to help and resources.

**Table 5.** Suicide prevention guideline.

| Disaster (type) | Authors | Article type | Outcomes of suicide prevention | Suicide prevention activities following disasters |
|---|---|---|---|---|
| GEJE, 2011 (Earthquake,Tsunami) (Japan) | Takeshima, et al. (2015) [47] | Review | (-) | It is recommended that suicide prevention activities be enhanced for the disaster area of the GEJE, as it is important to monitor the mental health (including suicide) of victims, volunteers, support staff from local governments, and other affected persons. |
| Any disasters | Lee, et al. (2019) [48] | Review | (-) | In total, 440 pieces of literature were reviewed for the purpose of establishing evidence-based guidelines for mental health services following a disaster by an online Delphi survey. The developed evidence-based guidelines should reflect the social and cultural aspects including the protection of personal information and privacy, research ethics at the disaster site, and interventions for suicide prevention. It is important to develop and apply disaster mental health guidelines that are tailored to each country. |

# Discussion

For findings of this review, one-third of the reviewed articles examined the outcomes regarding suicide or suicide-related problems (e.g., suicidal ideation and suicide attempts) Therefore, this discussion focuses mainly on the examination of suicide prevention activities after a disaster with outcomes.

## Examination of suicide prevention activities

Four articles examined interventions implemented immediately after a disaster, and all of them reported that there were no subsequent increases in suicidal ideation, suicide attempts, or suicide cases in subjects who underwent the intervention immediately after the disaster [21–23,26,27]. Although these interventions were not identical in terms of subjects and duration, interventions that focused on vulnerable groups, such as the needy, the elderly, and quarantined people might be considered effective to a certain degree.

Additionally, in four articles that examined continuous interventions and community approaches, there was no steep increase in suicide cases in the subject area of the intervention [30,33], and the others showed a declining or stable trend for suicide cases during the COVID-19 pandemic, despite an increasing trend being shown nationwide [31,32]. Moreover, not only mental health issues but also issues in daily lives and linkages to further types of specific continuous care for affected residents [23,31,32] might also be effective. Therefore, efforts like continuous interventions for addressing mental and social issues could suppress an increase in suicide cases [30–33].

Suicide prevention activities in school settings were reported that the use of interventions while repeatedly monitoring depression and suicidal ideation [41]. Likely due to interventions conducted in community settings, continuous interventions for high-risk groups in school settings are assumed to be also effective.

Regarding suicide prevention activities by telephone and online devices, patients receiving ongoing care through online interventions for suicide attempts were stable during the COVID-19 pandemic [45]. Additionally, the results may suggest that, during infectious disasters such as the COVID-19 pandemic, the number of affected residents will rise, increasing the importance of online interventions, and the development of effective and appropriate policies, including restrictions due to infection and financial aid for affected residents, will be essential [31,45,46].

In summary, one-third of the reviewed articles reported assessable outcomes of suicidal problems, showing some effectiveness of suicide prevention activities, most of which occur immediately after disasters with continuous interventions provided to specific targets.

## Difference in suicide prevention activities between non-disaster and post-disaster periods

In previous review studies regarding suicide prevention in non-disaster times, efficient suicide prevention measures included the preservation of contact with individuals at the risk of suicide recurrence [16]. Additionally, community-based interventions were evaluated as moderate in terms of their effectiveness for suicide prevention [18]. In other previous review studies concerning suicide prevention programs, it was found that community-based outreach programs, consisting of early detection of high-risk individuals, mental health workshops to promote the awareness of depression and suicide risk, and increased outreach to the elderly are key strategies for suicide prevention [12,16].

The findings of this reviewed articles with any suicidal outcomes show that the methods/style of suicide prevention activities after a disaster may not be so different from those used in non-disaster times. However, it was found that interventions need to be targeted at vulnerable residents with severe disaster experiences, those who had mental disabilities before the disaster, those who have not been able to adjust to drastic social and environmental changes after evacuation, and those who have faced economic hardships.

Like these situations, the suicide prevention measure after disasters is characterized by support to many high-risk individuals simultaneously, with the number of people affected multiplying after disasters [49]. Additionally, among residents affected by a disaster, some experience chronic or delayed onset mental distress, and some have suicidal ideation [50]. Nevertheless, a previous review study regarding suicide prevention in community settings reported that the majority of programs operated at the prevention level, with less than half providing continuing long-term care [15].

Of course, intervention immediately after a disaster is essential, however, it is thought that suicide prevention activities in the post-disaster period must take into account the many high-risk individuals that exist simultaneously and multiply, leading to chronic and delayed onset mental illness; thus, interventions should be continued over the long-term period in order to contact with affected and vulnerable individuals while building a more sustainable and intensive community mental health system [28,30–32] than that used in non-disaster times.

### Current challenges of research regarding suicide prevention after disasters

Although well-designed study articles regarding suicide prevention in non-disaster times have been conducted, including intervention and control groups [12,13,16–19]. However, few research articles have examined suicide interventions after disasters with outcomes included [21–23,27,30–33,41,45,46], this point is assumed the current challenges of research regarding suicide prevention after disasters. Therefore, further research regarding interventions for suicide prevention while considering monitoring suicide-related problems among affected residents [47] and the evaluation of activities is required to develop more effective prevention activities.

### Limitations and strengths of this literature review study

This literature review has certain limitations. Firstly, because the search process was implemented by the author alone, there is a risk of selection bias, even though the search strategy and inclusion/exclusion criteria were set out in advance. Second, less than half of the research articles examined suicide prevention interventions with outcomes; additionally, these articles did not have a high evidence level, because the studies were not well designed, and absent a formal study quality assessment of outcomes. Thirdly, it has some concerns that the articles of suicide prevention activities conducted in Japan are so many in the sample because of including articles written in Japanese. The fourth is lack of conducting more rigorous and well-designed studies in the field of post-disaster suicide prevention. Finally, it was impossible to examine other suicide prevention activities, like linkages of the social network to prevent social isolation, gatekeeper training (GKT), and public awareness, because there is no information available on suicide outcomes.

Despite the above limitations, this literature review has several strengths, one of which is that it included articles written in Japanese. In particular, many practical reports regarding suicide prevention after disasters written in Japanese were included, since numerous natural disasters, such as earthquakes, have occurred in Japan. These Japanese suicide prevention after disasters was characterized by policy strategies by the national government and continuous community suicide prevention strategies by local governments and non-governmental organizations. One of the reasons was the Basic Act for Suicide Prevention encouraged the activities enhanced for the disaster area [47]. As such, this is a good opportunity to reveal Japanese suicide prevention activities globally.

## Conclusions

Although many studies on suicide prevention activities after disasters, few studies have examined the outcomes associated with suicide or suicide-related problems. These interventions, from those conducted immediately after disasters to long-term programs, consisted of careful screening, outreach, and counseling targeting not only individuals with direct experiences of traumatic events but also those who are vulnerable to secondary stress, such as the elderly and needy and psychiatric patients. The findings of this review suggest that suicide prevention activities after disasters must be implemented over long-term periods targeted at vulnerable residents while building a sustainable and intensive community mental health system.

In conclusion, it is necessary to keep in mind that the mission, for both researchers and practitioners, is to create a society where no increase in suicide is seen, even if numerous individuals have been affected by a devastating disaster. Indeed, it is necessary to accumulate further findings related to suicide prevention activities while considering evaluations on the outcomes of interventions and identifying the best ways to engage to contact vulnerable individuals in post-disaster settings.

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This study did not require ethical approval because no individual information was used.

### Conflicts of interest

The author declares no conflict of interest (Masatsugu ORUI).

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Special Articles

# Hidden Suicides: Their Misclassification as Accidental, 'Undetermined' or Unknown Cause Deaths

**John Snowdon**[1,2*]

**Abstract:** ***Background:*** Suicides are under-counted to a varying extent around the world: studies show a substantial proportion to have been inappropriately classified as accidental. In various countries, high proportions of self-killings are coded as 'undetermined deaths' because of uncertainty about whether the decedent intended to die. Some experts declare that the mortality classification code 'ill-defined or unknown cause' is commonly a haven for 'hidden suicides'. ***Aim:*** The aim of this review is to examine to what extent differences between nations in their reported suicide rates are attributable to misclassification of cause of death as accidental, 'undetermined intent' or 'ill-defined or unknown'. ***Discussion:*** Reports suggest that accidental death is the ICD-10 category to which suicides are most often misclassified. Commonly (for example in drug poisoning deaths) those certifying deaths have no definite information to point to intentional self-killing, but this may be because assessment and investigations were inadequate. Misclassifying suicides as 'undetermined' is relatively common in some nations, but occurs rarely or not at all in some others. Most 'ill-defined or unknown' cause deaths are 'natural' and (except in Britain) occur mainly in late old age. ***Conclusion:*** Well-resourced nations should be using psychological autopsy and intensive investigations (including forensic autopsy and toxicology, as in Finland) in cases where there is doubt about cause of death. If resources are limited, comparable studies on representative samples of non-elderly decedents should be undertaken, with studies of selected elderly decedents as well, if funds permit.

**Keywords:** suicide rates, undetermined death, accidental death, unknown cause death, ICD-10 codes.

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## Introduction

It is claimed that suicide rates in most countries are underestimated [1-3], with suicides largely 'hidden' in categories of accident, undetermined intent (ICD-10 code Y10-34), or 'ill-defined and unknown cause' death (ICD-10 code R99) [4,5]. The present article poses questions about variations between nations in the degrees to which suicides are reportedly misclassified to one or other of these three categories.

Where suicides are misclassified, it may be because of inadequate enquiries or investigation, incomplete reporting, deliberate misrepresentation (by family, informants, or those wishing to protect against hurt, shame, stigma or punitive consequences), or inappropriate death certification (such as ascribing death to something which could never be considered an underlying cause). Training in death certification is reportedly deficient in many countries [6,7], and resourcing for adequate enquiries and investigations may be limited.

## Background

### Certifying the underlying cause of death: why there are 'garbage codes'

In 1948, the World Health Assembly introduced ICD-6, the sixth revision of the International Statistical Classification of Diseases and Related Health Problems [4,8]. It adopted an international death certificate, and agreed on principles of identifying in the certificate the underlying cause of death (c.o.d.). However, at the same time as using ICD coding in certifying deaths, health administrators started using ICD to record reasons why living persons consulted clinicians or were in a health facility. "The introduction of multiple purposes for the ICD has led to the addition of many codes for causes that should not be considered underlying causes of death" [8], and the term 'garbage codes' (GCs) was introduced to encompass ICD codes that are useless or unusable in relation to mortality surveillance and public health research, policy and practice [8,9]. Most deaths coded to GCs were 'natural', though insufficiently defined. Among 'natural disease' categories declared to be GCs are the R codes listed in chapter 18 of ICD-10 [4], the most commonly used being 'ill-defined and unknown cause of death' (coded R99).

Among other ICD codes listed by Naghavi et al [8] as GCs are some used in classifying deaths attributable to external causes. Prominent among them are 'Events of Undetermined Intent' (EUIs; coded Y10-34), the term used (in cases of poisoning, drowning, car-crash, falling or due to some other external cause) when there is uncertainty about whether to code the death as intentional

[1] Sydney University, Sydney, New South Wales, Australia; [2] Concord Hospital, NSW 2139, Australia.
[*]**Correspondence to:** Professor John Snowdon, Concord Hospital, Sydney, New South Wales 2139, Australia;Tel:(+61)432615099;E-mail:johnamblersnowdon@gmail.com
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(suicide), or unintentional (accident or homicide). Of accidental death codes (X40-59), only X59 (exposure to an unspecified factor causing injury) has been nominated as a garbage code. Most misclassified suicides have been coded as either EUI deaths, accidental deaths or R99 deaths; proportionally few 'hidden suicides' are coded X59 [10]. Despite recommendations from WHO that GCs not be used in certifying c.o.d., in many jurisdictions they often are.

There is considerable inter-nation variation in the proportion of deaths assigned to GCs. In the early 2000s, Australasia consistently was the region with the lowest fraction of GC codes, while countries in Africa, the Middle East and Southeast Asia had the highest percentages, some exceeding 50% of all deaths [8]. Data from the Global Burden of Disease 2010 Study showed the proportion of GC deaths was lowest in Finland (5.5%) and highest in Sri Lanka (69.6%) [11]. Mikkelsen et al [7] compared patterns and distributions of unusable and insufficiently specified GCs in six high-income nations in 2015-2016: the average proportion of unusable c.o.d. was 18%, ranging from 14% in Australia to 25% in Japan. The most commonly used GCs were R99, heart failure and senility.

## Assigning ICD-10 codes

Misclassification occurs during death certification and also during coding processes at national statistics offices, where ICD codes for the underlying cause of death are assigned, based on information provided in death certificates. Policies regarding how best to conform with WHO guidelines on assigning codes in cases where certificate data are incomplete or implausible, vary between nations, partly due to varied skills, training and flexibility of the coders and other information managers [1,2]. Assigning appropriate and 'usable' codes in cases where certifiers have used non-specific terms such as 'senility' or 'heart failure' on death certificates without adding further details, is problematic unless the coder is enabled to seek out clarifying information (for example, from the certifier). It has been declared [1] that in such cases "cause listings must be reworked during the official death registration and codification process. This reworking requires medical expertise, sound judgement, and a thorough knowledge of ICD coding rules".

Foreman et al [12] found that many death certificates that resulted in deaths being assigned to GCs contained information "about contributing causes of death", and that a plausible underlying c.o.d. often appeared among them, thus providing strong clues about a valid 'usable' c.o.d. Claassen et al [1] extolled the advantages of using a computer software programme, called the Mortality Medical Data System, to code death certificate information. The programme analyses the chain of medical events leading to death, as documented on the death certificate, when selecting which code to assign to a death.

Although Australia was being reported as assigning relatively few deaths to GCs, worldwide problems with coding processes are exemplified by inaccuracies in coding in Australia in 2002-2006 [13]. During that period, following process changes, if deaths during the relevant year had not yet been registered and coded by a certain cut-off date, some relevant details concerning those cases (such as c.o.d.) were omitted from officially compiled death registers. Of the 12% of deaths that were referred to a coroner for a ruling on c.o.d., a verdict had not been reached by the cut-off date in various external cause cases; where findings were not available to the Australian Bureau of Statistics (ABS) in time for publication of c.o.d. statistics, deaths were "coded to other accidental, ill-defined or unspecified causes rather than suicide" [13]. In 2007, the ABS listed a number of issues affecting data collection, including variability of coroners' practices when determining the intent of a death, but emphasized the imperative of defaulting to "accident" when suicide intent was not evident [13]. However, later in that year the ABS changed its practices regarding timing of cut-off dates. Starting in 2007, the ABS released 'preliminary' mortality statistics 15 months after the end of the year for which mortality figures were being extracted, though this was changed in 2015 to just 9 months after the end of the reference year; if cases had not yet been finalized, coders would assign a code to indicate that the c.o.d. was not yet known – and this could be R99 or a code giving partial indication of c.o.d., such as Y10-34 (EUI) or X59. Since 2007, enhanced resourcing has allowed ABS coders to seek out toxicology, autopsy and police investigation reports, and to gather data from coronial files, in order to better identify the specific c.o.d. Since 2015 the mortality data have been revised (if indicated) during the two years following their initial release, and are then publicly reported. A further year later (some three years and nine months after the end of the reference year), the data are finalised, having been further revised where necessary. Some countries follow a similar revision process. The ABS has provided a discussion regarding the methodology of its current processes when releasing and then revising its cause-of-death statistics [14]. Various other nations delay publication of mortality figures, giving a chance for all long-drawn-out cases to be finalized before the data are officially released. The WHO 2020 Mortality Database [15] showed that a substantial number of countries had not (in 2020) provided data from years later than 2014. The national differences in processes for coding and then releasing their mortality figures add to complexities in comparing the suicide and other mortality rates of different nations.

## Quality of reported mortality data

Completeness and accuracy of the mortality data reported annually to WHO vary between nations [16], the variability being largely attributable to differing levels of resourcing for investigations and training in accurate certification and codification. In South Korea it was suggested that varying effort for c.o.d. ascertainment, as well as changing attitudes concerning disclosure, could have affected the completeness of suicide statistics [17]. Many lower-income countries have registration systems that cover only part of the population, with no c.o.d. data for those dying outside hospitals and no routine compilation of data for analysis and policy purposes [16]. In order to make more meaningful estimates concerning statistics provided to WHO by nations that assign large proportions of deaths to GCs (and thus to maximise the public health utility of c.o.d. data), analysts have sought to reassign GCs, largely by proportionate redistribution within the same age-sex groups, using an expert- based

algorithm to decide the fractions to be allocated to different "target causes" [8,12]. As an example, WHO's reassignment of GCs reported in Thailand in 2015 resulted in that country's suicide rate being estimated as double the officially reported rate [18,19]. But there has been no 'gold standard' by which to appraise the accuracy of such estimates.

# Discussion Concerning 'Havens' for Hidden Suicides

## EUI deaths

Central to the process of officially labelling a suicide is the need to recognize whether the death was deliberately self-inflicted with the intention of ending life. Jurisdictions that rely on a legal/criminal ('burden of proof') standard when judging intentionality may be more likely than those relying on a medical ('balance of probabilities') standard to settle on an open ('undetermined') verdict rather than one of suicide [20]. The term 'Event of Undetermined Intent' (EUI) was introduced in 1968 in ICD-8 to label any injury or external cause death "for which the intention cannot be established beyond reasonable doubt" by a medical or coronial examination. General understanding is that the term 'undetermined deaths' (UDs) equates to EUI deaths [16,20,21]. Värnik et al [20] added that not just suicides but "accidents and homicides may also be misclassified as 'undetermined' in some situations." In most EUI cases, the physical cause (manner) of death can be specified; the certifier knew there was an external cause for the death, but did not know whether death was intentional. If tenacious attempts to assess intentionality have proved unsuccessful, assigning an EUI code may be justifiable; however, when assigned because of a lack of resources to determine intent, its use is regrettable.

Some nations (Spain, Norway, Greece, and the Netherlands, for example) assign proportionally few or no deaths to any EUI code. A majority of nations report low rates (under 2.0 per 100,000). However, various Eastern European nations have been reporting substantial EUI rates, notably Russia, Belarus and Ukraine (with EUI rates > 20 per 100,000), and Lithuania, Estonia and Latvia (EUI rates about 10 per 100,000), all having suicide rates of 25 or more per 100,000 [20]. In these nations (notably, Russia), it is believed that a number of the EUIs were in fact homicides. A minority of other nations also reported high EUI rates: Pritchard et al [22] noted that 20 out of 21 Islamic countries had "undetermined death" (UD) rates that were higher than the corresponding suicide rates, but it should be noted that these authors included not only EUIs, but also "what are described as 'inexplicable deaths'", as UDs; rates ranged from 3 to 33 per 100,000, eight of the 21 having rates greater than 10 per 100,000. Most of these countries reported suicide rates that were less than 3 (including Iraq, <1), but rates ranged through 4.3 (Bosnia), 6.8 (Uzbekistan), and 7.6 (Kyrgyzstan) to 16.4 (Kazakhstan). The quality of mortality data in most of these nations has been assessed as moderate or low [16].

Mid-range EUI rates have been reported in sundry countries, but with suicide rates exceeding them [23]. In nations recording relatively high ratios of EUI deaths to suicides, substantial proportions of deaths coded as EUI deaths were probably suicides; researchers in England reported evidence that most so-called EUI deaths there were in fact hidden suicides [24]. For two decades, England & Wales have reported suicide and EUI rates to WHO as separate figures, but include totaled EUI and suicide rates in their 'official' suicide figures. Of interest, though, following a change in July 2018 in the standard of proof used by coroners in England & Wales to determine whether a death was a suicide, from "beyond reasonable doubt" to "on the balance of probabilities", there was a halving of the numbers per year of cases recorded as EUI deaths, with a corresponding increase in deaths recorded as suicides. Figure 1 provides a comparison between age rates of male and female suicides and EUI deaths in 2021 (data provided by the Office of National Statistics [ONS]). Because EUI deaths were already being recorded in official national statistics as being suicides, the change in standard of proof has not had a notable impact on the suicide rates reported by England & Wales.

Värnik et al [20] noted that although female rates were lower, the correlation between male and female EUI rates in their European study was 0.99; the correlation between rank order of suicide rates and suicide plus EUI rates was 0.96.

EUI deaths have been declared the mortality category most prone to contain misclassified suicides [21], but clearly this statement cannot apply in those countries highlighted as reporting low or zero EUI death rates: studies of mortality in these nations point to accidental death as the likeliest misclassification category. If there is no evidence at all to suggest that an apparent accident (for example, a car crash, falling from a height, excessive intake of drugs, or drowning) was intentional, the relevant ICD accident code will be assigned. If, however, there is reasonable doubt concerning whether it was unintentional, the death should be coded as an EUI death. Whether there are doubts depends partly on circumstances and on assiduousness in investigating the cause of death.

It has been stated that some countries interpret ICD rules to mean that a death cannot be coded to undetermined intent unless a legal official conducts a full investigation of the death and is unable to determine intentionality [25]. The fact that some nations (assessed as publishing high quality mortality data) report few or no EUI deaths suggests that they have policies or processes that require avoidance of coding uncertainty about whether a self-inflicted death was intentional – but raise questions about whether, instead, their certifiers and/or information managers are more likely to code 'undetermined' deaths as suicides, or as deaths of ill-defined or unknown cause (R99), accidents (e.g. X59: accident, unspecified), or to another code. Spain reports very low EUI rates and relatively low suicide rates, but moderately high R99 rates [26]. Pritchard and Hansen [27] argued that countries such as Greece, that report low EUI rates, are likely to misclassify correspondingly higher proportions of suicides as accidental deaths.

Around half the deaths coded as UDs in the United States (US), Finland and elsewhere have been

drug overdose deaths [9,21,28], and one sixth have been drownings. External cause deaths resulting from less effortful activities (for example, overdose rather than hanging) are much less likely to be adjudged as intentional self-killing, as opposed to undetermined – unless the decedent left a note or there have been other pointers concerning a wish to die. It is said that if there is no accompanying note in a US drug intoxication case, the death is 45 times less likely than one with a note to be classified as a suicide [29]. Much depends on how intentionality is assessed. Repetitive self-harm behaviours are commonly associated with substance use disorder, but there is variation in when and whether a reported episodic desire to die is interpreted (in a case of self-killing) as suicidal intention [30].

Researchers in some of those countries that report mid-range EUI death rates have noted demographic profiles of EUI deaths that are similar to those of suicide [25,31,32], though others have reported differences between the two [33]. Age patterns of suicide and EUI deaths are similar in some countries (e.g. Korea) but variably different in others (e.g. Mexico and Taiwan; see Figures 2, 3 and 4) [23]; in England & Wales, the male EUI death rate in 2015 peaked at age 30-34 years [23], while that of suicide peaked at 40-49 years. It has been stated that if a country's mortality statistics show more than 2 EUI deaths to every 10 suicides, and rates of EUI deaths greater than 2 per 100,000 (as in Mexico, Portugal, Russia and Sweden, for example), it is likely that its suicide rate is substantially under-reported [20,23,26].

The UD rates in Russia and countries of the former Soviet Union escalated hugely between the 1980s and the early 2000s, from a mean of 8 to about 27 per 100,000, but so did the homicide rate, and the mean suicide rate increased from about 46 to 61 per 100,000 [34]. In all these countries, prevalence trends of injury-death categories were strongly correlated over time. No direct substitution of one diagnosis for another was evident. Commonly, when changes in a nation's suicide rates are reported, rates of its EUI deaths are reported to have changed in the same direction at the same time, though not necessarily to similar extents.

In summary, in some countries (but not all), substantial proportions of suicides are being misclassified as EUIs. There is mixed evidence about similarities between suicide and EUI patterns and presentations.

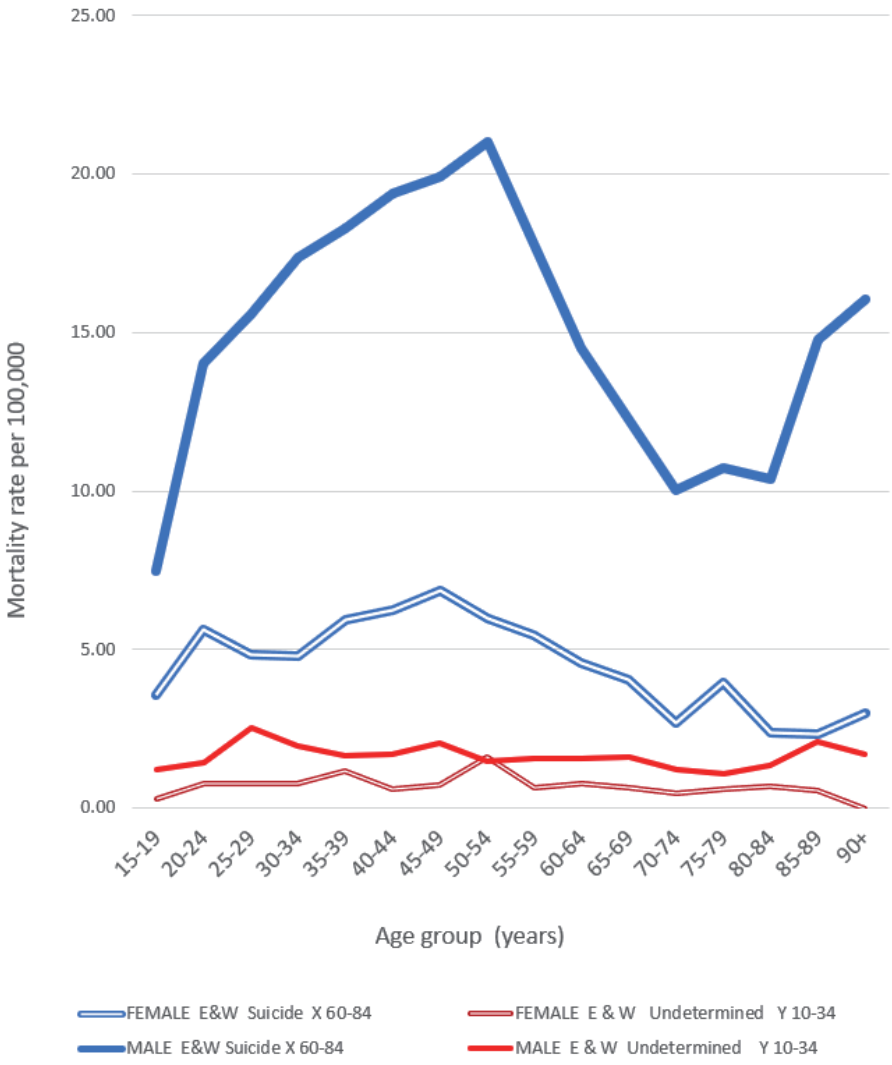
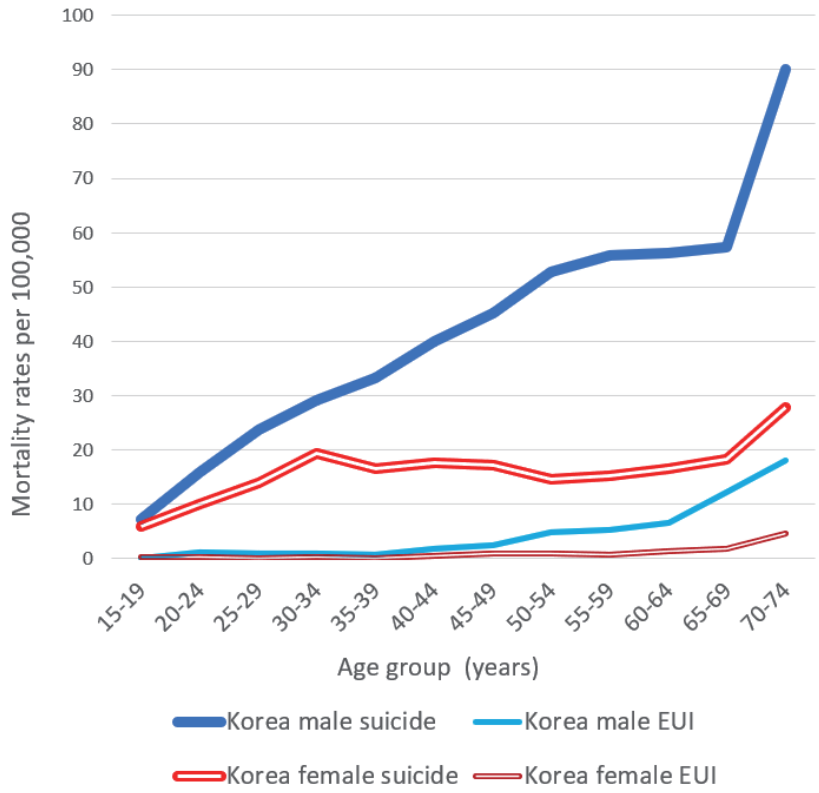



**Figure 1.** Age patterns of rates of suicide and undetermined deaths in England & Wales in 2021.




*Mortality rates of age groups 75-79, 80-85 and 85+ have been omitted for clarity.

**Figure 2.** Rates of Korean suicide and undetermined deaths in 2015*

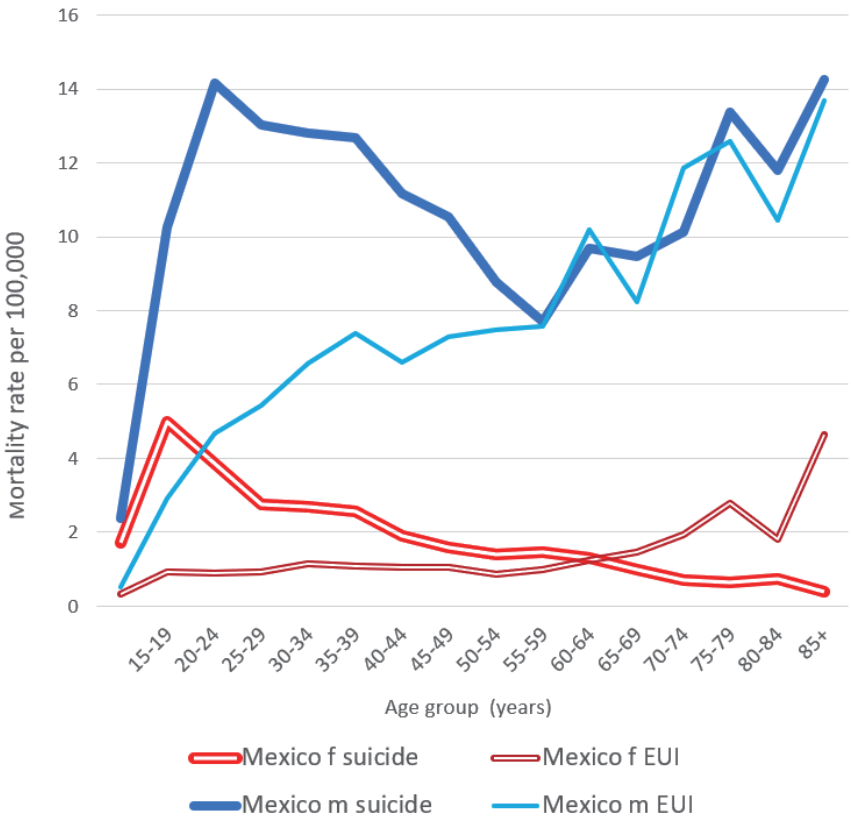
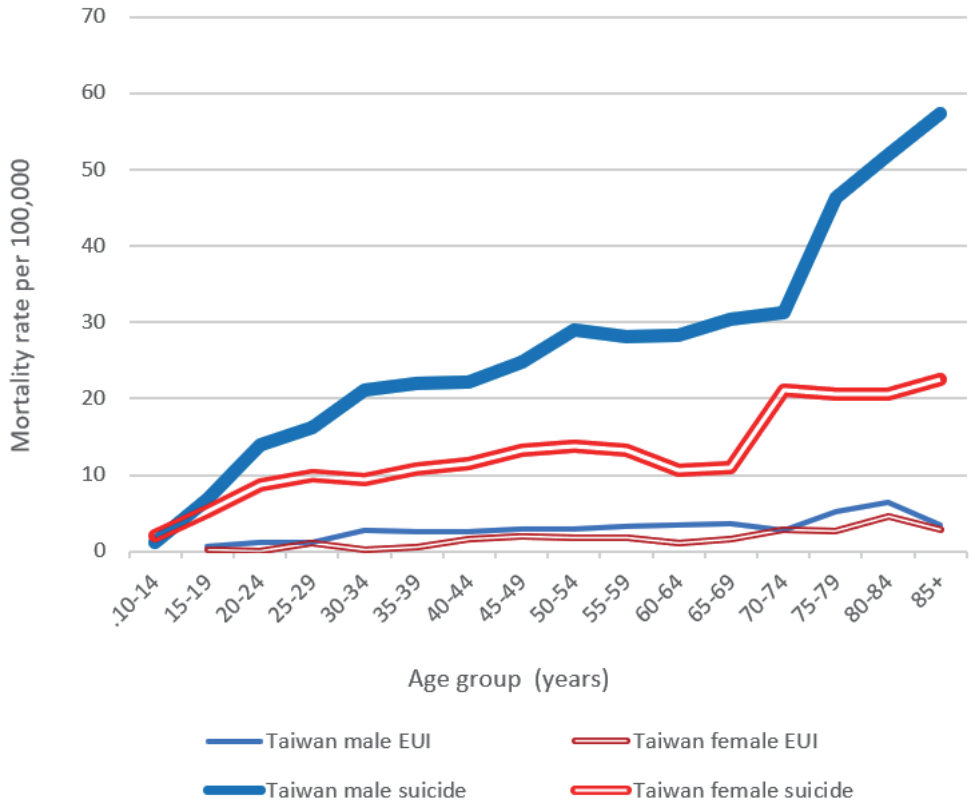



**Figure 3.** Rates of Mexican suicide and undetermined deaths in 2015.




*Data from Ministry of Health & Welfare, Taiwan.
**Figure 4.** Rates of Taiwan suicide and undetermined deaths in 2019-2020.

## Accidental deaths

Various studies have reported decreases in suicide rate that were concurrent with increased accident rates. United Kingdom (UK) researchers documented an increasing trend for coroners to use an accident/misadventure verdict for cases of researcher-defined suicide, particularly for deaths involving poisoning [35]. It is believed that poisoning suicides in the US are grossly underestimated [2]. An increase in the unintentional poisoning mortality rate in the US between 1987 and 2000 was concomitant with a drop in suicide rate, but this finding was considered to be partly due to inadequacy of death investigations affecting how validly manner of death could be differentiated [21,29]. More recently the US suicide and accidental poisoning rates have both escalated, but a huge increase in the accidental poisoning rate in Canada in 2014-2017 was accompanied by a considerable fall in the poisoning suicide rate [36]. This and other evidence from Western nations points to a likelihood that those certifying c.o.d. have become more inclined, in recent years, to code external cause deaths as accidental rather than suicides or EUI deaths.

In contrast, in Korea there has been a substantial increase in the suicide rate in recent years, accompanied by a fall in accident rates. Some 43% of the increase was attributed to improvements in death registration processes, but 57% was attributed to a real increase in suicide rates [17]. In 1992, 50% of poisoning deaths (other than gas poisoning) were coded as accidents and 50% as suicides, but in 2011, 97% of such deaths were coded as suicides. In 1992, 90% of drowning deaths were coded as accidental and 10% as either suicides or EUI deaths, whereas in 2011, 50% were coded as suicides/EUI deaths. Contrastingly, in Japan, over 1995-2011, there was little change in the proportions of poisoning deaths coded as accidents versus suicide, and a small increase in the proportions of accidental fall or drowning deaths [17]. Chang et al [31] commented that age profiles of accidental deaths in Taiwan (other than accidental pesticide poisoning) were unlike those of suicides.

The proportion of injury deaths coded to X59 (exposure to unspecified factor, accident not otherwise specified) varies between nations. A majority of those so coded are aged over 65 years and many have fractured femurs [25]. In Norway, 25.8% of injury deaths were assigned to X59 in 2005-2014, about 97% being attributable to accidental falls, but Ellingsen et al [10] used a redistribution algorithm to estimate that 1.7% of X59 deaths had been suicides (10 deaths per year, mostly male). Proportionally large numbers of suicides are misclassified as accidental deaths, but calculation shows that only 0.4% of these misclassified suicides in Norway were coded X59.

Rockett et al [2] have recommended extensive international use of psychological autopsy (PA) or sociological autopsy in investigating deaths of an uncertain manner (and this would apply to EUI and R99 deaths, and to seemingly accidental deaths). In effect, PA provides more intensive and in-depth assessment of a decedent's emotions, thoughts, and behaviours prior to their death, commonly through prolonged interviews with next-of-kin and those close to them, but gathering

more information than is commonly obtained by those certifying deaths. Rockett et al [2] recommended that rather than use PA to enrich the understanding of validated suicides, PA could be used much more to help resolve intentionality in deaths from equivocal, ill-defined or unknown causes. This certainly could apply in cases of drug overdose deaths, especially in nations with high and escalating drug death rates which are increasingly being reported as accidental, but could have been suicides.

In summary, there is good reason to believe that in some countries a substantial number of suicides are being misclassified as accidental deaths.

## R99 deaths (classified as 'natural deaths')

The R99 code is typically assigned when little or no information about the c.o.d. is known [12]. This could occur when a decedent is not examined until long after death, or when deaths occur in areas of a country where there is an absence of clinicians and investigative services, or when no one is available to provide information about the decedent's medical or personal history. Research-based opinion is that most R99 deaths are likely to have had a natural cause, but some may have been due to external causes that were somehow disguised or unidentifiable. Codes for ill-defined and unknown c.o.d. should only be used in death certificates if all available and affordable investigation methods have been exhausted [37]. However, in some jurisdictions, R99 is sometimes assigned as a 'placeholder' diagnosis on death certificates [1], i.e. a stopgap (meant to be temporary) measure, when mortality statistics are due for release but there has been prolonged delay in determining c.o.d. (e.g. while waiting for finalization by a coroner's court). If these placeholders are not updated in the official mortality database after investigation is complete, they become the official underlying cause [1].

If the person certifying a death knows the decedent's medical history, has no reason to be suspicious about why the person died, and does not ask for an autopsy to be performed (even if unsure about the c.o.d.), a suicide may not be recognised. A suicidal person may take steps to prevent recognition of what they intend to do; equally, a person informing authorities about a death may deliberately provide information that results in mis-coding to one of the natural death categories such as cardiovascular disease or cancer. Regarding other natural death codes, c.o.d. is sometimes coded (inappropriately) as due to mental or behavioural disorders, and it seems possible that some of these were suicides.

Studies of rates at which suicides are misclassified as EUI deaths (Y10-34) and accidental deaths (X40-59) commonly do not report whether (and if so, at what rate) suicides are assigned the R99 code. To a varying extent, R99 ("ill-defined and unknown cause") is one of the natural death categories to which deaths are most commonly coded – usually assigned because certifiers/coders believe that the death was due to a natural cause but they are not sure which one. However, in addition, R99 is commonly the code used when coders are uncertain whether the death was natural or not: maybe it was natural but maybe it was due to an external cause, such as suicide, accident or homicide. Rockett et al [2] declared that "the two most imprecise cause-of-death categories that we documented as being highly prone to contain misclassified suicides [are] injury of undetermined intent and ill-defined and unknown causes", with the latter even more imprecise than undetermined intent because EUI deaths are identified by mechanism, whereas the former fails to distinguish whether pertinent deaths were from injury or disease (page 56). In particular, they stated that poisoning suicides are highly prone to misclassification, not only as accidental or EUI deaths, but also as 'ill-defined and unknown cause' deaths. When a death is suspected of being caused by drug ingestion, toxicological analysis should answer whether it was indeed due to poisoning, and if the answer is positive, it should not be coded as a 'natural' (R99) death'; if then there is no evidence about whether or not the death was intentional, it could be coded as EUI.

Neither Rockett and colleagues, nor others, appear to have conducted studies to determine the proportion of the R99 deaths reported in national mortality statistics that were hidden suicides. Bakst et al [38] reported a study of 2756 deaths in Tel Aviv (14.7% of the total death number) that had been certified as being due to "unknown causes". They commented that "the residual and imprecise natural cause mortality category of 'unknown causes' emerged as a prime contender for containing misclassified suicides". After intensive investigations they found evidence that 53 (1.9%) of these 'unknown cause' deaths were probable suicides. However, along with this finding they concluded that all 53 were attributable to external causes such as poisoning (n=19), falls (14), and suffocation (7). The mechanism of death was known: if uncertain about whether the death was accidental or not, the correct classification should have been EUI (Y10-33). The external causes were specified, so Y34 (unspecified event) would have been inappropriate. Their conclusion could have been that if the official certifiers of the deaths had had access to all the information obtained in this study the number of deaths coded R99 would have been zero. Of 208 deaths that they did code as Y10-Y34 (EUI), 22 were labelled as probable suicides.

This raises a question: if all deaths recorded in the WHO Mortality Database as being of "ill-defined or unknown cause" had been as intensively investigated as the cases studied by Bakst et al [38], and/or with psychological or social autopsy as recommended by Rockett et al [2], what proportion would still have been coded R99 when reported to WHO? There probably would still have been some R99 cases; for example, c.o.d. of unidentified persons with decomposed bodies may be impossible to determine even after autopsy [37].

In Finland, where forensic autopsy is mandatory when other investigations and assessments have not revealed a c.o.d., it was found that, following autopsy, 0.24% of all deaths were coded R96, R98 or R99, and only 0.03% were assigned any of the R00 to R95 codes [37]. Among Nordic countries, Finland has the highest total autopsy frequency and Denmark the lowest. The number of ill-defined and unknown cause deaths correlates inversely with the autopsy frequencies of each Nordic country. In Denmark, only 2.4% of R-coded deaths were autopsied and most were aged over 70 years; some 1.65% of all deaths were coded R54 (senility) and 2.12% of all deaths were coded R96-R99 (nine times

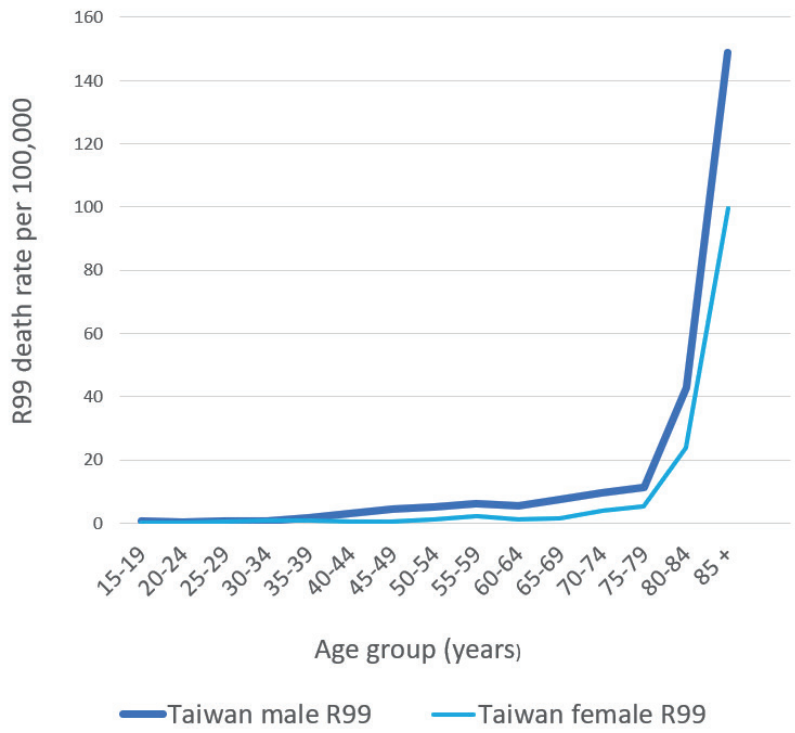
the percentage reported in Finland) [37]. Similarly, in the US, forensic autopsy and toxicological testing rates varied greatly between states [29]. A cross-national analysis of data from 35 countries showed a high and positive correlation between suicide rate and autopsy rate during three successive decades [39]. The national rate of 'ill-defined' deaths (R00-R53 + R55-R99) was significantly negatively associated with autopsy rate in the 1980s, but not in the next two decades. The EUI rate was not significantly associated with the autopsy rate. The researchers in this study suggested that rates of autopsy in a nation were more consistent in explaining cross-national variation in suicide rates than were suggestions about suicides being misclassified as EUIs or as ill-defined or unknown cause deaths.

De Leo [13] showed that the finalised official number of 'ill-defined' deaths in Australia rose from 245 in 2000-2003 to 745 in 2004-2008, and the number of UD deaths per year escalated from 68 to 460, but concomitantly the number of suicides per year in Australia fell from 2350 to 2030. To what extent the fall in one explains the increase in one or both of the other two is debatable, and could only be discovered by detailed assessments and investigations, including toxicology and autopsy. Such measures would require much increased resourcing, which would be too expensive to afford in most nations, except on a representative sample basis.

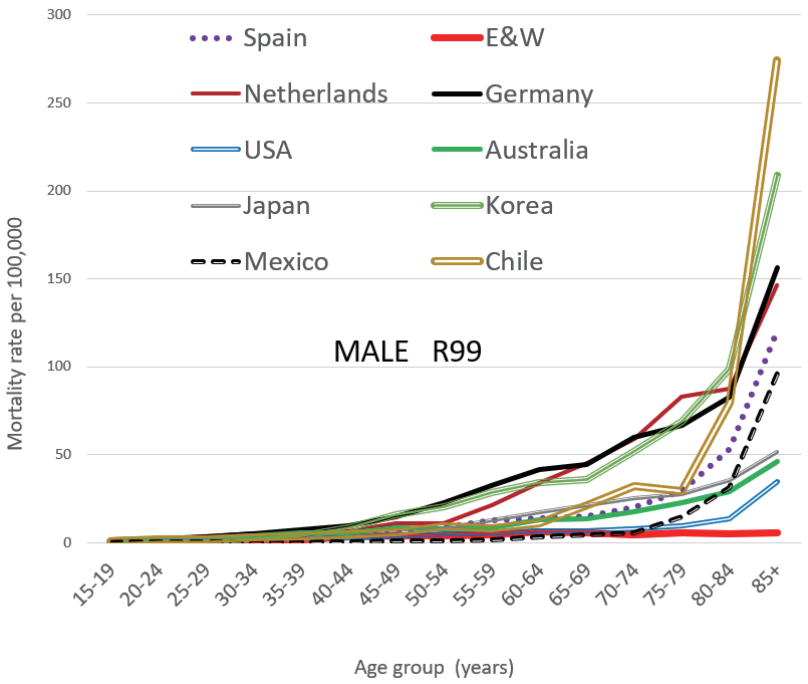
The age patterns of R99 death rates in most countries are shown to increase exponentially in later life [23]. This is exemplified by the age patterns of Taiwan's R99 death rates in 2020 (Figure 5). Rates of male R99 deaths are higher than those of females. The rates of deaths coded R99 vary hugely between nations [2,40]. For example, rates per 100,000 in 14 populous nations assessed as providing high quality mortality data in 2015 were: Mexico 1.49, UK 2.08, Cuba 3.67, US 3.77, Australia 6.22, Chile 7.76, Japan 8.02, Spain 8.63, Korea 11.42, the Czech Republic 11.97, Romania 13.82, the Netherlands 14.92, Germany 19.03 and Argentina 28.17 [23]. Some other countries reported even higher rates. Both male and female R99 death rates of age groups under age 45 in the above-listed 14 countries were under 10.0, except for males in Romania. UK male rates were below 3.0 until age 40-44 years, peaked (6.15) at 60-64 years, and averaged 5.2 at 65+ years; UK female rates were less than 2.0 until 50-54 years, averaged 2.2 from 50 to 84 years and rose to 5.9 at 85+ years (Figure 6). Of the 14 nations, only the UK, Australia, the US and Cuba had male rates less than 30.0 at age 80-84 years; the female age patterns of R99 rates were similar. UK rates at age 85+ years were 5.4 (male), 5.9 (female). Male and female rates at age 85+ years in the other 13 nations were all well over 30.0, the highest male rates being those of Korea (208.9), Chile (274.1) and Argentina (849.4), the highest female R99 rates also being in Korea (140.3), Chile (209.8) and Argentina (755.7). Comprehensive discussions of why the age patterns of rates of R99 deaths in the UK are so different from those of other nations have not come to the present author's attention.

R99 age patterns and rates are commonly very different to those of suicide. In some countries, graphs of age patterns of suicide are upward-sloping, sometimes exponentially (e.g. China). Age patterns of male and/or female suicide in various other countries are bimodal, convex or downward-sloping [41]. The importance of this is to recognise that R99 rates become much higher than suicide rates (except in E&W) in late life, presumed to be largely because of the difficulty certifiers and coders may have in identifying a single underlying c.o.d. when the decedents had a number of different medical problems, especially if detailed medical histories, results of investigations and/or autopsy results are unavailable (Figure 5). It is often difficult to define a single, disease-specific, underlying c.o.d in the very old population [42]. It may be true that some deaths assigned the R99 code were suicides and that it would have been impossible or difficult for anyone to recognise that fact, but the vast majority (as shown by Bakst et al's findings [38]) of deaths coded as having ill-defined or unknown cause, in most countries, are 'natural'. It is also true that if indeed R99 is a code that 'hides' large numbers of suicides (as suggested by Rockett et al [2] and others), the way to test this assertion is to mount a study that uses psychological or social autopsy plus detailed investigation and testing to determine the manner of death and (hopefully) why the person died. The percentage of R99 deaths found to have been suicide would be small, in most nations, if consecutive R99 deaths are included in the study. The best place to begin such research might be the UK since it seems from the above figures that proportionally fewer R99 cases in the UK have been older people with multiple medical problems. Studies of R99 deaths of people aged less than 65 years, in countries with relatively low R99 rates, might be expected to indicate the degree to which suicides lie hidden among R99 deaths.

Another indication of whether some deaths initially coded as R99 deaths might instead have been suicides is provided by ABS (Australian) figures. Since 2007, initially released mortality statistics have been subject to revision in the next two to three years. Since 2015, the first revision has been published two years after the preliminary release, coders having changed the assignment of codes after acquiring extra information about cases, particularly in relation to cases that had not (at first release) been finalised by the coroner's court. In a number of cases that were initially coded R99, a suicide code has been substituted. Another year later, the statistics are finalised; no further revision is allowed. When preliminary mortality figures for deaths registered in 2015 to 2018 were released, the R99 rate averaged about 5.0. Two years later, revised R99 rates for each of those years were about 3.0. The preliminary suicide rates in 2017 and 2018 were not as high as the revised rates, though the increase between preliminary and revised was not nearly so large as the decrease between preliminary and revised R99 rate. ABS data show that preliminary R99 death rates in 2019 and 2020 were considerably higher than those reported in previous years, whereas the preliminary suicide rates were 13.1 (2019) and 12.2 (2020), the mean finalised suicide rate in 2017-2018 having been 13.1. It can be anticipated that the finalised suicide rates for these years will be somewhat higher (say, 13.6 and 12.7) after re-coding of GCs, but that the finalised R99 rates will be about the same as in 2019 and 2020.




*Data from Ministry of Health and Welfare, Taiwan.
**Figure 5.** Age patterns of Taiwan's 2020 male and female R99 death rates*.




*Data from WHO Mortality Database.
#Graphs or R99 rates in Argentina, Cuba, the Czech Republic and Romania have been omitted for clarity.
**Figure 6.** A comparison of age patterns of male R99 deaths in ten selected nations in 2015*#.

## Conclusions

It appears likely that (for various reasons, and varying between nations) suicides are quite commonly misclassified as accidental, and this is commonest in cases of drug overdoses and drowning. In many countries (but not all), to an extent that varies between nations and across time, suicides have been misclassified as EUI deaths. Studies in the UK showed that most deaths assigned EUI codes were probably suicides. It has also been posited that relatively large numbers, but small proportions, of deaths coded as due to 'ill-defined or unknown causes' (R99), are misclassified ('hidden') suicides. The fact that R99 rates in most nations progressively (commonly exponentially) increase across late life points to a likelihood that most R99 deaths are 'natural'. In contrast, the age patterns of R99 deaths in the UK peak in middle age and rates are comparatively low: this needs explanation.

In nations where autopsies and toxicological testing are conducted more commonly than elsewhere, misclassification has been found to be less frequent. To show the extent to which poisoning, drowning, falls from a height, and deaths with no clear underlying cause, are being misclassified as accidental, EUI or due to ill-defined/unknown cause, it is recommended that detailed studies of select populations in nations that can obtain resources be conducted. There need to be detailed enquiries about medical and personal histories of the decedents, forensic autopsies, toxicological and other testing, and psychological or sociological autopsies. Initially, such studies should be targeting deaths of adults aged under 65 years who did not leave notes or other evidence of intentionality, though in due course a study focussing on late life decedents with nothing to suggest a medical cause of death will be desirable. A study focussed on R99 deaths in the UK in comparison to another country with high quality data would be of particular interest. At present there is very little evidence to indicate how commonly deaths coded R99 in diverse countries were in fact suicides.

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# Suicide Crisis Syndrome and Psychosocial Correlates under COVID-19: An Online Survey in Taiwan

**Chia-Yi Wu[1,2,3], Ming-Been Lee[3,4,5*], Megan L. Rogers[6], Chia-Ta Chan[2,4], Chun-Ying Chen[2], Jenelle Richards[7], Igor Galynker[7]**

**Abstract:** ***Background:*** The psychosocial consequences related to COVID-19 have been widely investigated. However, limited attention was paid to suicide crisis syndrome (SCS) among the general public and its associated psycho-socioeconomic risk factors during the pandemic. The SCS manifests the last sequence of personal and environmental stress among potentially vulnerable individuals. The study aimed to examine whether SCS was associated with key psychosocial and suicide-related factors in Taiwan. ***Methods:*** An online survey was conducted during April and May of 2021. A structured questionnaire was used, with assessments of the Suicide Crisis Inventory (SCI-2), the 5-item Brief Symptom Rating Scale (BSRS-5), Life Stress Event, the COVID-19-related psychological responses and environmental factors as well as suicide risks including death wish and prior acts of suicide/self-harm. ***Results:*** Among the 4846 participants recruited online (mean age: 37.5±10.8) with female dominance (82.6%), just over half were married (54.8%) and two-thirds graduated from college. The majority of the public had a job before or during the COVID-19 pandemic, yet economic issues significantly affected the SCS. Those who were younger, living alone, lacking family support, or feeling unsafe toward the environment during the COVID-19 pandemic had higher risks of SCS. Additionally, all the psychological factors such as higher BSRS-5 scores, feeling stressed, poor adjustment or emotional support, or prior suicide attempt/ self-harm contributed to SCS. ***Limitations:*** The findings reflected the views of young respondents right before a severe outbreak in Taiwan between May and August 2021. Online survey results might lead to information bias. ***Conclusion:*** The pre-suicide mental states assessed by the SCS scale were significantly associated with younger age (≤25), lifetime suicide act, recent psychological distress, and poor economic status or social relationships. Healthcare providers should pay attention to these early warning signs of suicide risks in the post-acute COVID-19 era.

**Keywords:** suicide crisis syndrome, COVID-19, socioeconomic factors, psychological distress, online survey, Taiwan.

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## Introduction

COVID-19 has spread globally with tremendous societal and health impacts worldwide since 2020. The situation in Taiwan has been relatively stable until mid-May in 2021 and 2022 respectively when two outbreaks caused significant changes in the society. The first national quarantine policy was implemented during 17 May and 26 July 2021 under public health precautions in Taiwan, restricting school, work, recreation, and other societal activity movements. Before the ban was enacted throughout the island, there has been distinct mental health consequences at the individual level due to social restrictions, such as anxiety and fear caused by excessive news or misinformation reported related to COVID-19 [1]. However, few evidence-based studies investigated a broad range of social factors including public response toward news reports and quarantine restrictions. It is critical that healthcare providers stay vigilant toward the social changes and longer-term mental health effects [2].

The COVID-19-related stress such as interpersonal or financial insecurity has been experienced in the general population [3], with consequences of different levels of mental health problems including depression, anxiety, distress, insomnia, and suicide risks [4]. The prevalence of major psychological symptoms ranged between 30-45% across the public, patient or professional populations during January and March in 2020 [5]. Online surveys of social media in Taiwan further showed a high prevalence of sleep disturbances and suicide ideation in April 2020 [6]. Public health interventions were suggested to engage in those under pandemic-related stress, social isolation, and job or life restrains in order to lower the risk of suicide and self-harm [3,4]. Given that the suicide rates remained leveling offor slightly decreased in the early stages of COVID-19

[1] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan; [2] Department of Nursing, National Taiwan University Hospital, Taipei, Taiwan; [3] Taiwanese Society of Suicidology and Taiwan Suicide Prevention Center, Taipei, Taiwan; [4] Department of Psychiatry, National Taiwan University Hospital and National Taiwan University College of Medicine; [5] Department of Psychiatry, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan; [6] Department of Psychology, Texas State University, San Marcos, TX, USA; [7] Department of Psychiatry, Mount Sinai Beth Israel, New York, USA.

[*]**Correspondence to:** Ming-Been Lee, MD, Professor emeritus, Department of Psychiatry, National Taiwan University College of Medicine & National Taiwan University Hospital; 7 Chung-Shan South Road, Taipei 100, Taiwan (ROC); Email: mingbeen@ntu.edu.tw

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in 2020 globally [2], the mental healthcare needs of people under different levels of suicide risk should be addressed by all healthcare providers.

Under the accumulating stress of external and internal environmental changes, people with suicidal thoughts may present short-term or long-term risks due to multiple challenges in life. Meanwhile, the social relationships are likely to be restricted. To prevent the progression from ideation to action of suicide or self-injurious behavior, identification of acute suicide states also known as the suicidal crisis syndrome before the act was implemented plays a key role in suicide prevention. During COVID-19, several pandemic-related factors were associated with suicidal thoughts, including age, self-reported physical health, perceived social support, or specific support related to COVID-19 [6]. The concept of suicide crisis can be measured to predict recent suicide behavior following discharge among psychiatric inpatients with excellent internal consistency and predictive validity [7]. The Suicide Crisis Syndrome (SCS) describes a pre-suicidal mental state marked by entrapment accompanied by affective disturbances, loss of cognitive control, hyperarousal, and social withdrawal [8], which matched the psychological performance under COVID-19. However, the current investigation of the SCS was rarely performed among the general public.

The key pathways to suicidal thinking and potential protective factors that can be promoted to reduce suicide risk were important knowledge to learn by the nurses [9]. It is critical to study what socio-economic and psychological factors of COVID-19-related suicide crisis syndrome were noted in the general public. However, current evidence about information on suicidality and mental health risk factors under COVID-19 is limited, particularly among the young and middle-aged groups in society. The study aimed to fill the knowledge gap in analyzing the suicide crisis syndrome and its association with individual health and socio-economic factors during the acute stage of the COVID-19 pandemic during April and May 2021.

# Methods

## Study design

The first pandemic of COVID-19 hit Taiwan with a nationwide social restriction policy between May and August 2021 after a relatively stable period in the previous year. The research team joined the International Suicide Prevention Assessment Research for COVID-19, I-SPARC, an international research project led by Mount Sinai Hospital in New York in late 2020. The project investigated the near-term mental states before suicidal acts under COVID-19 across 14 countries. This online investigation in Taiwan was performed between April and May in 2021 before the national policy of infection precautions in mid of May. It was designed as a cross-sectional study with a convenience sample volunteering to participate. The overall time to complete the questionnaire was around 20-25 minutes. The response rate was calculated according to the total completeness of each item required for the survey.The study acquired its ethical approval from the institution the first author affiliated (IRB number 202101118W).

## Participants

Social media users such as Facebook and LINE who identified the study information and were aged over 20 were invited to take part in this project. The inclusion criteria included Mandarin-speaking and cognitively intact to consent and complete the questionnaire. The exclusion criteria were any incompleteness of required items in the survey. Participation in the online study was absolutely voluntary, so the respondents could drop out at any time when they filled out the online information.

## Study procedure and ethical considerations

Firstly the researchers at the Taiwanese Society of Suicidology (TSOS) and National Taiwan Suicide Prevention Center (NTSPC) discussed the procedures and quality design of the study. Before the dissemination of the study, ethical approval was acquired by the Institutional Review Board at the first author's affiliated university hospital in northern Taiwan. All the people who administered the online survey questionnaire were informed on the first webpage about the ethical considerations and agreed to participate at their own discretion after ticking the box of agreement. The survey was enacted during the month of 7th April and 4th May. Online promotion of the research was facilitated through Facebook on the main webpage of the TSOS. Meanwhile, transmission of the study information was also enacted through snowballing among LINE group members related to the TSOS. A wide range of the general public was reached through wide social networking.

## Measurements

All the questionnaire items of the I-SPARC were translated into Chinese and established on Qualtrics website through the assistance of a New York research team member who is bilingual. The Taiwan research team has developed the Taiwanese version of the questionnaire in addition to the BSRS-5 and validated their contents. The following instructions were of all the scales or research items used in this study.

### The 2nd version of the Suicide Crisis Inventory (SCI-2)

Previously known as the Suicide Trigger Scale (STS), the SCI-2 is an assessment tool used to measure near-term suicide risk [8]. It is comprised of five subscale components: entrapment (10 items, e.g. "Did you feel there is no way out?"), affective disturbance (17 items, e.g. "Did you become afraid that you would die?"), loss of cognitive control (15 items, e.g. "Did you feel pressure in your head from thinking too much?"), hyperarousal (13 items, e.g. "Did you feel a lot of emotional turmoil in your gut?"), and social withdrawal (6 items, e.g. "Did you feel isolated from others?"). The items are rated by self-report on a five-point scale ranging from not at all (0) to extreme (4). The scale The KMO statistics (0.99) and Bartlett's test of sphericity ($\chi 2[1830] = 293024.44$, $p < 0.001$) each indicated that there were sufficient significant correlations in the data for its use in factor analysis. Internal consistencies of the SCI-2 total score and its proposed subscales were all good to high in this study: total score ($\alpha = 0.98$), entrapment ($\alpha = 0.96$), affective disturbances ($\alpha = 0.91$), loss of cognitive control ($\alpha$

=0.82), hyperarousal (α =0.94), and social withdrawal (α = 0.93).

**Psychological distress (The 5-item Brief Symptom Rating Scale, BSRS-5)**

The BSRS-5 is a self-report scale with satisfactory validity for the identification of psychiatric morbidity in both clinical or community populations [10,11]. Participants were asked to rate the degree to which they felt distressed from each dimension of BSRS-5 during the week preceding the assessment. The BSRS-5 contains the following five items: (1) having trouble falling asleep (insomnia); (2) feeling tense or keyed up (anxiety); (3) feeling easily annoyed or irritated (hostility); 4) feeling blue (depression); (5) feeling inferior to others (inferiority). A five-point Likert system was used to rate each item (0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; 4, extremely), with total score ranging from 0-20. The higher the score, the higher the mental distress over the past week. An additional 6th item with the same rating method was used to assess the degree of perceived suicide ideation in the recent week. In this study the Cronbach's alpha value was 0.863.

**The Life Stress Event (LSE)**

A self-invented list of major life events during the COVID-19 pandemic was provided by the American research team through international collaboration. The study analyzed some of the key items related to economic status that may typically affect the respondents' psychological health conditions, including a major financial crisis in the past week, economic problems in the past 3-month, and job status before and after April 2021. In this study, the Cronbach's alpha of this measurement was 0.916.

**The COVID19-psychological and environmental assessment scale**

The key variables related to psychological consequences or environmental factors under COVID-19 were invented by the international research team. They were all rated on a 5-point Likert Scale (i.e., 0-4 or 1-5); higher scores indicated poorer conditions. Four major items measured the psychological factors, i.e., loneliness, hopelessness due to COVID-19, difficulty adjusting to life, perceived stress levels, and mental support needs. Loneliness was evaluated through self-report perceptions, and so was the rest of the psychological items. Moreover, environmental risk factors were assessed by three items of family support, environmental safety feelings, and concerns about COVID-19-related news.

**Suicide-related variables**

Apart from past-week suicide ideation assessed by the 6th item of BSRS-5 (0-4 Likert scale), three screening questions were inquired to assess specific suicide risks in this study. These binary variables asked whether the participant had a lifetime suicide attempt, lifetime self-harm act, or a death wish in the past month. These self-report responses were recorded to indicate the participant's prior experience of suicidal behavior and reflect different levels of suicide risks.

## Statistical analysis

This cross-sectional study mainly provided descriptive statistics on the observed variables. Based on key concepts of suicide crisis syndrome and related psychological factors, mean scores, numbers of distribution, and/or percentages were calculated for continuous or categorical variables. Correlational analysis was performed and presented using cross tables, in which the five components of suicide crisis syndrome were listed on top to evaluate their associations with each independent variable across demographic and psychosocial measurements. Specifically, the significance of the correlation between the subscales of suicide crisis syndrome and psychological distress under COVID-19 was tested using a t-test.

# Results

Among the 4846 participants, the mean age is 37.5 ± 10.8 (standard deviation), with females predominating the sample (82.6%). More than half were married (54.8%), and two-thirds graduated from college. The percentage of having a job during and before COVID-19 was similar (86.3 vs. 86.7%)(Table 1).

In Table 2, the demographic variables were most significantly associated with the five components of suicide crisis syndrome, except for gender. Except for affective disturbance, all the other four components in the SCS were associated with age. Younger age and lower education were related to higher pre-suicidal mental states. In terms of socioeconomic variables, part-time job or jobless, past 3-week or 3-month economic crisis, poor social relationships, or lacking outdoor activities were significantly associated with SCS, indicating the risks of suicide relating to social contact under the COVID-19 outbreak in Taiwan. Moreover, having a job appeared to be protective against suicide risks, either before or during COVID-19.

Furthermore, living alone, lack of family support, or feeling unsafe toward the environment during COVID-19 may have higher risks of SCS(Table 3). However, among all social and environmental factors discussed in this study, only COVID-19 news concerns were not associated with pre-suicidal states. All the psychological features were associated with SCS, such as poor life adjustment, high levels of stress, poor emotional support, and lifetime suicide attempt/ self-harm.

Table 4 showed the association between the five components of suicide crisis syndrome and the psychopathology assessed by the BSRS-5. It is evident that all 6 items of BSRS-5 including suicide ideation in the past week were significantly related to pre-suicidal mental states during COVID-19, including entrapment (r=0.41-0.63), affective disturbance (r=0.43-0.62), loss of cognitive control (r=0.42-0.60), hyperarousal (r=0.45-0.60), and social withdrawal (r=0.34-0.52). These five immediate pre-suicide mental states had medium to high levels of correlation with all five items of the BSRS-5, indicating the close associations between measurements

of psychological distress and pre-suicide emotional responses.

Lastly, the stepwise regression models showed the levels of influence of various COVID-19-related socioeconomic and psychological factors that were significantly associated with the suicide crisis syndrome. (Table 5) Except for COVID-19 news concerns and the living status, all other variables impacted such syndrome. Among the main categories of variables, major life events (e.g., past-week/3-month economic crisis), BSRS-5 measured psychological distress, and suicide-related factors (e.g., death wish in 1 month, lifetime suicide attempt, loneliness) could concurrently predict the five subscales and the total scale of the SCS ($p<0.001$). However, "feeling connected to others" (B=-0.48 (-0.63~-0.34), $p<0.001$) and "unsafe about the environment" (B=0.2 (0.07-0.33), $p<0.01$) were only associated with the 5th SCI subscale of Social Withdrawal rather than other subscales, indicating the two essential influences of psychosocial factors to suicide-related withdrawal symptoms under COVID-19 pandemic. Overall, the results highlighted the key roles of economic crisis, psychological distress, and suicide risk factors in the formulation of suicide crisis syndrome during COVID-19 period in 2021.

## Discussion

The online survey was performed between April and May 2021 before a period of COVID-19 outbreak in Taiwan. A variety of psychopathological and psychosocial factors were found to attribute to the pre-suicidal cognitive and affective states, including the lack of emotional support or a secured environment, job-related socio-economic factors, and negative psychological features such as recent mental distress and lifetime suicidal behavior. These findings revealed that acute suicide mental states were not only associated with psychological factors but also environmental and predisposing suicide acts. Apart from the non-justifiable attributes like previous suicidal acts, suicide prevention strategies in the longer-term post-acute COVID periods should focus on correcting both psychological and socio-economic factors to alleviate immediate suicide characteristics.

The study participants had an average age of

**Table 1.** Sociodemographic and suicidality profile of the participants (N=4846).

| | | n/ Mean | %/ SD |
|---|---|---|---|
| Age | | 37.5 | 10.8 |
| | <=25 | 621 | 12.8 |
| | 26-44 | 3044 | 62.8 |
| | >=45 | 1181 | 24.4 |
| Gender | Male | 816 | 16.8 |
| | Female | 4002 | 82.6 |
| | Others | 28 | 0.6 |
| Marriage | Unmarried | 1979 | 40.8 |
| | Married/stable relationship | 2656 | 54.8 |
| | Separate/others | 211 | 4.3 |
| Education | Under senior high | 206 | 4.3 |
| | College | 3635 | 75.0 |
| | Graduate | 1005 | 20.7 |
| Job under COVID-19 | Yes | 4203 | 86.7 |
| (2021.4) | No | 643 | 13.3 |
| Job before COVID-19 | Yes | 4183 | 86.3 |
| (by 2020) | No | 663 | 13.7 |
| Suicide crisis syndrome | | | |
| (item numbers) | 1. Entrapment (10) | 5.17 | 6.99 |
| | 2.Affective disturbance (17) | 10.31 | 9.59 |
| | 3.Loss of cognitive control (15) | 17.52 | 7.09 |
| | 4.Hyperarousal (13) | 9.25 | 8.77 |
| | 5.Social withdrawal (6) | 5.84 | 4.11 |

**Table 2.** The participants' sociodemographic and economic characteristics and their associations with suicide crisis syndrome under COVID-19 in April 2021 (N=4846).

| | Category/ measures | n (%)/ Mean ± SD | Suicide Crisis Syndrome | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.Entrapment | 2.Affective disturbance | 3.Loss of cognitive control | 4.Hyperarousal | 5.Social withdrawal | Total |
| Demographics | | | | | | | | |
| Age | <=25 | 621 (12.8) | 6.37±8.16 | 11.27±10.67 | 18.95±8.31 | 10.17±9.79 | 6.23±4.56 | 52.99±38.9 |
| | 26-44 | 3044 (62.8) | 5.37±7.16 | 10.63±9.79 | 17.78±7.13 | 9.59±8.96 | 6.02±4.21 | 49.39±34.7 |
| | >=45 | 1181 (24.4) | 3.99±5.57 | 8.99±8.26 | 16.1±5.97 | 7.88±7.5 | 5.18±3.49 | 42.13±28.52 |
| | P value (ANOVA) | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Gender | Male | 820 (16.9) | 5.15 ± 7.29 | 9.96 ± 9.80 | 17.43 ± 7.20 | 8.71 ± 8.65 | 5.87 ± 4.14 | 47.12 ± 34.63 |
| | Female | 4026 (83.1) | 5.17 ± 6.93 | 10.38 ± 9.55 | 17.54 ± 7.07 | 9.36 ± 8.80 | 5.83 ± 4.11 | 48.28 ± 33.96 |
| | P value (T-test) | | 0.944 | 0.252 | 0.680 | 0.054 | 0.800 | 0.374 |
| Education | Under senior | 206 (4.3) | 5.34 ± 7.52 | 10.53 ± 9.71 | 17.64 ± 7.46 | 8.90 ± 9.45 | 5.89 ± 4.31 | 48.30 ± 36.65 |
| | College | 3635 (75.0) | 5.23 ± 7.00 | 10.44 ± 9.70 | 17.60 ± 7.15 | 9.33 ± 8.85 | 5.89 ± 4.10 | 48.50 ± 34.35 |
| | Graduate | 1005(20.7) | 4.89 ± 6.84 | 9.78 ± 9.15 | 17.18 ± 6.78 | 9.02 ± 8.36 | 5.66 ± 4.11 | 46.53 ± 32.44 |
| | P value (ANOVA) | | 0.353 | 0.146 | 0.239 | 0.518 | 0.312 | 0.270 |
| Social-economic variables | | | | | | | | |
| Job (2021.4 under COVID-19) | Full-time job | 4203 (86.7) | 5.02 ± 6.80 | 10.16 ± 9.31 | 17.38 ± 6.89 | 9.13 ± 8.61 | 5.78 ± 4.02 | 47.47 ± 33.12 |
| | Others | 643 (13.3) | 6.14 ± 8.08 | 11.31 ± 11.21 | 18.42 ± 8.23 | 10.00 ± 9.76 | 6.23 ± 4.69 | 52.09 ± 39.51 |
| | P value (T-test) | | 0.001 | 0.013 | 0.002 | 0.034 | 0.023 | 0.005 |
| Job (by 2020 before COVID-19) | Full-time job | 4183 (86.3) | 4.99 ± 6.76 | 10.14 ± 9.35 | 17.34 ± 6.85 | 9.07 ± 8.63 | 5.77 ± 4.01 | 47.32 ± 33.15 |
| | Others | 663 (13.7) | 6.28 ± 8.21 | 11.37 ± 10.92 | 18.63 ± 8.37 | 10.34 ± 9.59 | 6.30 ± 4.69 | 52.90 ± 39.04 |
| | P value (T-test) | | <0.001 | 0.006 | <0.001 | 0.001 | 0.006 | 0.001 |
| Economic crisis (past week) | Yes | 196 (4.0) | 13.65 ± 10.89 | 20.82 ± 14.63 | 25.15 ± 9.63 | 18.55 ± 12.64 | 9.95 ± 5.73 | 88.11 ± 49.85 |
| | No | 4650 (96.0) | 4.81 ± 6.54 | 9.87 ± 9.06 | 17.20 ± 6.78 | 8.86 ± 8.35 | 5.67 ± 3.94 | 46.39 ± 32.17 |
| | P value (T-test) | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Economic crisis (past 3 months) | Yes | 257 (5.3) | 12.16 ± 10.49 | 18.94 ± 14.07 | 24.21 ± 9.44 | 17.30 ± 12.23 | 9.01 ± 5.78 | 81.62 ± 48.74 |
| | No | 4589 (94.7) | 4.77 ± 6.52 | 9.83 ± 9.04 | 17.14 ± 6.74 | 8.80 ± 8.31 | 5.66 ± 3.93 | 46.20 ± 32.04 |
| | P value (T-test) | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Social relationships^ | | | | | | | | |
| Social contact | 1-5 | 2.69 ± 0.96 | -0.06** | -0.06** | -0.06** | -0.06** | -0.07** | -0.06** |
| Interpersonal interaction | 1-5 | 2.68 ± 0.99 | -0.05** | -0.05** | -0.04** | -0.05** | -0.05** | -0.05** |
| Feeling connected to others | 1-5 | 3.40 ± 0.83 | -0.29** | -0.28** | -0.26** | -0.24** | -0.32** | -0.29** |
| Attending outdoor activities | 1-5 | 2.79 ± 0.99 | -0.08** | -0.07** | -0.07** | -0.06** | -0.08** | -0.07** |

Note:
COVID-19: Coronavirus disease 2019; BSRS-5: The 5-item Brief Symptom Rating Scale; SD: standard deviation.
^Score 1-5: 1 never, 2 a little, 3 somewhat, 4 pretty much, 5 extremely so.

**Table 3.** The participants' environmental risk and psychological features and their associations with suicide crisis syndrome under COVID-19 in April 2021 (N=4846).

| | Measures | n (%)/ Mean ± SD | Suicide Crisis Syndrome | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.Entrapment | 2.Affective disturbance | 3.Loss of cognitive control | 4.Hyperarousal | 5.Social withdrawal | Total |
| Environmental risk under COVID-19 | | | | | | | | |
| Living status | With family | 3951 (81.5) | 4.88 ± 6.66 | 10.02 ± 9.30 | 17.29 ± 6.84 | 8.99 ± 8.54 | 5.65 ± 3.96 | 46.82 ± 32.88 |
| | Others | 895 (18.5) | 6.43 ± 8.17 | 11.60 ± 10.71 | 18.55 ± 8.00 | 10.39 ± 9.67 | 6.70 ± 4.63 | 53.66 ± 38.42 |
| | T-test | | *** | *** | *** | *** | *** | *** |
| Family companionship | 0-4 | 1.60 ± 1.32 | 0.06** | 0.02 | 0.06** | 0.21** | -0.23** | 0.06** |
| Care about COVID-19 news | 1-5 | 3.41 ± 0.76 | -0.01 | -0.00 | -0.01 | 0.01 | -0.04* | -0.01 |
| Feelings of safety to the surroundings | 1-5 | 3.56 ± 0 .83 | -0.22** | -0.24** | -0.20** | -0.18** | -0.20** | -0.22** |
| Psychological features under COVID-19^ | | | | | | | | |
| Difficult life adjustment | 1-5 | 2.20 ± 0.77 | 0.19** | 0.20** | 0.18** | 0.20** | 0.15** | 0.20** |
| Feeling stressed | 1-5 | 2.19 ± 0.87 | 0.30** | 0.32** | 0.30** | 0.32** | 0.23** | 0.32** |
| Receiving good emotional support | 1-5 | 3.51 ± 0.87 | -0.31** | -0.30** | -0.29** | -0.25** | -0.34** | -0.31** |
| Feeling lonely | 1-5 | 1.66 ± 0.83 | 0.37** | 0.38** | 0.34** | 0.33** | 0.35** | 0.38** |
| Psychological distress (BSRS-5) | 0-20 | 3.89 ± 3.31 | 0.66** | 0.66** | 0.66** | 0.67** | 0.52** | 0.69** |
| Lifetime suicide attempt | 0/1 | 0.09± 0.28 | .259** | .263** | .237** | .245** | .219** | .266** |
| Lifetime self-harm history | 0/1 | 0.14± 0.35 | .243** | .226** | .243** | .271** | .208** | .259** |
| Death wish in one month | 0/1 | 0.05± 0.21 | .413** | .398** | .374** | .366** | .301** | .405** |

Note:
BSRS-5: The 5-item Brief Symptom Rating Scale; SD: standard deviation.
^ The higher the value of the ratings in psychological features, the severer the symptoms or negative perceptions.

**Table 4.** The correlation between psychological distress and suicide crisis syndrome under COVID-19 pandemic.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. BSRS_1_Insomnia | 1 | | | | | | | | | | | | |
| 2. BSRS_2_Anxiety | .552** | 1 | | | | | | | | | | | |
| 3. BSRS_3_Hostility | .508** | .631** | 1 | | | | | | | | | | |
| 4. BSRS_4_Depression | .511** | .641** | .677** | 1 | | | | | | | | | |
| 5. BSRS_5_Inferiority | .370** | .538** | .536** | .619** | 1 | | | | | | | | |
| 6. BSRS_6_SuicideIdea | .343** | .396** | .412** | .511** | .423** | 1 | | | | | | | |
| 7. BSRS_total | .735** | .832** | .835** | .857** | .761** | .518** | 1 | | | | | | |
| 8. SCI_1Entrapment | .405** | .524** | .531** | .628** | .549** | .564** | .656** | 1 | | | | | |
| 9. SCI_2AffecDisturb. | .427** | .544** | .552** | .615** | .517** | .548** | .660** | .928** | 1 | | | | |
| 10. SCI_3LoseCogControl | .424** | .537** | .533** | .594** | .502** | .475** | .644** | .880** | .901** | 1 | | | |
| 11. SCI_4Hyperarousal | .454** | .549** | .589** | .602** | .511** | .497** | .673** | .859** | .899** | .904** | 1 | | |
| 12. SCI_5SocialWithdr. | .338** | .421** | .482** | .516** | .449** | .422** | .549** | .731** | .741** | .731** | .800** | 1 | |
| 13. SCI_total | .444** | .558** | .577** | .634** | .541** | .538** | .685** | .946** | .967** | .958** | .959** | .822** | 1 |

Note:
Abbreviations: BSRS (The 5-item Brief Symptom Rating Scale, BSRS-5), SCI (Suicide Crisis Inventory): AffecDisturb: Affective Disturbance; LoseCogControl: Lose cognitive control; SocailWithdr: Social withdrawal.
T-test was used in this table for significance testing.

37.5 years and were highly educated compared to the national dataset according to the Ministry of Interior [12], which result was consistent with other reports [13]. The younger age group of this survey compared to other national surveys made it slightly higher in the educational level, i.e., two-thirds versus 54.3% above college in the previous study. During the time the survey was carried out, the job attendance rate was similar to that before the worldwide COVID-19 pandemic in 2020, which indicated the relatively unaffected societal economic conditions given local precautions.

In analyzing the critical socio-demographic factors relating to pre-suicidal mental states during COVID-19, younger age and lower education were influential to suicide risk, along with disadvantaged economic conditions or restricted social contact in terms of interpersonal or environmental domains. It was noted that economic factors could induce mental health problems in previously healthy people and negatively affect those with pre-existing mental disorders, and the economic breakdown under COVID-19 could further exacerbate mental health conditions [14]. Previous studies have warned of suicide-related consequences in the aftermath of the pandemic, particularly under economic adversity [4]. In addition, people with suicidal ideation were suggested to receive better care under the context of the COVID-19 pandemic due to the loneliness and financial strain derived from the social effects of the Coronavirus [3]. Thus, our findings add that apart from interpersonal relationships, environmental factors such as living status or feelings of safety in the surroundings might also influence suicide tendencies as measured by the 5 components of the SCS scale.

Among all the social relationship measurements, news concerns were not associated with pre-suicidal states. This result was against the anecdotal information about the negative or misleading news impact on mental health [1]. This could be due to the fact that during this survey in April 2021, Taiwan has implemented news broadcast of national coverage to relieve potential public anxiety for over one year since the outbreak of COVID-19. Because the disease casualties were not as severe as seen in other countries, news reports during the survey period had no significant influence on suicide crisis symptoms. In contrast, the mental distress concerns measured by the five-item BSRS-5 scale were found to have high associations with each of the five components of the suicide crisis syndrome (r=0.685), as evident in all the psychopathological symptoms including general sleep problems, anxiety, irritability, depressed mood, and inferiority. Such findings have supported previous evidence regarding the close relationship between mental distress symptoms and suicidal ideation [15] or behaviors [16,17].

**Table 5.** Stepwise regression models of COVID-19 related socioeconomic and psychological factors in the total score and subscales of the suicide crisis inventory.

| Variables | | SCI-Total | | SCI1 Entrapment | | SCI2 AffecDisturb | | SCI3 LoseCogControl | | SCI4 Hyperarousal | | SCI5 SocialWithdr | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B (95%CI) | T | B (95%CI) | T | B (95%CI) | T | B (95%CI) | T | B (95%CI) | T | B (95%CI) | T |
| Demographics | | | | | | | | | | | | | |
| Age | | -0.09 (-0.15--0.03)** | -2.92 | -0.02 (-0.03--0.01)** | -3.3 | 0 (-0.02-0.01) | -0.49 | -0.04 (-0.05--0.03)*** | -6.01 | -0.02 (-0.03-0)* | -2.16 | -0.01 (-0.01-0) | -1.4 |
| Major life events | | | | | | | | | | | | | |
| Economic crisis (past 3 months) | | 6.9 (3.17-10.63)*** | 3.63 | 1.41 (0.61-2.21)*** | 3.46 | 1.53 (0.42-2.64)** | 2.71 | 1.81 (0.98-2.64)*** | 4.26 | 1.59 (0.6-2.58)** | 3.15 | 0.57 (0.04-1.1)* | 2.11 |
| Major financial crisis (past week) | | 7.4 (3.14-11.66)*** | 3.40 | 2.02 (1.1-2.93)*** | 4.33 | 1.81 (0.54-3.08)** | 2.8 | 0.98 (0.03-1.93)* | 2.03 | 1.69 (0.56-2.82)** | 2.93 | 0.93 (0.33-1.54)** | 3.03 |
| Job (before 2021.4) | FT | ref | | | | | | | | | | | |
| | Others | 1.71 (-0.11-3.54) | 1.85 | 0.48 (0.09-0.87)* | 2.41 | 0.24 (-0.3-0.78) | 0.87 | 0.56 (0.15-0.96)** | 2.69 | 0.20 (-0.29-0.68) | 0.8 | 0.22 (-0.03-0.48) | 1.7 |
| Psychosocial factors | | | | | | | | | | | | | |
| Family support | | 1.04 (0.55-1.53)*** | 4.16 | 0.31 (0.2-0.42)*** | 5.77 | 0.01 (-0.13-0.16) | 0.2 | 0.2 (0.09-0.31)*** | 3.63 | 1.24 (1.11-1.37)*** | 18.64 | -0.72 (-0.79--0.65)*** | -20.39 |
| Feeling connected to others | | -0.91 (-1.94-0.12) | -1.73 | -0.11 (-0.33-0.11) | -0.98 | -0.06 (-0.37-0.24) | -0.39 | 0.03 (-0.2-0.26) | 0.23 | -0.25 (-0.52-0.03) | -1.76 | -0.48 (-0.63--0.34)*** | -6.49 |
| Feeling unsafe toward the environment under COVID-19 | | -0.44 (-1.34-0.46) | -0.95 | -0.06 (-0.26-0.13) | -0.65 | -0.49 (-0.76--0.23)*** | -3.63 | -0.13 (-0.33-0.07) | -1.27 | -0.01 (-0.24-0.23) | -0.05 | 0.2 (0.07-0.33)** | 3.09 |
| Follow COVID-19-related news often | | 0.29 (-0.57-1.15) | 0.66 | 0.05 (-0.13-0.24) | 0.57 | 0.09 (-0.17-0.34) | 0.68 | 0.1 (-0.09-0.3) | 1.08 | 0.08 (-0.15-0.3) | 0.65 | 0.02 (-0.11-0.14) | 0.26 |
| Living status | With family | ref | | ref | | | | | | | | ref | |
| | Others | 0.4 (-1.24-2.05) | 0.48 | 0.23 (-0.12-0.58) | 1.27 | | | | | | | 0.29 (0.06-0.53)* | 2.46 |
| Psychological distress (BSRS-5) | | 5.21 (5-5.43)*** | 46.62 | 0.98 (0.93-1.03)*** | 40.81 | 1.39 (1.33-1.46)*** | 41.9 | 1.07 (1.02-1.12)*** | 42.87 | 1.33 (1.27-1.38)*** | 44.71 | 0.45 (0.42-0.48)*** | 28.37 |
| Suicide-related factors | | | | | | | | | | | | | |
| Death wish in one month | | 29.47 (26.31-32.63)*** | 18.29 | 6.72 (6.04-7.4)*** | 19.44 | 8.66 (7.72-9.6)*** | 18.05 | 5.44 (4.74-6.15)*** | 15.13 | 6.48 (5.64-7.32)*** | 15.16 | 2.17 (1.72-2.62)*** | 9.49 |
| Feeling lonely under COVID-19 | | 5.14 (4.23-6.04)*** | 11.15 | 1.1 (0.91-1.29)*** | 11.29 | 1.57 (1.31-1.84)*** | 11.64 | 0.91 (0.71-1.11)*** | 8.98 | 0.95 (0.71-1.19)*** | 7.82 | 0.69 (0.56-0.82)*** | 10.73 |
| Lifetime suicide attempt | | 6.73 (4.37-9.09)*** | 5.58 | 1.37 (0.86-1.88)*** | 5.29 | 2.25 (1.55-2.96)*** | 6.28 | 0.97 (0.44-1.5)*** | 3.61 | 1.38 (0.75-2.01)*** | 4.32 | 0.73 (0.39-1.06)*** | 4.26 |
| Feeling stressed out under COVID-19 | | 2.5 (1.63-3.37)*** | 5.62 | 0.43 (0.25-0.61)*** | 4.67 | 0.82 (0.57-1.07)*** | 6.38 | 0.49 (0.3-0.68)*** | 5.08 | 0.7 (0.47-0.93)*** | 5.91 | 0.21 (0.09-0.33)*** | 3.47 |
| Able to get adequate emotional support | | -2.78 (-3.8--1.75)*** | -5.32 | -0.74(-0.96--0.52)*** | -6.6 | -0.55 (-0.85--0.24)*** | -3.52 | -0.61 (-0.84--0.39)*** | -5.28 | -0.58 (-0.85--0.31)*** | -4.17 | -0.3 (-0.44--0.15)*** | -4.01 |
| Lifetime self-harm history | | 4.99 (3.07-6.9)*** | 5.10 | 0.77 (0.36-1.18)*** | 3.67 | 0.8 (0.23-1.37)** | 2.75 | 0.92 (0.49-1.35)*** | 4.2 | 1.62 (1.11-2.13)*** | 6.25 | 0.88 (0.6-1.15)*** | 6.31 |
| Difficulty adjusting to life under COVID-19 | | 0.91 (0.02-1.81)* | 2.00 | | | | | | | 0.35 (0.11-0.59)** | 2.9 | | |

Note:
*p<0.05, **p<0.01, ***p<0.001. FT: full-time; BSRS (The 5-item Brief Symptom Rating Scale, BSRS-5); SCI (Suicide Crisis Inventory); AffecDisturb: Affective Disturbance; LoseCogControl: Lose cognitive control; SocailWithdr: Social withdrawal.

This study needs to be interpreted under several limitations. First and foremost, the online survey is vulnerable to the issue of representativeness, particularly when inferring to the nationwide sample of young populations. The results could only infer those who have easy website access and higher motivations to join online surveys. However, the wide range of web-link among Taiwanese online users made it easier to spread research invitations such as the underlying survey. Secondly, the online survey could also lead to information bias, deriving from the uncontrollable environmental or personal confounding factors that pose threats to the reliability of the data. According to our estimation, around forty percent of any unfinished item was identified among all respondents, resulting in 4846 participants out of the 8788 people with original data in the system (i.e., the response rate was 53%). However, the underlying survey had reached a reasonable response rate compared to other studies among young civilians aged between 18–39 years old [18]. Third and finally, the cross-sectional research design limited causal inferences between key psychological factors such as mental distress and suicide risks. Moreover, the social or economic factors failed to be followed up, restricting the inference of socioeconomic causes of immediate suicidal mental states. On the other hand, the study has quite a few advantages to pay attention to, including the large sample size for statistical analysis, a relatively shorter period for a scaled survey, and easy access to fulfill the study among the young participants.

In summary, we highlight some key implications based on the findings of this study. The first implication was that under the worldwide pandemic of COVID-19, younger age and various psychosocial factors could be alarming signs of higher suicide risks, such as living alone or being jobless [4,19]. Although they may not be immediately present with high-suicidal consequences, the potential psychological impacts accumulating through these devastating mental states should be warned for early identification and management in order to prevent higher suicide risks or suicidal acts. Under the COVID-19 restriction policy, there is also a need to focus on the issues of family support and environmental safety to enhance psychological protection for young civilians. A recent study has called for more studies to prove the effects of brief interventions that may mitigate mental distress related to the family because family interventions may decrease suicide ideation and build coping skills in the youth people and their families [20]. Future studies are suggested to engage in mental distress or COVID-19-related psychosocial consequences with proactive management and long-term observations among community civilians to lower potential suicide risks in the post-acute pandemic era.

# Conclusion

The pre-suicide mental states assessed by the SCS scale were significantly associated with younger age (≤25), lifetime suicide act, recent psychological distress and, poor economic status or social relationships. The regression models indicated significant influences of economic crisis, psychological distress, and suicide risk factors in the formulation of suicide crisis syndrome under the COVID-19 period in 2021, which inform further strategies for the detection and prevention of suicide behaviors. Healthcare providers should pay attention to these early warning signs of suicide risks in the post-acute COVID-19 era.

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Original Articles

# Comparison of Suicide Rate, Means of Suicide, and Gender Difference in Kaohsiung City, Taiwan before and after Outbreak of the COVID Pandemic

**Hung-Yu Wang[1], Joh-Jong Huang[2,3], Min-Wei Huang[1], Wei-Jen Chen[1], Frank Huang-Chih Chou[1*]**

**Abstract:** ***Background:*** The impact of the COVID-19 pandemic on the suicidal ideology of the Taiwanese population remained unclear. ***Methods:*** By utilizing secondary data from the Taiwanese Society of Suicidology, we conducted an analysis of the suicide rate and the means of suicide among males and females in Kaohsiung, a major city known for its higher suicide rate in Taiwan. We selected a four-year study period (2018–2021) to account for the significance related to the pandemic (i.e., pre-pandemic: 2018–2019, sporadic cases: 2020, and the large-scale outbreak in 2021). ***Results:*** The mean number of suicides was 482±22.29 (range, 453–506). The mean numbers of suicides for males were 310±18.91(range: 294–337), while for females it was 173±19.87 (range: 148–196). There was a slight increase in the total number of suicides from 2018 to 2019, followed by a reduction in 2020. However, the number rebounded in 2021. The age-standardized suicide rate followed the similar trend. During the four-year period, a comparison of the age-standardized suicide rate between the whole country and that of Kaohsiung demonstrated a consistently higher rate in the latter. It was noteworthy that while there was a reduction in the national suicide rate following the pandemic, there was an increase observed in Kaohsiung. The five major means of suicide in Kaohsiung were hanging (35.7%), charcoal burning (22.5%), falling (17.8%), pesticide ingestion (12.3%), and drowning (11.7%). While there were notable increases in suicides through hanging and falling, there was a drastic decrease in cases through charcoal burning after the pandemic outbreak. ***Conclusion:*** In contrast to the national trend, Kaohsiung showed an increase in suicide rate after full-scale pandemic outbreak. While suicides through hanging and falling were increased, a remarkable reduction in charcoal burning may be attributed to the suicide-preventing efforts of the Kaohsiung City government.

**Keywords:** COVID, suicide, lockdown, suicide prevention.

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## Introduction

In late 2019, a new unknown viral respiratory disease, known as coronavirus infectious disease 2019 (COVID-19), broke out in Wuhan, China, and rapidly spread throughout the country [1]. On January 23, 2020, Wuhan announced an official lockdown of the city. Despite this measure, the pandemic quickly spread to the rest of the world [2]. On January 30, 2020, the World Health Organization declared the novel coronavirus outbreak as an international public health emergency [3]. In the early stage of the pandemic, the high infectivity of the virus [4] together with its staggering mortality rate up to 75% especially in males [5] crippled the medical systems in many countries due to insufficient negative pressure wards and ventilators [6].

In addition to its physiological impact on the human body, the COVID-19 pandemic has presented a significant psychological threat to the global population. A study involving 1456 participants conducted during the pandemic showed that the prevalence of loneliness as well as the symptoms of post-traumatic stress disorder (PTSD), depression, and anxiety were 38.7%, 33.9%, 11.3 %, and 7.6%, respectively [7].

The lockdown measures as well as the policy of social distancing that many countries implemented to curb the spread of the pandemic not only adversely influenced people's income due to their inability to participate in their daily occupation, but also resulted in social isolation that intensified the feelings of loneliness, hopelessness, and depression as well as weakening their network of social support [8]. According to a study utilizing Google Trends, "boredom" was identified as the top search term of interest among internet users, followed by "worry", "loneliness" and "sadness", whereas searches for the terms of "stress" and "suicide" decreased during the same period.

Another pandemic-related psychosocial effect is also shown in the elevated rates of alcohol consumption and substance abuse. In the US, recent statistics demonstrated an increased rate of alcohol consumption by 14% during the pandemic compared to that in the first half of 2019 [9]. Social isolation together with fears and anxiety triggered by a feeling of uncertainty for the future may predispose to an increased alcohol consumption [10]. Moreover, substance abuse has increased significantly during the pandemic and increased risk of hospitalization [11].

It has been reported than an increased cost of living could contribute to psychological stress. The shutdowns of the industrial assembly lines in China, known as the

[1] Kaohsiung Municipal Kai-Syuan Psychiatric Hospital, Kaohsiung City, Taiwan; [2] Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan; [3] Department of Family Medicine, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan.

[*]**Correspondence to:** Dr. Frank Huang-Chih Chou, Department of Community Psychiatry, Kai-Syuan Psychiatric Hospital 130, Kai-Syuan 2nd Rd, Lingya district, Kaohsiung, Taiwan;Tel: 886-7-7513171-2232;Fax: 886-7-5373299;E-mail: f50911.tw@yahoo.com.tw

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world's factory in the global trade system, have reduced the country's export of relatively inexpensive items to other nations [12]. The resulting global economic downturn and a rise in prices of daily commodities have imposed a significant financial and psychological burden on the global population [13].

Focusing on the impact of the above-mentioned COVID-related factors on suicide rate, a large-scale systematic review and meta-analysis including 120,076 participants showed that the pooled prevalence of suicide ideations was 12.1% [14]. According to that study, the main risk factors for suicidal ideation included low social support as well as high mental and physical exhaustion. Another meta-analytical study reported that monitoring of suicidal ideation is crucial in psychiatric patients during the COVID-19 epidemic [15].

Although Taiwan enjoyed a pandemic-free period at the beginning of its global outbreak in other European countries and the United States due to our early implementation of screening measures and meticulous tracing of potentially infected individuals, the number of infected cases began to escalate to prompt the Government to implement a national lockdown on May 19, 2021 [16]. The situation became aggravated from March 2022 when the country encountered another wave of pandemic assault with a record-breaking 100,000 newly infected cases (i.e., 0.41% of the whole population) in a single day in May 2022 [17].

Kaohsiung City, which is the third largest among the six major cities in Taiwan in terms of population [18], had the highest or second-highest suicide rate in the recent decade among the six cities before the pandemic possibly attributable to multiple factors. In view of its high susceptibility to committing suicide, this study aimed at analyzing the impact of the COVID-19 pandemic on the suicide rate of the city.

# Methods

## Subjects and methods study design

The present retrospective study was conducted based on a national database established by the Taiwanese Society of Suicidology sponsored by the Taiwan Ministry of Health and Welfare that focuses on the incidence of suicide by year in Taiwan [19]. The database contains the demographic characteristics (i.e., age, gender), means of committing suicide, and mortality rate of the Taiwanese population. For the current study, changes in the incidence, demographic characteristics, means, and mortality of suicide in Kaohsiung City during the period 2018–2021 were compared and analyzed. The four years were chosen taking into consideration the associated significance of each period. While the period 2018-2019 represented the pre-pandemic period, the year 2020 and 2021 reflected the periods of sporadic cases and the large-scale outbreak, respectively.

In addition to a comparison of the age-standardized suicide rate between the whole country and that of Kaohsiung City in the four-year period, the rates of males and females who committed suicide during the same period regardless of the cause of death were also scrutinized. The means of suicide during the four years were also analyzed. The correlations between gender and the top five causes of death were compared. Ethical approval and informed consent were waived because the data used in the current study had been delinked from traceable personal information and the subjects were deceased.

## Definitions

The definition of suicide was according to that of the national database. In Taiwan, information related to an incidence of suicide is uploaded to the Suicide Prevention System, an electronic platform operated by the Ministry of Health and Welfare, to be collected and analyzed. Based on the definition of the World Health Organization (WHO), age-standardized suicide rate (per 100,000 population) refers to number of suicides in a country in a year, divided by the WHO standard population and multiplied with 100,000 [20].

## Statistical analysis

The current study adopted descriptive statistics for data presentation, including the changes in male and female populations and the number of suicides of the two genders with the four-year study period (i.e., 2018–2021). The mortality rates were shown as age-standardized suicide rates. Mean values are expressed as mean ± standard deviation (SD). The correlation between gender and the means of suicide were also compared.

# Results

## Changes in total population and number of suicides committed in Kaohsiung City between 2018 and 2021

According to the data from the Kaohsiung Civil Affairs Bureau, the city showed a slight female prevalence from the year 2018 to 2021. The mean male and female populations in the four-year study period were 1,364,690 and 1,399,648, respectively. An inspection of the trend demonstrated a minor but persistent decrease in the male population from 2018 to 2021. In contrast, there was a slight increase in the female population from 2018 to 2019, followed by a progressive reduction in the next two years.

Based on the data of the Taiwanese Society of Suicidology, the mean number of suicides in Kaohsiung City within the four-year period regardless of genders was 482 ± 22.29 (range, 453-506). Focusing on the gender, the mean numbers of suicides for males and females were 310 ± 18.91 (range, 294-337) and 173 ± 19.87 (range, 148-196) (Figure 1B). An inspection of the number of individual cases without considering the total population revealed a slight increase in the total number of suicides from 2018 to 2019, followed by a reduction in 2020 but a rebound in 2021. There was a parallel trend for males except for the year 2021 when there was a slight reduction from 2020. In contrast, the number of female cases progressively decreased from 2018 to 2020, followed by an increase in 2021. Therefore, the rise in female cases in 2021 appeared to contribute to the rebound in the total number of cases in 2021.

## Age-Standardized suicide rate

A comparison of the age-standardized suicide rate between the whole country and that of Kaohsiung City showed a higher rate in the latter than that in the former throughout the whole four-year period (Fig. 2A). Besides, both demonstrated a similar trend of reaching a summit in the year 2019 (12.6 vs. 13.8, respectively), followed by a drop in 2020 (11.8 vs. 12.2, respectively). However, instead of a reduction from 2020 to 2021 to reach a nadir during the four-year period at a national level (i.e., from 11.8 to 11.6), the mortality rate of Kaohsiung City exhibited a rebound in 2021 (12.3 to 13.0) to a level that was even higher that of the city in 2018 (i.e.12.8).

## Gender difference in standardized death rate

A comparison of the age-standardized suicide rate between males and females in Kaohsiung City regardless of age and cause of death revealed a significant male dominance throughout the four-year period (Fig. 2B). Focusing on the gender-specific trend, an inspection of the fluctuations in death rate in males demonstrated a tendency compatible with that of the national death rate that exhibited an elevation from 2018 to 2019, followed by a progressive decrease in the next two years. In contrast, although the death rate of females showed a progressive reduction in the following two years, it demonstrated a paradoxical increase in 2021 that may explain the distinctive feature of an elevation in the overall death rate of the city in that year (Fig. 1). The male-to-female ratios of suicide in the city in 2018, 2019, 2020, and 2021 were 1.7, 2.1, 2.1, and 1.6, respectively, further highlighting the relative increase in the proportion of females committing suicide in 2021.

## Means of suicide

The means of suicide during the four-year period from 2018 to 2021 are shown in Fig. 3. The top five causes of death were hanging (35.7%), charcoal burning (22.5%), falling (17.8%), pesticide ingestion (12.3%), and drowning (11.7%).

## Association between gender and means of suicide

### Hanging

Regardless of gender, hanging was the most common means of suicide in Kaohsiung City during the four-year period affected by the pandemic. The mean numbers of cases for males and females were 114.3 ± 8.02 (range, 104-122) and 49 ± 7.87 (range, 41-58), respectively. An inspection of the changes in the total number of hanging cases showed a trend of persistent decrease from 2018 to 2020, followed by a rebound in the year 2021 that was the highest within the four-year period (Fig. 3A). Scrutinizing the gender-specific trends demonstrated a similar pattern for females. The same trend was also noted in the age-standardized suicide rate in females (Fig. 2B). By comparison, despite a similar tendency in the first three years to that of the age-standardized suicide rate for males, there was a rebound in cases of hanging in 2021. Both genders showed the largest numbers in 2021, which contributed to the overall increase in the number of individuals who committed suicide by hanging in 2021.

Focusing on the changes between 2020 and 2021 when the pandemic broke out in Taiwan, there was an overall increase in the number of hanging cases regardless of gender from 148 to 180 (i.e., 21.6%). While males showed a 17.3% increase from 104 to 122, females demonstrated a 31.8% elevation from 44 to 58.

### Charcoal burning

The second common means of suicide in Kaohsiung City was charcoal burning. The total numbers of individuals who committed suicide by charcoal burning were relatively constant between 2018 and 2020 (113, 113, and 110, respectively) (Fig. 3B). The trend may be explained by the relatively stable numbers of males (85, 86, and 88, respectively) and females (28, 27, and 22, respectively) committing suicide with this approach. Interestingly, there was a 31.8% decrease in the total number of cases from 2020 to 2021 (110 and 75, respectively). The reductions from 2020 to 2021 in males and females were 35.2% (from 88 to 57) and 18.2% (from 22 to 18), respectively.

### Falling

The fluctuation in the total numbers of suicide cases by falling was similar to that of the age-standardized suicide rate between 2018 and 2020, except for a notable increase in 2021 (Fig. 3C). An examination of the gender difference showed a notable increase from 2018 to 2019 for men (i.e., from 28 to 42 , 50%). The trend then reached a plateau in the next three years (i.e., 2019-2021) (42, 40, and 42, respectively). In contrast, there was a progressive decrease in the number of female cases in the first three years (i.e., 48, 43, 29, respectively) but a notable 82.8% increase from 2020 to 2021 from 29 to 53.

### Pesticide

As the fourth most common cause of suicide in Kaohsiung City, pesticide ingestion showed a relatively constant trend during the four-year study period (59, 55, 59, and 51, respectively) except for a minor decrease in 2021. While men demonstrated a reduction in the year 2021 (from 39 to 26, 33.3%), women exhibited a 25% increase from 2020 to 2021 (20 and 25, respectively).

### Drowning

The total numbers of suicide cases through drowning increased from 2018 to 2019, followed by a decrease in 2020 and a rebound in 2021 (42, 65, 48, 59 during 2018-2021, respectively). Males (19, 31, 22, 25, respectively) and females (23, 34, 26, 34, respectively) followed the same pattern with the number of females slightly higher than that of males.

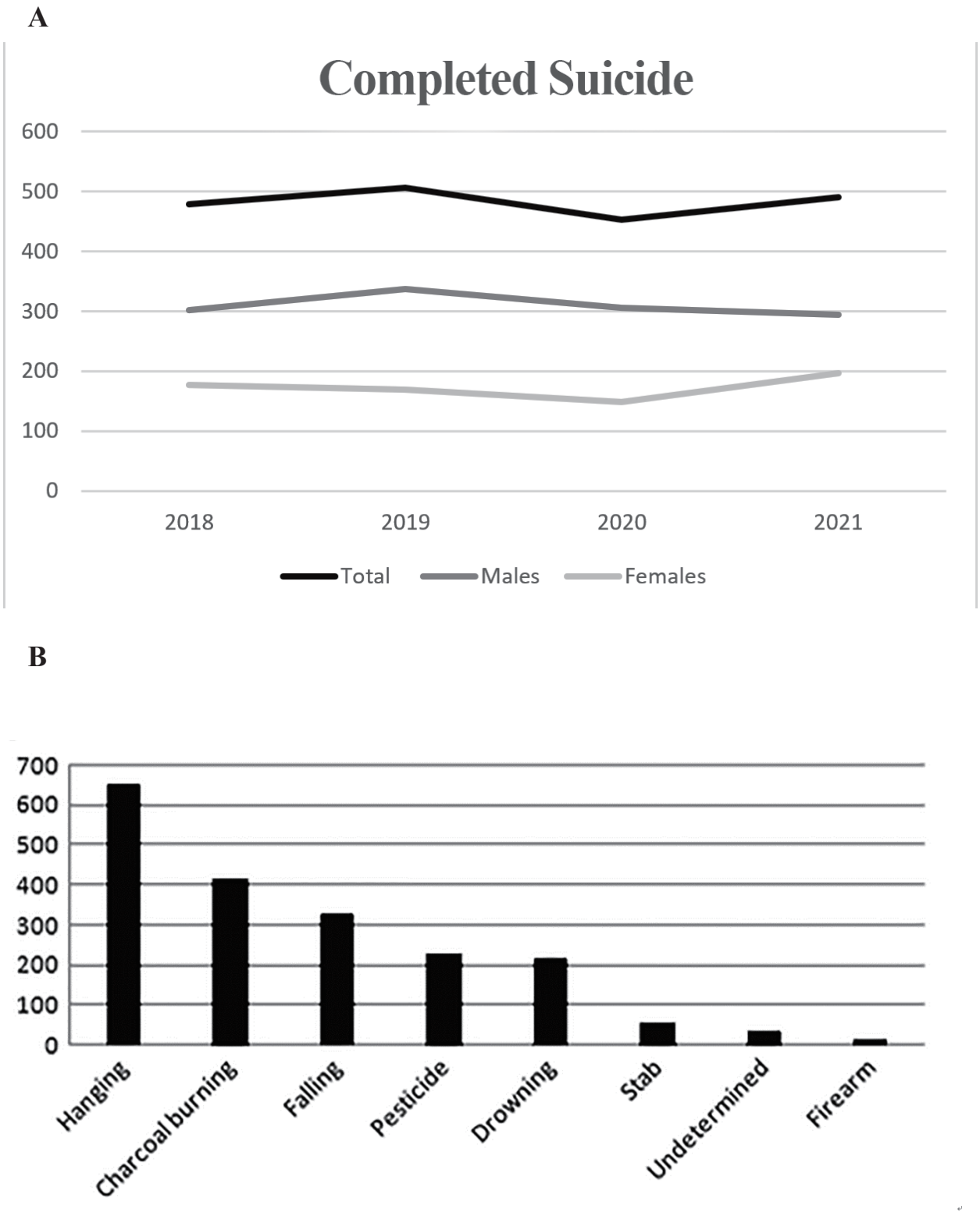


**Figure 1.** (A) Fluctuations in the number of suicides committed by males and females; (B) Means of suicide in Kaohsiung City between 2018 and 2021.

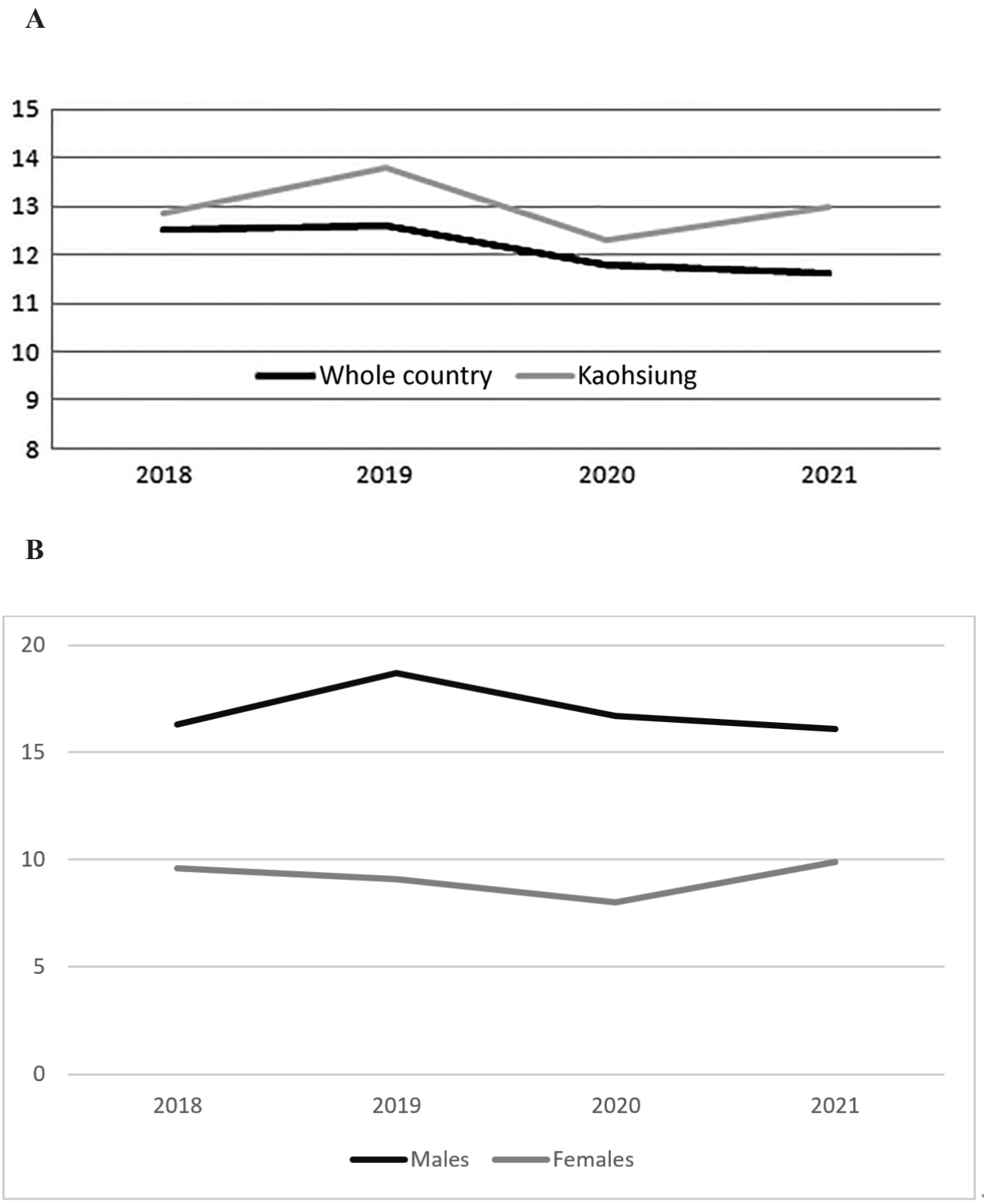


**Figure 2.** (A) Comparison of standardized death rate (per 100,000 population) between the whole country and that of Kaohsiung City between 2018 and 2021;
(B) The rates of males and females committing suicide during the four-year period (2018-2021) regardless of the cause of death.

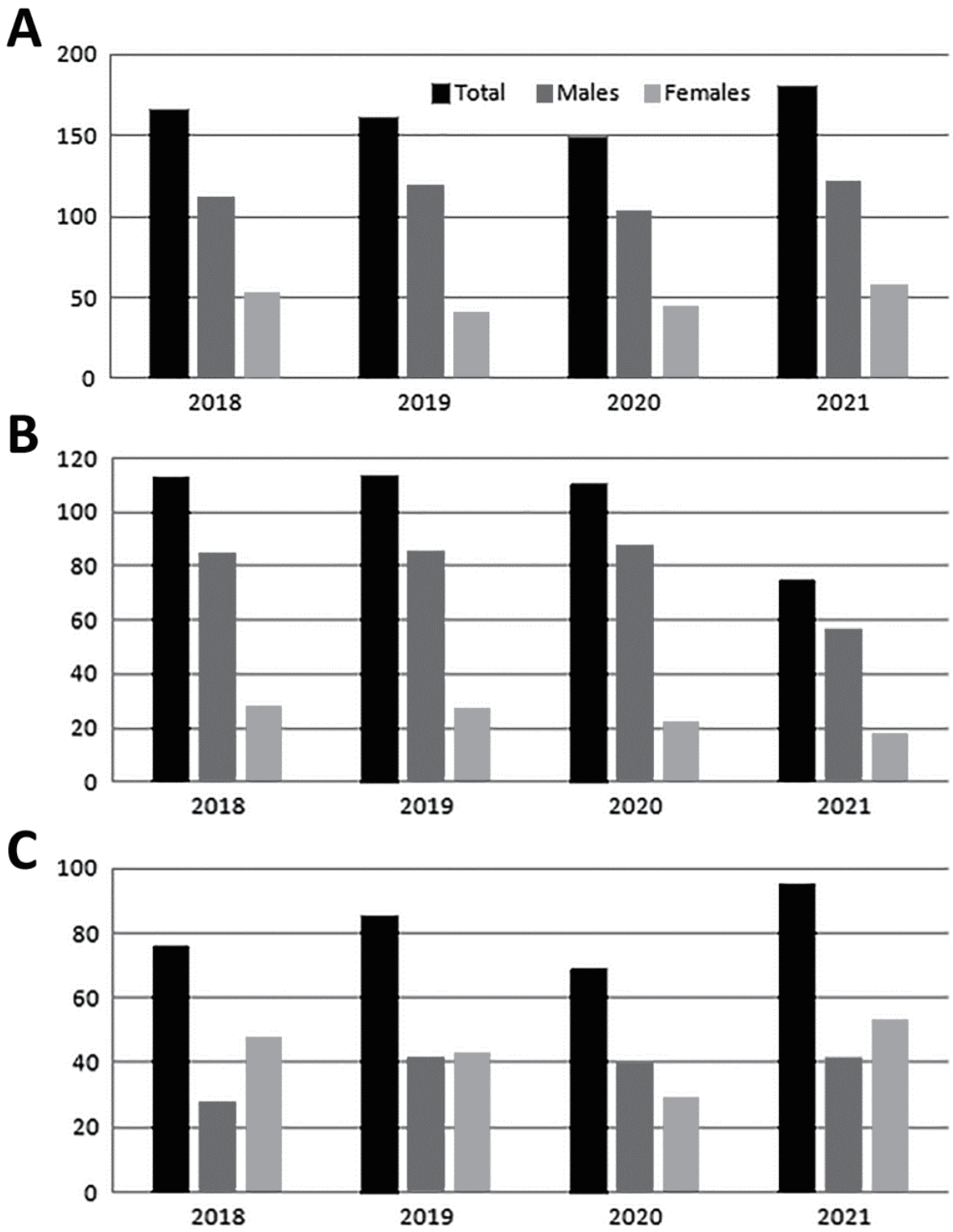


**Figure 3.** Gender distribution of individuals committing suicide by (A) hanging; (B) charcoal burning; (C) falling.

# Discussion

The present study, which is the first to focus on the impact of the COVID-19 pandemic on the suicide rate in a major Taiwanese city, has several clinical implications. First, we found a higher age-standardized suicide rate in Kaohsiung City compared with that of the whole country, thereby justifying our choosing the city for the present investigation. Second, despite the increases in suicides through hanging and falling after the outbreak of the pandemic in Taiwan from 2020 to 2021, there was a notable decrease in suicides through charcoal burning. Nevertheless, there was an overall rise in age-standardized suicide rate in Kaohsiung from 2020 to 2021 in contrast to a reduction at a national level, suggesting a more notable impact of the pandemic on the city compared with other regions in the country.

Unlike the rest of the world that were adversely affected by the outbreak of the pandemic at the end of 2019, Taiwan enjoyed more than one year of pandemic-free period attributed to its sustained efforts to trace the infected cases and maintenance of a strict quarantine policy [21]. However, Taiwanese defense against the pandemic began to collapse in May 2022 when community spread became evident. The current study, which aimed at investigating the impact of the pandemic on the suicide rate of a southern Taiwanese city, collected suicide-related data of the city before the pandemic (i.e., 2018 and 2019), at the early stage of the pandemic when sporadic cases were noted (i.e., 2020), and after pandemic outbreak (i.e., 2021) from an official source. Our results not only demonstrated changes in the preferred means of suicide but also revealed a gender impact on the suicide rate during the four-year study period.

Regarding the means of suicide, our results showed notable elevations in the number of suicide cases through hanging and falling following outbreak of the pandemic. In contrast to hanging which is considered a premeditated form of suicide, falling is more impulse-driven [22]. Hence, our findings may indicate an increase in suicidal ideation among the city inhabitants regardless of their initial intentions. One of the significant findings of this study was the notable reduction in suicides by charcoal burning in 2021. The dominance of charcoal burning as the second cause of suicidal death in Taiwan and also Kaohsiung before the pandemic may be explained by the ease with which charcoal can be purchased and its cheapness. The reduction in suicide via charcoal burning may be attributed to the efforts of the Department of Health of the Kaohsiung City government including offering courses on suicide prevention to retailers, not openly displaying charcoal on shelves, putting warnings on charcoal packages, and availability in only small quantities [23]. It takes time for any intervention to be effective. Because such suicide prevention measures have been implemented since 2019, the reduction in charcoal-related suicide rate in 2021 may reflect a time lag for such strategies to take effect.

Since 2018, the number of reported cases of domestic violence in Kaohsiung increased gradually, resulting in a total increase of 39% from 2018 to 2021. Furthermore, the number of domestic violence is often underestimated, and the actual number is likely to be higher. Further studies are needed regarding the correlation between domestic violence and the number of suicide rate.

Focusing on the prevention of suicides from falling, the installation of barbed wires and increasing the height of parapet on the top floor may be examples of some feasible strategies [24]. For the prevention of drowning, one of the measures was increasing the height of railings on a bridge as reported by a Korean article after their finding of a reduced rate of suicide on the Han River following the renovation of the railing on the Mapo bridge, which used to be a hot spot for suicide through drowning [25].

## Limitations

The present study had its limitations. First, because we only investigated the suicide rate of Kaohsiung City without analyzing that of other major cities in Taiwan, whether the same pattern was shared by other cities during the same study period remains unclear. Second, a mere analysis of demographic data precluded further analyses of the potential economic and occupational impacts as well as the effects of pre-existing diseases (e.g., cancers or chronic illnesses) on the suicide rate as well as the choice of the means of suicide. Third, the number of suicide cases included in the current study may be underestimated because some cases of suicide may be mistakenly categorized into accidental deaths. Fourth, despite the previous demonstration of a significant influence of weather (i.e., temperature and humidity) on the suicide ideology of the inhabitants of a country with a higher suicide rate being noted in areas with relatively short periods of sunshine in a year [26], the condition may not be applicable in Kaohsiung City where the temperature and humidity remain relatively stable throughout the year. Therefore, the seasonal impact on suicide rate was not investigated. Finally, although we selected a four-year period to cover the pre-pandemic condition, the period with sporadic cases, the time at which the outbreak occurred, and the period of full pandemic spread, we could not attribute the observed fluctuations in suicide rates through different means to the spread of pandemic in the city especially when no data from emotion assessment questionnaires were available for correlation during the study period.

# Conclusion

The results of the current study showed an overall parallel trend of suicide between Kaohsiung City and the country, the former exhibited a rebound after the pandemic in 2021 probably attributable to the increases in suicides through hanging and falling. On the other hand, there was a notable reduction in suicide through charcoal burning following the pandemic outbreak, in which the suicide-preventing efforts made by the Department of Health of the Kaohsiung City government may have a significant role to play.

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Original Articles

# Real World Effectiveness of Psychological Intervention on the Reduction of Suicidal Attempts among Patients with Drug Use Disorder before and during the COVID-19 Pandemic in Tainan

**Cheng-Chan Shih [1,2*], Wan-Sin Cheng[1], Yueh-Yin Chen[1], Edward Chia-Cheng Lai[2], Ming-Been Lee,[3,4,5], Shih-Bin Su[1*]**

**Abstract:** ***Background and purpose:*** Patients with drug use disorder (DUD) during the COVID-19 pandemic may have been more likely to experience anxiety, depression and insomnia, which can potentially lead to suicidal behavior. This study investigated the effectiveness of psychological interventions in preventing suicidal events among patients with DUD during 2019–2020. ***Methods:*** The five-item Brief Symptom Rating Scale (BSRS-5) was used to monitor psychological distress, and it was calculated according to baseline variables. The exposure group was participants who received BSRS-5 assessment during their follow-up period. The other patients were the nonexposure group. The relative risk (RR) of developing DUD was the ratio of the incidence in the BSRS-5 exposed group to the incidence in the non-exposed group. The Chi-square test was used to compare differences among the DUD patients. As part of this study, a one-year follow-up intervention was conducted to assess the effectiveness of psychological intervention. ***Results:*** This study included a total of 3,187 participants in 2019 and 3,308 participants in 2020 with their records linked to suicidal attempts. Patients assessed with BSRS-5 had a lower risk of suicidal attempts (RR, 0.48; 95% confidence intervals [CI], 0.22–1.07) during the period under study. The prevalence rate of suicidal attempts was 0.68% in 2019 and 0.27% in 2020. The average age of the participants was 48.3 ± 7.6 years in 2019 and 48.2 ± 7.9 years in 2020. Most patients were male (87.7% in 2019 and 88.1% in 2020). At one-year follow-up, intervention reduced the risk of psychiatric morbidity by 4.5% and one-week suicidal ideation (score > 1) by 0.9%. ***Conclusion:*** Patients with DUD undergoing BSRS-5 to measure psychological distress had a reduced risk of suicidal attempts during both prior to and during theCOVID-19 pandemic. Additional studies are needed to confirm this conclusion.

**Keywords:** drug use disorder, suicidal attempt, COVID-19 pandemic.

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## Introduction

The COVID-19 pandemic has intensified global concerns about suicide, indicating a significant public health issue. This unprecedented global health crisis has led to widespread mental health problems and a heightened risk of suicide [1]. The pandemic's impact on mental well-being included increased levels of anxiety, fear, sadness, and difficulties in adapting to the new reality. These effects have been observed across diverse populations encompassing both the general public and specific subgroups. Individuals facing psychological challenges during this time period were more vulnerable to initiating or exacerbating the use of addictive substances and alcohol as coping mechanisms [2,3]. As noted previously, individuals diagnosed with drug use disorders (DUD) had a significantly higher risk of self-harm, nearly ten times greater, than those without such a diagnosis [4]. Additional studies have found that individuals suffering from DUD, particularly opioid use disorder (OUD), had the highest prevalence of self-harm with an elevated risk of suicide [5,6].

Patients with DUD, especially OUD, might be particularly susceptible to experiencing anxiety, depression, and insomnia under the stressful conditions of the COVID-19 pandemic. These psychological challenges could potentially contribute to an increased risk of suicidal behavior [7]. However, there is currently a dearth of published literature, particularly regarding the COVID-19 pandemic, on the prevalence of suicidal behavior during the follow-up period for individuals with DUD who were released from prison, granted deferred prosecution from criminal justice sources, or were voluntary participants in drug treatment. Additionally, patients might also be more likely to be lost to follow-up during the pandemic. Implementation of effective suicide prevention for people with DUD in Tainan is urgently needed. However, the relationship between psychological interventions and the risk of suicide during the follow-up care period for individuals with DUD who were

[1] Health Bureau of Tainan City Government, Tainan, Taiwan; [2] School of Pharmacy, Institute of Clinical Pharmacy and Pharmaceutical Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan; [3] Taiwanese Society of Suicidology & Taiwan Suicide Prevention Center, Taipei, Taiwan; [4] Department of Psychiatry, Shin Kong Wu Memorial Hospital, Taipei, Taiwan; [5] Department of Psychiatry, National Taiwan University College of Medicine and Hospital, Taipei, Taiwan.

[*]**Correspondence to:** [1]Cheng-Chan Shih, Public Health Bureau, Tainan City Government Linsen Office, 418, Sec.1, Linsen Rd., East District, Tainan City 70151, Taiwan; Tel +886-6-2679751; E-mail: diazepam850@gmail.com

[2]Shih-Bin Su, MD, PhD, Director General, Public Health Bureau, Tainan City Government, Linsen Office, 418, Sec.1, Linsen Rd., East District, Tainan City 70151, Taiwan; Tel +886-6-2679751; E-mail:su@tncghb.gov.tw

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subjected to the legal system has not been previously evaluated. This study examined the effectiveness of psychological interventions in preventing suicide among patients with DUD both prior to and during the COVID-19 pandemic in Tainan.

# Methods

## Study design

This was a cohort study analyzing data from the National Suicide Surveillance System (NSSS) and the Drug Abuse Case Management System (DACMS). The population-based matching NSSS study was conducted to examine the association between psychological intervention and reduced suicidal attempts in individuals with DUD from NSSS records in 2019 and 2020 in Tainan City. The Brief Symptom Rating Scale (BSRS-5) questionnaire survey was administered to individuals with DUD to monitor psychological distress, and it was calculated according to baseline variables.

The exposure group was defined as those receiving the BSRS-5 questionnaire survey during their follow-up period. Otherwise, patients were considered to be part of the nonexposure group. The relative risk (RR) of patients developing DUD was the ratio of the incidence in the BSRS-5 exposed group to the incidence in the nonexposed group. The Chi-square test was used to compare differences among the patients with DUD. As part of this study, a one-year follow-up intervention was conducted, and the effectiveness of the intervention was compared using the results of the two groups.

## Participants

Participants were individuals who engaged in illegal drug abuse, had a diagnosis of DUD, and required follow-up care in the DACMS in 2019 and 2020 in Tainan City. The follow-up care program provided individuals with DUD with psychological counseling, employment referral, drug addiction treatment and subsidy, assistance in recovering family support, legal advice, and social assistance.

The study also obtained information from various data sources, including gender, age, current status, and referral source. In the study, participants with DUD were divided into two groups. One group consisted of individuals with OUD who received the BSRS-5 assessment, while the other group consisted of individuals with nonopioid DUD who did not receive the BSRS-5 questionnaire survey. Participants with previous suicidal attempts who were already enrolled in the NSSS during 2019 and 2020 in Tainan City were identified.

## Data sources & management

A cohort study was conducted by analyzing data from the NSSS and DACMS. This study included patients enrolled in the DACMS program for DUD with a record of a suicidal attempt in Tainan during 2019 and 2020. The NSSS was established in 2006 and was initially responsible for suicide reporting. However, in 2013 Tainan became the first city in Taiwan to establish the "Tainan Municipal Self-Government Ordinance on Suicide Reporting and Care" to handle reporting suicides.

The DACMS has a record of patients greater than 18 years of age who have been arrested for illegal drug use. The data source of follow-up care included those with deferred prosecution, probation, discharge from prison at the expiration of their sentence, or voluntary patients in drug treatment. Follow-up care lasted from six months to two years.

## Five-item Brief Symptom Rating Scale (BSRS-5)

The BSRS-5 is a self-reporting scale with satisfactory validity for identifying psychiatric morbidity and suicidal ideation in both clinical and community populations [8-10]. Since 2016, the Tainan City Government has included the BSRS-5 in the subsidies for methadone maintenance treatment for OUD. When individuals undergoing methadone maintenance treatment applied to the treatment assistance program, an on-site assessment was conducted to evaluate their psychological distress.

During the application for financial assistance for methadone maintenance treatment in December 2019 and December 2020, a BSRS-5 assessment was provided to screen for mental disorders among patients with DUD. With the assistance of a case manager, these patients self-reported the level of distress experienced in the past week regarding the following issues: (1) insomnia, (2) anxiety, (3) hostility, (4) depression, and (5) inferiority. The level of distress for each indicator was expressed on a scale of 0 (not at all) to 4 (extremely). Triage of psychological distress levels was performed based on the following BSRS-5 score: normal, < 6; mild, 6–9; moderate, 10–14; severe, ≥15. An additional item on suicidal thoughts was added to the BSRS-5 items using the same scale: 0 (not at all) to 4 (extremely). The Cronbach's alpha value of the BSRS-5 was 0.90 in the study.

When patients with DUD had a suicidal ideation score > 1, they were referred to an aftercare program manager for psychological counseling and support. Those with a BSRS-5 score > 10 were identified as being at high risk for suicide and received intensified monitoring, counseling, and support from the case managers at the Drug Prevention Center until their BSRS-5 score was < 10. At that point, they were transferred to regular monitoring and counseling.

## Statistics analysis

The RR and 95% CI for the occurrence of suicidal attempts among individuals with a BSRS-5 assessment before and during the COVID-19 pandemic were calculated. Descriptive results were expressed as frequencies and percentage for categorical variables. Chi-square tests were used to examine the differences between the COVID-19 pandemic period and the period before the pandemic and patients with or without follow-up care for all categorical variables and outcomes. All analyses were performed using SPSS Statistics v. 22.0.

# Results

## Demographics

This study evaluated 3,187 participants from 2019 and 3,308 participants from 2020 and linked them to records of suicidal attempts. Patients with BSRS-5 measurements had a lower risk of suicidal attempts (RR, 0.48; 95% CI, 0.22–1.07) during the study period (Table 1).

Characteristics of the participants at baseline, overall, and by assessment frequency are noted in Table 2. The BSRS-5 questionnaire survey to monitor psychological distress in patients with DUD was used to assess 737 participants in 2019 and 750 participants in 2020. The prevalence of suicidal attempts was 0.68% in 2019 and 0.27% in 2020. The average age was 48.3 ± 7.6 years in 2019 and 48.2 ± 7.9 years in 2020. Among the patients in 2019 and 2020, 87.7% and 88.1% were male, 55.4% and 54% lived in urban areas, 41.5% and 37.9% had a psychiatric morbidity, 16.4% and 17.3% had suicidal ideation with a score of 1–4, and 7.9% and 7.3% had suicidal ideation with a score > 1, respectively.

Compared to 2020, the levels of psychiatric morbidity (BSRS-5 ≥ 6) and suicidal ideation within a week (score > 1) prior to evaluation were higher in 2019. There was a significant difference between the referral sources in 2019 and 2020.

## Psychological profiles based on follow-up condition

BSRS-5 was used to monitor psychological distress in patients with DUD. The survey included 737 participants in 2019 and 750 participants in 2020. The participants who received the BSRS-5 questionnaire survey during the study period were divided into a follow-up group and a nonfollow-up group consisting of 561 and 365 individuals, respectively. Most participants were males, accounting for 87.5% and 89% in the follow-up and nonfollow-up groups, respectively. The greatest number of participants was in the 40–49-year-old age category, comprising 45.8% and 50.1% of the follow-up and nonfollow-up groups, respectively. The majority of the follow-up group, 56%, resided in urban areas. The nonfollow-up group had a slightly lower percentage of individuals living in urban areas (50.7%). There were no statistically significant differences observed among the various categories in terms of demographics and psychological distress profiles based on follow-up condition.

In evaluating the referral source, the majority of the follow-up group came from hospital referrals (57.2%) followed by voluntary medical treatment (25.3%). In the nonfollow-up group, the main referral source was deferred prosecution (35.9%) followed by voluntary medical treatment (34.2%). There was a statistically significant difference between the two groups.

As noted in Table 3, the follow-up group had the highest prevalence of psychiatric morbidity (42.1%), with the nonfollow-up group having a prevalence of 39.2%. Regarding the one-week period of suicidal ideation, specifically comparing the rates for a score of 1–4 and a score > 2, the nonfollow-up group had a higher one-week suicidal ideation score of 1–4 (17.2%) than the follow-up group (8.8%) as well as a higher rate of a score > 2 (16.6% vs. 7.7%).

## Psychopathological profile of follow-up conditions at Time1 and Time2

As noted in Table 4, the prevalence of psychiatric morbidity and suicidal ideation (a score of 1–4 within one week of evaluation) between the first and second assessments was 42.1% vs. 37.6% and 16.7% vs. 17%, respectively. Furthermore, the prevalence of suicidal ideation (score > 1) was 7.7% vs. 6.8%.

**Table 1.** The relationship between BSRS-5 and suicidal attempts (SA) during 2019–2020.

| | SA in BSRS-5 group | SA in Non-BSRS-5 group | No SA in BSRS-5 group | No SA in Non-BSRS-5 group | Incidence in BSRS-5 group (%) | Incidence in Non-BSRS-5 group (%) | Relative risk (95% CI) |
|---|---|---|---|---|---|---|---|
| During the period of 2019–2020 | 7 | 49 | 1470 | 4989 | 0.47% | 0.98% | 0.48 (0.22-1.07) |

**Table 2.** The demographics and psychological distress of individuals before and during COVID-19.

| | 2019 (before COVID-19) (n=737) | 2020 (during COVID-19) (n=750) | P value |
|---|---|---|---|
| Prevalence rate of suicidal attempts | 0.68% | 0.27% | |
| Gender | | | 0.776 |
| Male | 646 (87.7) | 661 (88.1) | |
| Female | 91 (12.3) | 89 (11.9) | |
| Age (years) | | | 0.025 |
| <40 | 89 (11.9) | 65 (8.7) | |
| 40-49 | 339 (46) | 327 (43.6) | |
| 50-59 | 254 (34.5) | 276 (36.8) | |
| ≥60 | 56 (7.6) | 82 (10.9) | |
| Mean (SD) | 48.3±7.6 | 48.2±7.9 | 0.004 |
| Residential area | | | 0.600 |
| Urban | 408 (55.4) | 405 (54) | |
| Suburb | 329 (44.6) | 345 (46) | |
| BSRS-5 total | | | 0.428 |
| Normal (less than 6) | 431 (58.5) | 466 (62.1) | |
| Mild (6-9) | 171 (23.2) | 158 (21.1) | |
| Moderate (10-14) | 99 (13.4) | 98 (13.1) | |
| Severe | 36 (4.9) | 28 (3.7) | |
| Psychiatric morbidity | | | 0.15 |
| Absence | 431 (58.5) | 466 (62.1) | |
| Presence | 306 (41.5) | 284 (37.9) | |
| Suicidal ideation | | | 0.460 |
| 0 | 613 (83.2) | 612 (81.6) | |
| 1 | 63 (8.5) | 75 (10) | |
| 2 | 33 (4.5) | 37 (4.9) | |
| 3 | 19 (2.6) | 13 (1.7) | |
| 4 | 6 (0.8) | 5 (0.7) | |
| ≥2 | 58 (7.9) | 55 (7.3) | 0.312 |
| Unknown | 3 (0.4) | 8 (1.1) | |
| Referral source | | | 0.000 |
| Deferred prosecution | 125 (17) | 232 (30.9) | |
| Parole | 7 (0.9) | 3 (0.4) | |
| Released from prison | 7 (0.9) | 5 (0.7) | |
| Hospital referral | 353 (47.9) | 228 (30.4) | |
| Voluntary medical treatment | 245 (33.2) | 282 (37.6) | |

Note: BSRS-5= five-item Brief Symptom Rating Scale.

**Table 3.** The demographics and psychological distress profiles at the first-time (Time 1) assessment between individuals in the follow-up and nonfollow-up.

| | Follow-up (n = 561) (%) | Nonfollow-up (n = 365) (%) | P value |
|---|---|---|---|
| Gender | | | 0.485 |
| Male | 491 (87.5) | 325 (89) | |
| Female | 70 (12.5) | 40 (11) | |
| Age (years) | | | 0.253 |
| <40 | 60 (10.7) | 47 (12.9) | |
| 40-49 | 257 (45.8) | 183 (50.1) | |
| 50-59 | 198 (35.3) | 110 (30.1) | |
| ≥60 | 46 (8.2) | 25 (6.9) | |
| Mean (SD) | 48.75±7.5 | 47.31±8 | 0.000 |
| Residential area | | | 0.115 |
| Urban | 314 (56) | 185 (50.7) | |
| Suburb | 247 (44) | 180 (49.3) | |
| BSRS-5 total | | | 0.561 |
| Normal (less than 6) | 325 (57.9) | 222 (60.8) | |
| Mild (6-9) | 133 (23.7) | 72 (19.7) | |
| Moderate (10-14) | 75 (13.4) | 51 (14) | |
| Severe (more than 15) | 28 (5) | 20 (5.5) | |
| Psychiatric morbidity | | | 0.382 |
| Absence | 325 (57.9) | 222 (60.8) | |
| Presence | 236 (42.1) | 143 (39.2) | |
| Suicidal ideation | | | 0.904 |
| 0 | 465 (82.9) | 299 (81.9) | |
| 1 | 50 (8.9) | 31 (8.5) | |
| 2 | 25 (4.5) | 18 (4.9) | |
| 3 | 13 (2.3) | 12 (3.3) | |
| 4 | 5 (0.9) | 2 (0.5) | |
| ≥2 | 43 (7.7) | 32 (8.8) | 0.719 |
| Unknown | 3 (0.5) | 3 (0.8) | |
| Referral source | | | 0.000 |
| Deferred prosecution | 90 (16) | 131 (35.9) | |
| Parole | 4 (0.7) | 6 (1.6) | |
| Released from prison | 4 (0.7) | 5 (1.4) | |
| Hospital referral | 321 (57.2) | 98 (26.8) | |
| Voluntary medical treatment | 142 (25.3) | 125 (34.2) | |

Note: BSRS-5= five-item Brief Symptom Rating Scale.

**Table 4.** Comparisons of psychological distress levels between before COVID-19 (Time 1) and during COVID-19 (Time 2) assessment, based on follow-up group.

| | Time 1 (n = 561) n (%) | Time 2 (n = 561) n (%) | P value |
|---|---|---|---|
| BSRS-5 total | | | 0.202 |
| Normal (less than 6) | 325 (57.9) | 350 (62.3) | |
| Mild (6-9) | 133 (23.7) | 124 (22.1) | |
| Moderate (10-14) | 75 (13.4) | 71 (12.7) | |
| Severe (more than 15) | 28 (5) | 16 (2.9) | |
| Psychiatric morbidity | | | 0.127 |
| Absence | 325 (57.9) | 350 (62.3) | |
| Presence | 236 (42.1) | 211 (37.6) | |
| Suicidal ideation | | | 0.706 |
| 0 | 465 (82.9) | 461 (82.2) | |
| 1 | 50 (8.9) | 57 (10.2) | |
| 2 | 25 (4.5) | 27 (4.8) | |
| 3 | 13 (2.3) | 7 (1.2) | |
| 4 | 5 (0.9) | 4 (0.7) | |
| ≥2 | 43 (7.7) | 38 (6.8) | 0.665 |
| Unknown | 3 (0.5) | 5 (0.8) | |

Note: BSRS-5= five-item Brief Symptom Rating Scale.

## Discussion

In this study, patients assessed with the BSRS-5 had a lower risk of suicidal attempts (RR, 0.48; 95% CI, 0.22–1.07) during the period of 2019–2020. The prevalence of suicidal attempts was 0.68% in 2019 and 0.27% in 2020. This study found that a one-year follow-up intervention reduced the risk of psychiatric morbidity by 4.5% and suicidal ideation in the week prior to evaluation (score > 1) by 0.9%. To the best of our knowledge, this is the first study to investigate the prevalence of suicidal behavior during the follow-up care period for individuals with DUD who have been released from prison, granted deferred prosecution from criminal justice sources, or presented for voluntary drug treatment. Additionally, the study aimed to evaluate the effectiveness of psychological interventions in reducing the risk of suicide among this population.

All patients with DUD had a significantly associated risk of suicide. The relationships between DUD, psychiatric disorders, and suicide are complex. Indeed, among individuals with OUD in Taiwan, death by suicide had the highest standardized mortality ratio among all causes of mortality [11]. Since 2016, the Tainan City Government has included the BSRS-5 in the application process for methadone maintenance treatment subsidies for OUD. This study investigated the suicidal attempt rates among individuals with OUD who underwent BSRS-5 assessment compared to those with non-OUD who did not undergo BSRS-5 assessment. This study further compared these rates between the periods prior to and during the COVID-19 pandemic. The group experiencing BSRS-5 assessment had a lower incidence of suicidal attempts compared to the other group. There were several potential reasons for this finding: 1) BSRS-5 assessment was provided to screen comorbid mental disorders in patients with DUD patients, 2) patients with OUD received methadone maintenance treatment, and the Tainan City metropolitan area had the highest coverage rate of satellite Drug Addiction Treatment Centers (DATC) in Taiwan. During the COVID-19 pandemic, patients in Tainan were more willing to visit a satellite DATC than a hospital DATC because fewer people were present thus reducing concerns about COVID-19 infection, 3) the government allocated funds to alleviate the burden of OUD and increase medication adherence, and 4) implementation of the "Parallel-track Case Managers" program [12].

The results of this study, comparing the prepandemic and pandemic periods, follow-up conditions, and outcomes after psychological intervention, indicated that patients with DUD exhibited higher rates of psychiatric morbidity and suicidal ideation within one week of evaluation compared to the general population. During the pandemic, the incidence of psychiatric morbidity among patients with DUD was 37.9%. This was 2.2 times higher than the 11.7% rate among individuals on home quarantine during the 2022 pandemic. The occurrence of suicidal ideation among patients with DUD was 17.3%, which was 5 times higher than the 2.8% rate

among individuals on home quarantine during the 2022 pandemic [13].

Following psychological intervention, during the pandemic the psychiatric morbidity among patients with DUD decreased from 42.1% to 37.6% (a 10% reduction), while among individuals on home quarantine during the 2022 pandemic, it decreased from 11.7% to 8.3%, a 30% reduction. The occurrence of suicidal ideation among patients with DUD increased from 16.6% to 16.9% during the study period, while among individuals undergoing home quarantine during the 2022 pandemic, it decreased from 2.7% to 2.3% [14]. These data indicate that patients with DUD in Tainan City faced significantly higher psychological distress during the pandemic compared to the general population, and the effectiveness of interventions was limited. However, through the "Parallel-track Case Managers" program, active intervention and support from case managers, including psychological counseling, employment assistance, and legal support, were provided to alleviate emotional distress and reduce the risk of suicide. Table 1 notes the effectiveness of suicide prevention through various interventional approaches.

This study explored the effectiveness of psychological interventions for individuals at high risk of suicide due to DUD, particularly OUD, during the follow-up period after legal involvement. In Tainan City, a comprehensive model of psychological interventions has been implemented, utilizing the "Mood Thermometer" application (BSRS-5) to assess the risk for individuals with OUD. While the study has limitations in sample size, the results suggest that psychological interventions could reduce the risk of suicide among individuals with DUD. Further research is needed to investigate the impact of this intervention on suicidal behavior among different subgroups such as criminal justice sources or voluntary clients in drug treatment. Additional research could also enhance the understanding of effective interventions in this context.

# Conclusion

This study showed that patients with a BSRS-5 assessment had a lower risk of suicidal attempts (RR, 0.48; 95% CI, 0.22–1.07) during 2019–2020. The rate of suicidal attempts decreased from 0.68% in 2019 to 0.27% in 2020. Moreover, the one-year follow-up intervention reduced the risk of psychiatric morbidity by 4.5% and severe level suicidal ideation (score > 1) by 0.9%. However, it is important to note that the study involved a limited number of patients. Further research with a larger sample size is needed to provide more robust evidence and validate these conclusions. This study can serve as a foundational basis for future investigations with a larger cohort of patients to ensure reliability of the findings.

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## Ethical approval

The study used deidentified data and was approved by the institutional review board of National Cheng Kung University Human Research Ethics Committee (IRB No. NCKU HREC-E-110-267-2).

## Competing interests

The authors declare that they have no conflict of interests.

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Original Articles

# The Impact of Media Reporting of A Celebrity Suicide in Taiwan: A Qualitative Study

**Chi-Wei Tsai[1], Shu-Sen Chang[2,3], Ying-Yeh Chen[1,4*], Kevin Chien-Chang Wu[5,6*]**

**Abstract:** ***Background/ purpose:*** Celebrity suicide was known to be associated with an increase in suicidal behaviors in vulnerable groups. We conducted in-depth qualitative interviews to explore the impact of exposure to news items covering the suicide of a celebrity in Taiwan in 2017. ***Methods of study:*** Students from the celebrity's Alma Mater who visited Students' Counseling Center within 3 months of the celebrity's suicide were recruited. ***Results:*** Six students were recruited. The qualitative analysis indicated that the interviewed students expressed their admiration towards the deceased celebrity, and the celebrity suicide elicited feelings of inferiority and self-doubt among the students. ***Conclusion:*** The way media covers celebrity suicides can have a significant impact, especially on vulnerable people. Those who were already distressed are more likely to be affected by celebrity suicide reports. Responsible media reporting of suicide incidents is critical for preventing suicide.

**Keywords:** suicide, celebrity, media, Taiwan.

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## Introduction

Intensive media reporting of celebrity suicides was known to be associated with copycat effects [1]. Identification with the suicide idol is believed to be one of the key mechanisms underlying celebrity suicide modeling [2,3]. This copycat phenomenon is particularly prominent when the suicide stories were glamorized, heavily publicized, and presented in a sensational and emotional manner [1, 4-7].

Vulnerable individuals, such as people with active depressive symptoms, are particularly susceptible to the negative effects of media coverage of celebrity suicides [8-10]. Existing studies have rarely conducted in-depth qualitative explorations regarding the emotional reactions of distressed individuals after repetitive exposure to celebrity suicide news.

The suicide of I-Han Lin, a promising writer in Taiwan, attracted significant media coverage in April 2017. Her novel, which had been published two months prior to her death, portrayed a high school student who was sexually abused by her cram school tutor and suffered a mental breakdown as a result. In addition to depicting Lin's personal history, the novel also indirectly criticized the excessive emphasis on academic credentials in Taiwan and highlighted how high school students are alienated and rendered powerless by an intensely competitive educational system [10].

The preface of the novel indicates that it is based on a true story; and after Lin's suicide, this work was regarded as her suicide note. Lin's life story garnered attention from the media because the talented writer was academically successful and good-looking. She had been placed in a gifted student program during middle school, achieved perfect scores on her college entrance exam, and won numerous awards for her public speaking and science fair projects. Lin was also a successful athlete who captained her high school's volleyball team. Despite her many accomplishments, Lin was a suspected victim of sexual abuse, struggled with depression, and was repeatedly hospitalized for psychiatric care. Tragically, she was unable to complete her undergraduate degree and ultimately took her own life at the age of 26. Within a month of her death, the Taiwanese media became obsessed with I-Han Lin's suicide, with over 1,000 news articles published about her. To understand the impact of high-profile celebrity suicide news reports, we conducted an in-depth qualitative interview to assess how celebrity suicide reports affected a vulnerable group – Lin's depressed junior alumni.

## Methods

We recruited students with current suicide ideation or a history of suicide attempts who were seeking assistance at the Student Mental Health Care Center at the University which is Lin's Alma Mater during April 2017 and June 2017. In-depth qualitative interviews

[1] Taipei City Psychiatric Centre, Taipei City Hospital, Taipei City, Taiwan; [2] Institute of Health Behaviors and Community Sciences, and Global Health Program, College of Public Health, National Taiwan University, Taipei City, Taiwan; [3] Population Health Research Center, College of Public Health, National Taiwan University, Taipei City, Taiwan; [4] Institute of Public Health and Department of Public Health, National Yang Ming Chiao Tung University, Taipei City, Taiwan; [5] Graduate Institute of Medical Education and Bioethics, National Taiwan University College of Medicine, Taipei City, Taiwan; [6] Department of Psychiatry, National Taiwan University Hospital, Taipei City, Taiwan.

[*]**Correspondence to:** [1]Kevin Chien-Chang Wu, MD, Ph.D,No.1 Changde Street, Zhongzheng District, Taipei City 10048, Taiwan; Tel: 886-2-23123456 ext. 288575, Fax: 886-2-23825646; E-mail address: ccwu88@ntu.edu.tw [2]Ying-Yeh Chen, MD, No. 309, Songde Road, Xinyi District, Taipei City 11080, Taiwan; Tel: 886-2-27263141 ext. 1224, Fax: 886-2-27285059; E-mail address: familymail.yychen@gmail.com

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were conducted on consented students to explore their emotional impacts after reading Lin's news report.

The study was approved by the Research Ethics Committee of the Taipei City Hospital (TCHIRB-10412109).

Interpretative phenomenological analysis (IPA) was utilized to explore the "lived experience" of the study participants [11]. Rather than generating theories, IPA explores individualized experiences and investigates meanings attached to the experiences [12]. Researcher's reflexivity throughout the study process is crucial to provide contextualized interpretations of participants' experiences [13,14].

Each interview transcript was read and reread initially, noting summative descriptions of the participants' accounts in the left margin and interpretative statements in the right margin. A process of collating interpretative statements into groups was completed once transcripts had been thoroughly read. Connections between groups were identified to generate themes. Lists of themes were clustered and interpreted to provide readers with the important experiential elements that have been found throughout the whole study process. Overall, through comprehending each participant's personal experience, combined with researchers' interpretative activity, our analysis aims to gain an in-depth appreciation of the participants' personal world.

# Results

A total of six students accepted our qualitative interview invitation. The demographic characteristics of the study participants are presented in Table 1. All six students searched for social media, internet search engines and news reports to follow up on Lin's suicide stories. Overall, two major themes came out from the interview – 1) Emotional resonance: Lin's suicide created emotional resonance between these students and the suicide celebrity; 2) Glamorization of Lin's method of suicide: hanging was thought to be a good method of choice.

## Emotional resonance

Suffering from Taiwan's credentialism culture, these distressed students generally felt that their parents pushed them to get perfect grades; they were not loved unconditionally. Their values were judged by their academic achievement. They felt alienated and couldn't find meaning in life. Lin's suicide cried out and made public their pain and suffering; their voice was heard and was somehow taken seriously.

*"I searched for Lin's story, she got depression since high school, just like me…..my Dad said that I am a failure and depression is just an excuse….. If I hung myself someday (bitter smile), let's see how he deals with it!"*

*"I envied my neighbors……,they were academically under-achieved, they could do whatever they liked, ….. my mother just wanted to take me to show off to others. I had to behave like a perfect girl, a beautiful Barbie doll."*

*".....I understand her loneliness. Do you think it is better to die than to live such a miserable life? If you die, you will be recognized. Lin's parents would get to know that they killed her…. Well, not really about her…., I meant, if I died, my parents would know they treated me wrong"*

*"I told my Dad about a teacher's sexual harassment. My Dad laughed! He asked if I could differentiate between harassing and caring for students…. He didn't have the slightest concern about what happened to me. Do you understand the feelings of being betrayed by all the people around you? .....I had to take anti-depressants and accept counseling to treat depression, but nothing helped. I envy Lin! She dares to die. I hate myself; I don't even dare to rebel against my parents, let alone to kill myself. It is great to be able to die."*

These students felt estranged from their families because their pain was not recognized and they felt all alone in facing adversities. Lin's suicide was admired as an act of self-determination; Lin spoke out about their loneliness, depression and dark memories.

**Table 1.** Characteristics of study participants.

| Gender, age (years) | | Psychiatric history<br>Previous attempts |
|---|---|---|
| Male, 27 | graduate student | Major depressive disorder<br>jumping, hanging, car crash, medication overdose |
| Female, 21 | undergraduate student | Major depressive disorder<br>Medication overdose |
| Female, 22 | undergraduate student | Neurotic depression<br>none |
| Male, 24 | graduate student | Depression, panic disorder<br>jumping |
| Male, 25 | undergraduate student | Major depressive disorder<br>Medication overdose, hanging |
| Female, 24 | graduate student | Major depressive disorder<br>Medication overdose, wrist cutting |

### Glamorization of suicide by hanging

In addition to emotional resonance, interviewees expressed their acclamations towards Lin's method of suicide.

*"I once thought hanging was dreadful. Lin's suicide completely changed my impression. No other method of suicide can be so determined and so beautiful. Died of 'suffocation' -- only this method can match with my 'suffocated life'"*

*"Hanging is a good way to die. Everyone will discuss your death. My life is so plain, I am soundless and voiceless. Hanging is great, you see, you will be discussed and memorized."*

## Discussion

The qualitative interview of Lin's juniors who visited the Student Mental Health Care Center revealed a strong identification towards the suicide figure. They developed an emotional attachment to Lin for their similar personal life stories and showed their admiration of her owing to her better past achievements that even included her hanging herself at the right moment. None of them knew Lin in person; they got to know her through reading her novel and searching news reports related to her life stories.

In the era of evidence-based suicidology, some scholars have been keenly aware of the inadequacy of research results of reporting risk factors of suicide. These quantitative studies might find factors contributing to suicide, but thin contents therein often could not help us understand or appreciate the meaning and sociocultural contexts of suicide [15]. Therefore, combining quantitative and qualitative methodologies, our research not only found suicide risk factors but also tease out potential psychological paths linking Lin's story to its readers' increased suicidality. An elite ex-student, Lin is more likely to be modeled when her story was placed on the front page of news reports [6]. Identifying and resonating with Lin who had such a shining past, interviewees deemed Lin's suicide and her method of choice as a powerful protest against the system in which parental love and care is conditioned on students' perfection and achievement. Ending her life magnificently with so much media attention, Lin became their model of speaking out through writing and suicide. She enacted the interviewees' fantasy of revenging their not-good-enough parents and credentialism by suicide. Our findings elucidate two areas that are worthy of further suicide prevention policy research. First, literature has shown the association between poor parental bonding (low parental care and overprotection) and increased suicidality in adolescents and young adults [16, 17]. Our qualitative interviews showed potential detailed psychological paths through which readers of Lin's suicide story might resonate and identify with Lin and even consider following her to suicide. In the cultural East emphasizing familism and filial piety, honoring ancestors and parents through academic achievement is a high priority for students who internalize the cultural norm [18]. The Hymn of Tiger Mother demonstrated one extreme form of a successful story by strict parental discipline in the East Asian cultural context. However, a confusing mixture of fame and death, Lin's personal story, and her novel showed otherwise. Reports have revealed that many East Asian students feel stressed under the sociocultural contexts of credentialism [19, 20]. Interviewees blamed parental affectionless control as the power that pushed them off the cliff [21, 22]. Our findings show the possibility of a multi-level suicide prevention policy for students, which would address at the same time issues related to the sociocultural context of credentialism, academic stress for students, parental affectionless control and conditioned love, and students' insufficient coping skill.

Second, expressive writing and developmental creative writing have been shown to have positive effects on writers' mental health [23, 24]. Lin's novel and life story, as a general discursive writing, revealed loneliness, emptiness, fatalism, and loss of self when living under the shadow of family and societal expectations. If her suicide is not a welcome result, then her writing actually did not help her. Without proper professional facilitation, writing about death itself might not be beneficial and even harmful, if not only a warning sign [25], for writers with suicidal risk. Interviewees disclosed how Lin's literature and life created or consolidated the above meanings into their lives. It not only enhanced their cognitive availability of a lethal suicide method but also deepened their willingness and admiration of using the method. Our qualitative findings supplement contents for understanding the linkage between news reports and the choice of suicide method.

### Strengths and Limitations

The qualitative design of the current study allowed for an in-depth understanding of the impact of celebrity suicide news. No previous studies we know of had been able to conduct such kind of qualitative interview on participants who apparently had some sort of emotional connection with the suicide celebrity and identified with her. The limitation of the current study was the small sample size, the data may not be saturated. However, due to the time limits, we could only recruit six interviewees who visited Student Mental Health Care Center within two months after Lin's suicide. Furthermore, the process of conducting Interpretative Phenomenological Analysis (IPA) involves multiple steps, such as topic selection, participant selection, interview guidelines, interview transcripts, exploratory notes, personal experiential statements/themes, and the formulation of group experiential statements/themes. Presenting this comprehensive process within the constraints of a concise paper is challenging. Thus, the current paper relied heavily on the authors' reflexivity.

## Conclusions

Excessive reporting and glamorization of celebrity suicide may bring about harmful consequences, especially to vulnerable individuals. Vulnerable people tended to identify with the celebrity suicide and are oftentimes overinvolved in suicide news searching and discussion; consequent depression and suicidality may ensue. Our qualitative interviews have elucidated

how emotional resonance and identification with a suicide celebrity in media reports might link to suicidal behavior. Furthermore, they revealed other multilevel causal factors that might engender suicidal events, which include sociocultural contexts of credentialism, parenting style with unaffectionate control and conditioned love, academic stress and inadequate school support, and finally individual coping strategies. The impact of media reports on suicide tendency does not happen in a vacuum. If we are determined to deal with the root causes of suicidality induced by Lin's suicide media reports, we have to address all the factors at all levels at the same time [26].

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Original Articles

# Psychological Distress Predicted One-Year Non-Fatal Re-Attempts among Suicide Attempters in Taiwan: A Nationwide Population-Based Cohort during 2019-2021

**Jia-In Lee[1,2], Chia-Yi Wu[2,3], Ming-Been Lee[2,4,5*], Chia-Ta Chan[2,5], Shih-Cheng Liao[2,4], Chun-Ying Chen[2]**

**Abstract:** ***Background and Objective:*** Previous suicide attempt (SA) is one of the greatest risks for completed suicide. The national data of SA reporting indicated a steady increase in the number of SA over the past 16 years in Taiwan. The present study aimed to investigate the association between psychological distress and subsequent non-fatal attempt within one year in a nationwide population-based cohort of suicide attempters. ***Methods:*** The participants comprised the attempters reported first time to the Taiwan National Suicide Surveillance System (NSSS) during 2019-2021, who completed the five-item Brief Symptom Rating Scale (BSRS-5) at the index event. Kaplan-Meier survival curve analysis with log-rank test and Cox regression model was used to examine the association between psychological distress and the cumulative incidence of non-fatal re-attempts in the following year. ***Results:*** In total, 49,509 individuals (66.3% females) were recruited and 9,163 (18.5%) of them had subsequent non-fatal suicide attempts within one year. The females presented significantly higher levels of psychological distress and suicidal ideation. Survival curves analysis and Cox regression model revealed that the level of individual psychological distress (i.e., suicidal ideation (SI), depression, inferiority, anxiety, hostility. and insomnia) and general distress (BSRS-5 total scores) were positively correlated with the incidence of subsequent non-fatal reattempts with dose-response relationship at five time-points within one year (e.g., highest HR=2.10 for SI, 1.98 for depression and 1.95 for BSRS-5). ***Conclusion:*** The study revealed that psychological distress was a significant and sustained predictor of the first non-fatal reattempt in one year after the index event. The results imply that suicide is not only an acute crisis but also a chronic mental problem. The BSRS-5 can triage psychological distress and accordingly provide a pertinent person-centered approach to prevent suicide.

**Keywords:** population-based study, psychological distress, suicide attempt, repeated suicide attempt, five-item Brief Symptom Rating Scale (BSRS-5), Taiwan.

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## Introduction

Suicide is a major health issue worldwide [1]. Numerous long-term and short-term risk factors for suicidality have been identified (e.g., male gender, old age, previous suicide ideation or attempt, psychiatric disorders, and stress reactions) [2-8]. Of those factors, a prior attempt is recognized as the strongest predictor of subsequent non-fatal or fatal attempts [5,7,9-14]. Thus, the Taiwan government launched a National Suicide Surveillance System (NSSS) in 2006 to provide aftercare for the reported suicide attempters nationwide. The follow-up program included counseling, emotional support, and needed referral to mental health and social welfare services [5,15]. The previous report based on NSSS data found that male gender, older age, psychiatric disorders, and high-lethality methods used at the index attempt were significant risk factors for eventual suicide death [5]. The suicidal decedents ended their life because of emotional distress. Psychopathological factors represented the core sustained risk factors for suicide. However, past studies has mainly focused on the typology of psychiatric disorders instead of psychological distress levels among suicide attempters. Early detection of near-term mental distress was important to alleviate the imminent risk of suicide [16-19]. The five-item Brief Symptom Rating Scale (BSRS-5) has been validated for identifying near-term psychiatric morbidity or suicidal ideation (SI) in medical and non-medical community settings in Taiwan [18-23]. The scale has been applied to measure psychological distress in the follow-up care program of the NSSS [5,7,24]. A longitudinal cohort of attempters in NSSS revealed that the distress levels of BSRS-5 and SI could significantly predict the cumulative incidence of eventual suicide death within a year [7]. In the present study, we aimed to further examine whether self-rated psychological distress shortly after the index attempt can predict non-fatal reattempt (NFR) in the following year.

[1] Department of Psychiatry, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan; [2] Taiwanese Society of Suicidology and Taiwan Suicide Prevention Center, Taipei, Taiwan; [3] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan; [4] Department of Psychiatry, National Taiwan University Hospital and National Taiwan University College of Medicine; [5] Department of Psychiatry, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan.

[*]**Correspondence to:** Dr. Ming-Been Lee, Department of Psychiatry, National Taiwan University Hospital, No. 7, Chung Shan South Road, Taipei 100, Taiwan;Tel:+886-975731112;Fax:+886-2-23817816;E-mail: mingbeen@ntu.edu.tw

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# Methods

## Participants

The study included all non-fatal attempters who were reported to the NSSS from 1 January 2019 to 31 December 2021. The NSSS protocol was approved by the ethics committee of the National Taiwan University Hospital (NTUH-REC 200711030R). All suicide attempters were reported to the central government website by healthcare professionals, firefighters, or hotline workers and followed up by mental health professionals within two days after the report was filed [5,7]. The BSRS-5 was used to assess the attempter's psychopathology during follow-up. In the study, the suicide attempters completing the initial BSRS-5 at the index attempt were recruited for analysis. A subsequent non-fatal suicide attempt (NFR) in one year following the index event was identified from the NSSS data set.

## Assessment of psychological distress using BSRS-5

The BSRS-5, a 5-item self-report questionnaire, has been widely used in Taiwan to detect psychiatric morbidity and SI in medical settings and the general public [19-23]. It contains the following 5 items of psychopathology: 1) anxiety; 2) depression; 3) hostility; 4) inferiority; and 5) insomnia. A question of SI was added following the five items. The participants were asked to rate the distress level of each item during the past week including the current day on a 5-point Likert-type scale as follows: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; and 4, extremely. The presence of psychiatric morbidity was defined as a BSRS-5 total score >5.

## Statistical analyses

Descriptive statistics were used to present demographics, psychopathology (i.e., psychological distress and SI) and subsequent non-fatal attempt. The personal characteristics of participants were compared by gender and levels of BSRS-5 scores. The outcome was examined prospectively for the participants who had a repeated NFA in one year after assessment. The Kaplan-Meier survival curves were performed on the cumulative incidence of reattempts by levels of SI and BSRS- 5 at five time-points of 30 days, 90 days, 180 days, 270 days, and 365 days. The log-rank test was used to examine the statistical significance. The chi-square test with odds ratios was used to test the trend in cumulative re-attempt rates at different time points and the Cox regression model with hazard ratios (HRs) was conducted to estimate the probability of reattempt in a one-year period by levels of SI and BSRS-5 score. The R software version 2.7.2 was used and the significance level was set at .05.

# Results

## Demographics and psychiatric morbidity

The participants included 49,509 individuals with a suicide attempt first recorded in the NSSS and received an assessment ofBSRS-5 after the index event. As shown in Table 1, the cohort included 32,846 females (66.3%) and 16,663 males (33.7%). Regarding psychiatric morbidity defined by BSRS-5 (>5), the prevalence was around 30% in each gender (male = 29.2%, female = 32.1%); the prevalence was significantly higher in females than in males. Regarding the levels of SI in Table 1, there was a significant gender difference; females (26.6%) were higher than males (24.8%). Although a significant gender difference in levels of SI and BSRS-5 score, the effect size was small.

**Table 1.** Levels of suicidal ideation and psychological distress measured by BSRS-5 first time after the index suicide attempt by gender during 2019-2021.

| | Total | Male (N=16663) | Female (N=32846) | $\chi^2$ | P-value | Effect size |
|---|---|---|---|---|---|---|
| Suicidal ideation | | | | 22.8 | <0.001 | 0.02 |
| 0 | 36638 | 12525 (75.2) | 24113 (73.4) | | | |
| 1 | 8365 | 2648 (15.9) | 5717 (17.4) | | | |
| 2 | 3242 | 1055 (6.3) | 2187 (6.7) | | | |
| 3 | 926 | 311 (1.9) | 615 (1.9) | | | |
| 4 | 338 | 124 (0.7) | 214 (0.7) | | | |
| Mean±SD | | 0.37±0.75 | 0.39±0.75 | | | |
| BSRS-Total | | | | 45.6 | <0.001 | 0.09 |
| Normal | 34111 | 11804 (70.8) | 22307 (67.9) | | | |
| Mild | 9826 | 3099 (18.6) | 6727 (20.5) | | | |
| Moderate | 4523 | 1445 (8.7) | 3078 (9.4) | | | |
| Severe | 1049 | 315 (1.9) | 734 (2.2) | | | |
| Mean±SD | | 4.08±3.9 | 4.41±3.94 | | | |

Note:
1. Levels of distress: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; and 4, extremely.
2. Effect size was calculated by Cohen's d.

To compare the difference in gender, age, psychological distress and SI between repeaters and non-repeaters, as shown in Table 2, the repeaters presented significantly higher prevalence in females (OR=1.51) and younger ages of below 14 (OR=1.75) and 15-24 (OR=1.61) and higher levels of distress in all individual items of BSRS-5 and SI. The higher odds ratios of probability for reattempts were observed as 2.98 for SI, 2.80 for depression, and 2.08 for general psychological distress (BSRS-5 total score). The impact of the level of psychological distress based on the odds ratios presented an obvious dose-response effect; the odds increased with the levels of each item of distress.

**Table 2.** Comparisons of demographics and psychological distress measured by BSRS-5 first time after the index suicide attempt between repeater and non-repeater during 2019-2021.

| | Total | Non-repeater (N=40346) | Repeater (N=9163) | $\chi^2$ | OR (95%CI) |
|---|---|---|---|---|---|
| Sex | | | | 258.8*** | |
| Male | 32846 | 26110 (64.7) | 6736 (73.5) | | ref |
| Female | 16663 | 14236 (35.3) | 2427 (26.5) | | 1.51 (1.44-1.59)*** |
| Age | | | | 1005.7*** | |
| 0-14 | 1725 | 1246 (3.1) | 479 (5.2) | | 1.75 (1.57-1.96)*** |
| 15-24 | 11761 | 8693 (21.5) | 3068 (33.5) | | 1.61 (1.52-1.7)*** |
| 25-44 | 20003 | 16402 (40.7) | 3601 (39.3) | | ref |
| 45-64 | 11543 | 9892 (24.5) | 1651 (18) | | 0.76 (0.71-0.81)*** |
| 65+ | 4370 | 4010 (9.9) | 360 (3.9) | | 0.41 (0.37-0.46)*** |
| Unknown | 107 | 103 (0.3) | 4 (0) | | 0.18 (0.07-0.48)*** |
| Insomnia | | | | 363.3*** | |
| 0 | 18402 | 15673 (38.8) | 2729 (29.8) | | ref |
| 1 | 17632 | 14309 (35.5) | 3323 (36.3) | | 1.33 (1.26-.41)*** |
| 2 | 9122 | 7076 (17.5) | 2046 (22.3) | | 1.66 (1.56-.77)*** |
| 3 | 3384 | 2569 (6.4) | 815 (8.9) | | 1.82 (1.67-.99)*** |
| 4 | 969 | 719 (1.8) | 250 (2.7) | | 2 (1.72-.32)*** |
| Mean±SD | | 0.97±0.99 | 1.19±1.04 | | |
| Anxiety | | | | 486.4*** | |
| 0 | 23206 | 19725 (48.9) | 3481 (38) | | ref |
| 1 | 16891 | 13564 (33.6) | 3327 (36.3) | | 1.39 (1.32-.47)*** |
| 2 | 6776 | 5149 (12.8) | 1627 (17.8) | | 1.79 (1.68-.91)*** |
| 3 | 2145 | 1549 (3.8) | 596 (6.5) | | 2.18 (1.97-.41)*** |
| 4 | 491 | 359 (0.9) | 132 (1.4) | | 2.08 (1.7-.55)*** |
| Mean±SD | | 0.74±0.89 | 0.97±0.97 | | |
| Hostility | | | | 431.9*** | |
| 0 | 21280 | 18112 (44.9) | 3168 (34.6) | | ref |
| 1 | 16699 | 13453 (33.3) | 3246 (35.4) | | 1.38 (1.31-.46)*** |
| 2 | 8139 | 6281 (15.6) | 1858 (20.3) | | 1.69 (1.59-.8)*** |
| 3 | 2738 | 2010 (5) | 728 (7.9) | | 2.07 (1.892.27)*** |
| 4 | 653 | 490 (1.2) | 163 (1.8) | | 1.9 (1.59-.28)*** |
| Mean±SD | | 0.84±0.94 | 1.07±1.01 | | |
| Depression | | | | 832.8*** | |
| 0 | 17506 | 15208 (37.7) | 2298 (25.1) | | ref |
| 1 | 17483 | 14305 (35.5) | 3178 (34.7) | | 1.47 (1.39-.56)*** |
| 2 | 9680 | 7356 (18.2) | 2324 (25.4) | | 2.09 (1.96-.23)*** |
| 3 | 3771 | 2726 (6.8) | 1045 (11.4) | | 2.54 (2.33-.76)*** |
| 4 | 1069 | 751 (1.9) | 318 (3.5) | | 2.8 (2.44-.22)*** |
| Mean±SD | | 1.00±1.00 | 1.34±1.08 | | |

**Table 2(cont'd).** Comparisons of demographics and psychological distress measured by BSRS-5 first time after the index suicide attempt between repeater and non-repeater during 2019-2021.

| | Total | Non-repeater (N=40346) | Repeater (N=9163) | $\chi^2$ | OR (95%CI) |
|---|---|---|---|---|---|
| Inferiority | | | | 478.9*** | |
| 0 | 30349 | 25587 (63.4) | 4762 (52) | | ref |
| 1 | 12732 | 10010 (24.8) | 2722 (29.7) | | 1.46 (1.39-.54)*** |
| 2 | 4567 | 3391 (8.4) | 1176 (12.8) | | 1.86 (1.73-.01)*** |
| 3 | 1380 | 999 (2.5) | 381 (4.2) | | 2.05 (1.81-.32)*** |
| 4 | 481 | 359 (0.9) | 122 (1.3) | | 1.83 (1.48-.25)*** |
| Mean±SD | | 0.53±0.82 | 0.73±0.93 | | |
| Suicidal ideation | | | | 766.3*** | |
| 0 | 36638 | 5770 (14.3) | 30868 (76.5) | | |
| 1 | 8365 | 2068 (5.1) | 6297 (15.6) | | 1.76 (1.66-.86)*** |
| 2 | 3242 | 920 (2.3) | 2322 (5.8) | | 2.12 (1.95-.3)*** |
| 3 | 926 | 284 (0.7) | 642 (1.6) | | 2.37 (2.05-.73)*** |
| 4 | 338 | 121 (0.3) | 217 (0.5) | | 2.98 (2.38-.73)*** |
| Mean±SD | | 0.34±0.71 | 0.57±0.89 | | |
| BSRS-5 Total | | | | 629.5*** | |
| Normal | 34111 | 28786 (71.3) | 5325 (58.1) | | |
| Mild | 9826 | 7476 (18.5) | 2350 (25.6) | | 1.7 (1.61-.8)*** |
| Moderate | 4523 | 3326 (8.2) | 1197 (13.1) | | 1.95 (1.81-.09)*** |
| Severe | 1049 | 758 (1.9) | 291 (3.2) | | 2.08 (1.81-.38)*** |
| Mean±SD | | 4.08±3.84 | 5.29±4.14 | | |

Note:
1. Levels of distress: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; and 4, extremely.
2. *** $p<0.001$.

Regarding the cumulative incidence of subsequent suicide attempts, Table 3 displayed the cumulative incidence of reattempt by BSRS-5 and five time-points (length of days) of follow-up during 2019-2021. As shown in Table 3, the cumulative incidence of subsequent suicide attempts was 6.9% at the first month and increased to 22.7% at the 12th month. That indicated that the reattempt rate was 22.7% in a year of follow-up. To estimate the association of reattempt and psychological distress by the length of follow-up days, as displayed in Figures. 1 and 2, the Kaplan-Meier survival curve analysis revealed a significantly positive correlation between levels of BSRS-5 score and SI and the cumulative incidence of reattempt over time by days in the one-year follow-up among the participants. The correlation demonstrated a significant dose-response effect (Table 4, Figures 1 and 2). With respect to the hazard of repeated attempts in one year (Table 4), the Cox regression model indicated that the higher distress levels of each BSRS-5 item and SI presented significantly higher Hazard ratios of (HR) the cumulative incidence of re-attempts. In accordance with this cohort, as displayed in Figures. 1 and 2, the Kaplan-Meier survival curve analysis indicated a significantly positive correlation between levels of BSRS-5 score and suicidal ideation and cumulative incidence of reattempt over time by days in the one-year follow-up among the participants. The correlation demonstrated a significant dose-response effect by post hoc log rank test (Table 4, Figures 1 and 2). As Table 4 showed, higher HRs were observed in SI (HR=2.10), depression (HR=1.98), and BSRS-5 score (HR=1.95)

**Table 3.** The rates of non-fatal reattempt by levels of psychological distress measured by BSRS-5 first time after the index suicide attempt at different time points during 2019-2021.

| | 30 days | 90 days | 180 days | 270 days | 365 days |
|---|---|---|---|---|---|
| Insomnia | | | | | |
| 0,1 | 2052 (5.7) | 3275 (9.1) | 4602 (12.8) | 5525 (15.3) | 6052 (16.8) |
| 2 | 813 (8.9) | 1182 (13) | 1579 (17.3) | 1874 (20.5) | 2046 (22.4) |
| 3,4 | 425 (9.8) | 622 (14.3) | 815 (18.7) | 976 (22.4) | 1065 (24.5) |
| Anxiety | | | | | |
| 0,1 | 2284 (5.7) | 3649 (9.1) | 5121 (12.8) | 6198 (15.5) | 6808 (17) |
| 2 | 670 (9.9) | 966 (14.3) | 1292 (19.1) | 1503 (22.2) | 1627 (24) |
| 3,4 | 336 (12.7) | 464 (17.6) | 583 (22.1) | 674 (25.6) | 728 (27.6) |
| Hostility | | | | | |
| 0,1 | 2170 (5.7) | 3449 (9.1) | 4849 (12.8) | 5850 (15.4) | 6414 (16.9) |
| 2 | 733 (9) | 1075 (13.2) | 1440 (17.7) | 1705 (20.9) | 1858 (22.8) |
| 3,4 | 387 (11.4) | 555 (16.4) | 707 (20.8) | 820 (24.2) | 891 (26.3) |
| Depression | | | | | |
| 0,1 | 1783 (5.1) | 2878 (8.2) | 4112 (11.8) | 4972 (14.2) | 5476 (15.7) |
| 2 | 893 (9.2) | 1343 (13.9) | 1790 (18.5) | 2131 (22) | 2324 (24) |
| 3,4 | 614 (12.7) | 858 (17.7) | 1094 (22.6) | 1272 (26.3) | 1363 (28.2) |
| Inferiority | | | | | |
| 0,1 | 2570 (6) | 4044 (9.4) | 5669 (13.2) | 6821 (15.8) | 7484 (17.4) |
| 2 | 495 (10.8) | 716 (15.7) | 927 (20.3) | 1081 (23.7) | 1176 (25.7) |
| 3,4 | 225 (12.1) | 319 (17.1) | 400 (21.5) | 473 (25.4) | 503 (27) |
| Suicidal ideation | | | | | |
| 0,1 | 2692 (6) | 4234 (9.4) | 5922 (13.2) | 7126 (15.8) | 7838 (17.4) |
| 2 | 393 (12.1) | 558 (17.2) | 734 (22.6) | 863 (26.6) | 920 (28.4) |
| 3,4 | 205 (16.2) | 287 (22.7) | 340 (26.9) | 386 (30.5) | 405 (32) |
| BSRS-5 | | | | | |
| Normal | 1735 (5.1) | 2812 (8.2) | 4000 (11.7) | 4840 (14.2) | 5325 (15.6) |
| Mild | 903 (9.2) | 1339 (13.6) | 1810 (18.4) | 2160 (22) | 2350 (23.9) |
| Moderate | 523 (11.6) | 741 (16.4) | 959 (21.2) | 1101 (24.3) | 1197 (26.5) |
| Severe | 129 (12.3) | 187 (17.8) | 227 (21.6) | 274 (26.1) | 291 (27.7) |
| Total | 3290 (6.9) | 5079 (11.2) | 6996 (16.3) | 8375 (20.2) | 9163 (22.7) |

**Table 4.** Hazard ratios of BSRS-5 scores and suicidal ideation among the suicide attempters by cumulative incidence of non-fatal reattempts in a future year.

| BSRS-5 | N (%) | Total | Post hoc log rank | | | Hazard ratio (95%CI) |
|---|---|---|---|---|---|---|
| Insomnia | | | | | | |
| 0,1 | 6052 (16.8) | 36034 | ref | | | ref |
| 2 | 2046 (22.4) | 9122 | *** | ref | | 1.39 (1.32, 1.46)*** |
| 3,4 | 1065 (24.5) | 4353 | *** | 0.02 | | 1.54 (1.44, 1.64)*** |
| Anxiety | | | | | | |
| 0,1 | 6808 (17) | 40097 | ref | | | ref |
| 2 | 1627 (24) | 6776 | *** | ref | | 1.49 (1.41, 1.57)*** |
| 3,4 | 728 (27.6) | 2636 | *** | *** | | 1.77 (1.64, 1.91)*** |
| Hostility | | | | | | |
| 0,1 | 6414 (16.9) | 37979 | ref | | | ref |
| 2 | 1858 (22.8) | 8139 | *** | ref | | 1.41 (1.34, 1.48)*** |
| 3,4 | 891 (26.3) | 3391 | *** | *** | | 1.67 (1.56, 1.80)*** |
| Depression | | | | | | |
| 0,1 | 5476 (15.7) | 34989 | ref | | | ref |
| 2 | 2324 (24) | 9680 | *** | ref | | 1.62 (1.55, 1.70)*** |
| 3,4 | 1363 (28.2) | 4840 | *** | 0.20 | | 1.98 (1.87, 2.10)*** |
| Inferiority | | | | | | |
| 0,1 | 7484 (17.4) | 43081 | ref | | | ref |
| 2 | 1176 (25.7) | 4567 | *** | ref | | 1.58 (1.48, 1.68)*** |
| 3,4 | 503 (27) | 1861 | *** | *** | | 1.68 (1.53, 1.84)*** |
| Suicidal ideation | | | | | | |
| 0,1 | 7838 (17.4) | 45003 | ref | | | ref |
| 2 | 920 (28.4) | 3242 | *** | ref | | 1.77 (1.65, 1.90)*** |
| 3,4 | 405 (32) | 1264 | *** | *** | | 2.10 (1.89, 2.32)*** |
| BSRS-5 | | | | | | |
| Normal | 5325 (15.6) | 34111 | ref | | | ref |
| Mild | 2350 (23.9) | 9826 | *** | ref | | 1.62 (1.54, 1.70)*** |
| Moderate | 1197 (26.5) | 4523 | *** | *** | ref | 1.84 (1.73, 1.96)*** |
| Severe | 291 (27.7) | 1049 | *** | *** | *** | 1.95 (1.73, 2.20)*** |

Note: *** $p<0.001$

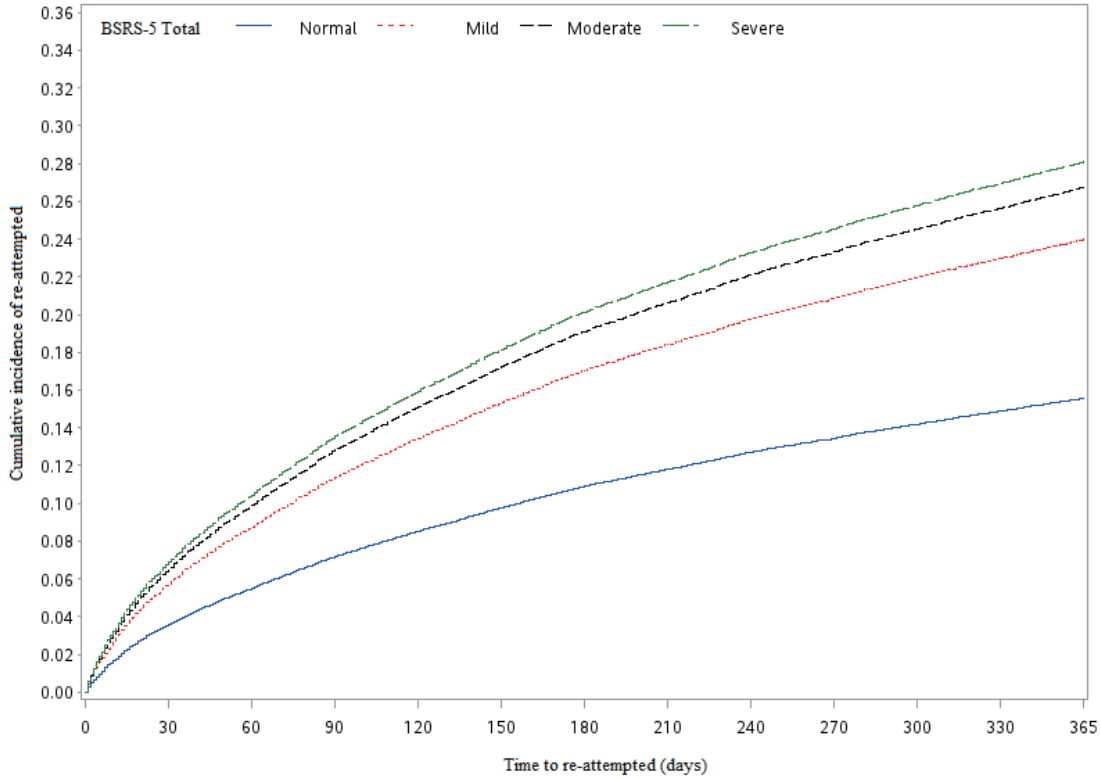


**Figure 1.** Kaplan-Meier survival curves representing cumulative risk of non-fatal re-attempts by time (days) in one year among suicide attempters with different levels of total BSRS-5 score.

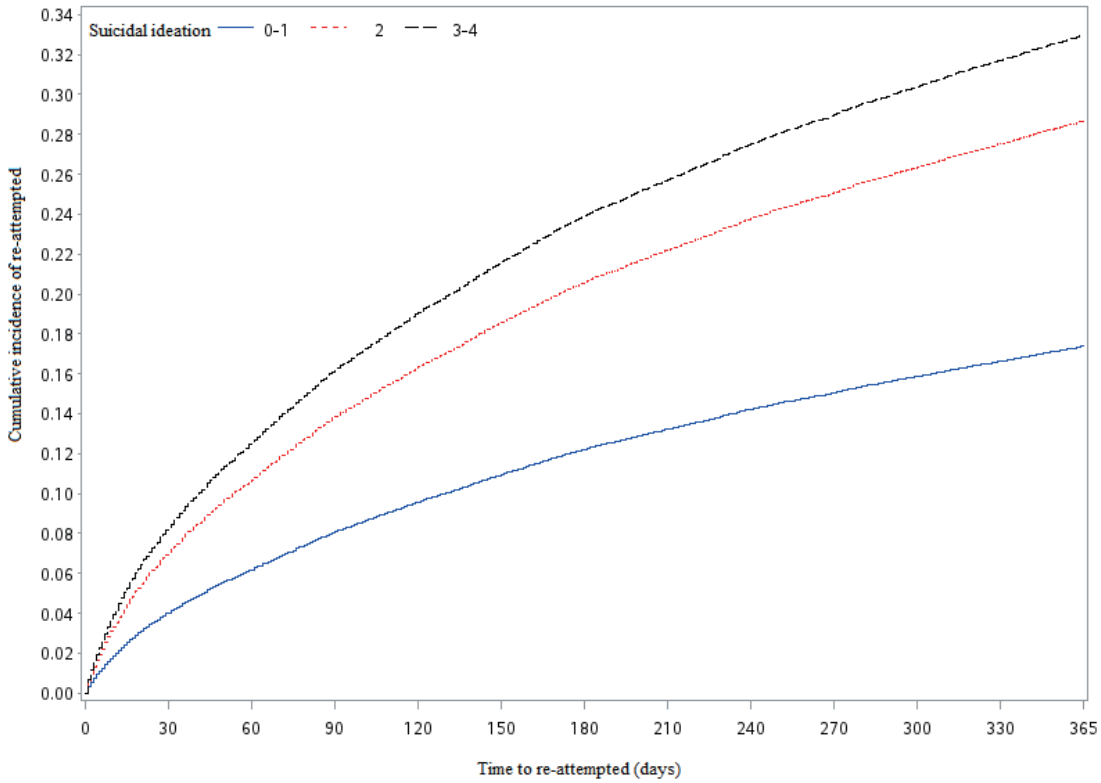


**Figure 2.** Kaplan-Meier survival curves representing cumulative risk of non-fatal re-attempts by time (days) in one year among suicide attempters with different levels of suicidal ideation during 2019-2021.

# Discussion

The nationwide population-based cohort of suicide attempters registered in the NSSS indicated that the level of self-rated psychological distress significantly predicted the risk for non-fatal reattempt (NFR) within one year after the index event. Other than the unmodifiable variables of female and younger age, the distress levels of SI and individual and total items of BSRS-5 could significantly predict the further cumulative incidence of NFR within a year. Furthermore, there was an obvious dose-response effect of the distress levels on the cumulative risk of re-attempts in the following year.

Suicide is a rare event with multiple risk factors involved at different stages to predispose, precipitate or perpetuate the suicidal behaviors during the complex process. Although no single predictive model could significantly predict suicidal death [25], a previous attempt and severe psychological distress have been reported as major risk factors for completed suicide [26-29]. A community-based, prospective cohort study was conducted in Japan by Tanji F, et al (2018) on 43,473 adults (aged ≥ 40 years) using the K6 psychological distress scale to assess the psychological levels at the baseline. They reported that moderate and severe psychological distress had a significant impact on completed suicide [29]. Another study using a health records dataset among attempters with Beck's Suicide Intention Scale measures reported that the levels of suicide intent could significantly predict eventual suicide death in a 12-year follow-up [30].

Unlike other health system-based studies, the study participants were recruited from the reporting portal of the NSSS and referred from non-governmental organizations and hospitals as well as from governmental departments. The sample size of the cohort represented greater possibilities to generalize the findings. Our previous series of studies in a prospective cohort of attempters in Taiwan reported some important significant predictors for future suicide mortalities [5,31]. Chen IM et al (2016) focused on the time interval and suicide method change between the last two nonfatal attempts in multiple attempters during 2006-2008. Among the 55,560 attempters, 6485 (11.7%) had survived attempts ranging from 1 to 11 times; 861 (1.5%) eventually died by suicide. Multiple attempters were characterized by females, non-recipient of national aftercare service, and current contact with mental health services. Most multiple attempters who survived hanging (68.1%) and gas poisoning (61.9%) chose the same method in the following fatal episode. Predictors of suicidal death were identified as male, older age (>= 45 years), shorter interval, and not maintaining methods of low lethality. Wu CY et al (2010) analyzed 104,441 suicide attempters first reported to the NSSS during 2007-2016 and found 1,254 (1.2%) participants subsequently killed themselves within one year. Their results indicated that levels of distress of individual items and total BSRS-5 scores were significantly correlated with the incidence of subsequent suicidal death within one year for both genders. Thus, the integration of the above-mentioned modifiable and modifiable variables might increase the predictability and treatability of complex suicide behaviors.

There is a marked increase in the number of suicide attempters reported to NSSS from 2005 to 2022. All the registered attempters needed follow-up care by the health professionals. According to the standardized operational procedure, each attempter needs to be cared at least for three months and ended the follow-up after the supervision meeting. Therefore, repeated suicide attempts became a big issue and workload for the professional care managers. Most studies on the attempters have investigated the impact of different types of mental disorders on suicide, rather than the level of the attempter's distress. Thus, the current study provided important evidence for the usefulness of the triage of psychological distress by BSRS-5 in the identification of the higher risk for subsequent non-fatal reattempt. The suicide risk assessment implies that it represents not only a statistical measure by which to predict risk level but more importantly, it is also a practical way for healthcare providers to identify modifiable risks for clinical interventions [32]. The BSRS-5 has been validated as an assessment tool used by the interview in person or telephone or thru BSRS-5 App online during social distancing to assess psychological distresses resulting from either stress reactions or psychiatric morbidities [33]. It can also reflect an individual's profile of mental distress while the assessment serves as an important basis for a therapeutic relationship and emotional support. Furthermore, the information provided by the BSRS-5 can help healthcare professionals offer timely person-centered approaches to reduce suicide risk.

Public health actions for suicide prevention should focus on moderate as well as severe psychological distress. Furthermore, regarding the indication of the combined use of various assessments for suicide risk, Rogers et al (2022) have reported that the SCS assessment alongside SI was incrementally informative in detecting individuals at risk of future suicide behavior [34]. Therefore, a combination of brief scales such as BSRS-5, SCS-5, and SI might increase the probability to identify the individuals at risk. So, it is worth testing if adding the SCS-5 into our current use of BSRS-5 with an item of SI in the nationwide aftercare program for suicide attempters can increase the predictability for future suicide and achieve a better outcome of the prevention strategy.

## Limitation

Similar to other reports, approximately one percent of attempters killed themselves within one year (1.2% in our previous study) [7,35]. The associated risks for the fatal reattempt have been reported in our previous reports [5,7]. The rate of fatal re-attempts death was low, thus we did not include the reattempted death in the study. We recognize that the limited extent of our follow-up period may restrict the generalizability of our results. However, most research emphasized the particular vulnerability of the attempters in the initial 1-2 years after an index event [10,12]. Our previous NSSS study with a three-year follow up of patients also found that 83% of suicides resulted from a repeated attempt within the first year [5]. Therefore, we believe that the evidence-based findings of the study provide the basis for future studies on suicide risk assessment, such as clinical utility of brief scales in suicide prevention.

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## Conflicts of interest

The authors declared no conflict of interest.

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Original Articles

# Surveillance and Interventions on Websites Instigating Suicide in Taiwan during 2014 and 2022

**En-Liang Wu[1,2], Ming-Been Lee[2,3,4,5], Chia-Yi Wu[2,6,7*], Chia-Ta Chan[2,5], Chun-Ing Chen[2]**

**Abstract:** ***Background/Purpose:*** In this increasingly globalized Internet-centered era, social media across different platforms and languages can rapidly spread suicide information without borders. The study aimed to track the trend of websites of local or overseas IP addresses with suicide-instigating information in Taiwan between 2014 and 2022 inclusively. ***Methods:*** From January 2014 to December 2022, the Taiwan Suicide Prevention Center (TSPC) regularly searched the top 100 web pages on the Google search engine using suicide-related keywords. The TSPC listed and reported web pages that met the inclusion criteria for content indicating the meaning of instigating or abetting suicide. The inclusive criteria for instigating suicide included information indicating analysis or a detailed description of suicide methods. Written and audio-visual works that contained detailed descriptions of how the suicide was completed and likely to be imitated were included. The TSPC initiated a standard intervention procedure to advise the removal of inappropriate messages or links for web content meeting the inclusion criteria. ***Results:*** The TSPC identified 543 websites containing suicide-related content, of which 420 (77.3%) website links were disabled or removed. The TSPC also removed 162 (95.9%) websites from the domestic market, taking down 258 (69.0%) overseas websites. ***Conclusions:*** Establishing mechanisms for worldwide cooperation is critical to stopping inadequate suicide information from circulating. The study findings suggested an important task for national surveillance of websites instigating suicide, particularly for those websites located at overseas IP addresses that were difficult to trace and take down. In the meantime, the WHO's 6 "Don'ts" for media professionals can serve as a reference guideline for Internet users while writing suicide-related posts.

**Keywords:** suicide prevention, suicide-instigating information, online media, suicide report guideline, Taiwan.

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## Introduction

Suicide and suicidal behaviors, particularly after the COVID-19 pandemic, are critical global mental health issues for complex reasons [1,2]. The general public primarily uses online media as a resource for suicide-related information. Inappropriate media suicide information might cause a copycat effect. Moreover, the Internet transmits suicide-risk information to younger populations through unlimited open messages in characters, pictures, or videos [3]. Internet access and social media usage have increased significantly, providing experts and patients with a means of communication that might contribute to developing methods for detecting potential mental health issues among social media users [4]. Individuals with suicidal ideation often seek help or leave suicide notes on social media before attempting suicide, whereas some might leave messages that instigate suicide or teach suicide methods [5].

Given its potential positive and negative impacts on suicide risk, suicide imitation has become a high-risk factor contributing to suicidality [6]. The association between social media and suicide is related to the following three major causes: First, social media might increase public exposure suicide-promoting atmospheres. Also, websites or blogs might evolve as platforms for exchanging suicide methods [7]. Second, online social networks have become channels for people to share negative emotions, and compared with adults, teenagers are more willing to expose emotional stress on the Internet [8]. However, cyberbullying and Internet-based trolling have simultaneously and significantly increased suicidality [9]. Third, the digital footprint of suicide risk tends to be trackable on the Internet and thus can be proactively evaluated and monitored.

To improve the quality of suicide reporting, the WHO released guidelines with a list of 6 "Dos" and 6 "Don'ts" for media professionals [10]. Implementing the WHO reporting guidelines could decrease the negative impact of suicide [11,12]. A prior Taiwan Suicide Prevention Center (TSPC) study found that daily surveillance and intervention improved the quality of suicide reporting by the news media and adherence to the WHO guidelines for the media [13].

About the seriousness of the impact of the Internet abetting suicide information and curbing the spread of related information on social media, the TSPC has continued to monitor websites under both the Taiwan

[1] Department of Community Psychiatry, Taoyuan Psychiatric Center, Taiwan; [2] Taiwan Taiwanese Society of Suicidology & Taiwan Suicide Prevention Center; [3] Department of Psychiatry, National Taiwan University College of Medicine, Taiwan; [4] Department of Psychiatry, National Taiwan University Hospital, Taipei, Taiwan; [5] Department of Psychiatry, Shin Kong Wu Memorial Hospital, Taipei, Taiwan; [6] School of Nursing, National Taiwan University College of Medicine, Taiwan; [7] Department of Nursing, National Taiwan University Hospital, Taipei, Taiwan.

[*]**Correspondence to:** Chia-Yi Wu, Ph.D., RN, School of Nursing, College of Medicine, National Taiwan University, No. 1, Jen-Ai Road Section 1, Taipei 100233, Taiwan;TEL: 886-2-23123456*288430;Fax: 886-2-23935736

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Suicide Prevention Act and the Child and Youth Welfare and Rights Protection Act since 2014. This study hopes to eliminate the spread of inappropriate information on the Internet and prevent more tragic suicides. Few studies have comprehensively examined the impacts of a long-term intervention on self-media and the social media of suicide. This TPSC-conduced surveillance study aimed to observe the trend change in the quality of suicide posts by social media or self-media under daily surveillance. This study monitored and handled websites instigating suicide information between January 1, 2014, and December 31, 2022. This study aimed to 1) analyze the trend in contents of suicide instigation online between 2014 and 2022 inclusively; 2) look into the results after those suicide-instigating posts were taken down with their domestic or overseas IP (Internet Protocol) addresses; and 3) examine the reasons why some suicide-related instigating posts were unable to be taken down.

## Methods

The study was performed through daily searches Top 100 web pages on the Google search engine by keywords since January 2014. Up till December 2022, we listed web pages that met the judgment principles and reported to the iWIN (i.e., a government-funded institution that takes down web content that violated the Child Protection Law in Taiwan, see https://i.win.org.tw/) for removal from local or overseas IP addresses. The research methodology was specified as follows.

1. Keywords: The Chinese keyword combinations used for this study were "painless + suicide", "jumping from a building + height", "burning charcoal + method", "hanging + suicide", and other suicide-related keywords such as "helium + suicide", "suicide undetected + location".
2. Judgment principle: the principle of whether website contents should be taken down was: "The subject of the report is with analysis or detailed descriptions of any suicide method and its procedures or related information" (usually including the following components: prepared items for suicide, operation steps, the dosage of drugs, degree of preparation, behavioral consequences, etc.). According to the general conditions, the descriptions of website contents could be very likely to be imitated and result in suicide, or with strong persuasion and encouragement of suicidal behaviors.
3. Exclusion criteria: Those who only listed various suicide methods (e.g., "plastic bag over the head", "jumping from a building", "hanging", "inhaling helium", etc.) and described them collectively were not required to be included in this report. Those who only described the physical, physiological, neurological, psychological, and social consequences of tragedies caused by suicide methods were neither required to be listed.
4. Special cases:
   (1) We would incorporate any article, link, or statement in the infamous Chinese "Complete Suicide Manual" that identifies or retrieves, transcribes, quotes, offers for download, or sells the full text or portions of the text of this Manual.
   (2) Written and audio-visual works (including poems, essays, novels, music videos, lyrics, etc.) were included if they contained an analysis or detailed descriptions of how the suicide was completed and if the descriptions were realistic and likely to be imitated or manipulated. If the clip or lyrics did not describe how the suicide was carried out, they were not needed to be listed.
   (3) We did not include the message about euthanasia by suicide if it only mentions the structure and preparation of euthanasia devices or drugs, and devices or drugs with similar effects, or if they are almost impossible to obtain under ordinary realistic conditions. However, we could include it if there was analysis or detailed descriptions of suicide methods, pictures of highly available tools (e.g., tubes, plastic bags, etc.) in the text, and they attempt to convince or encourage others to commit suicide.

The web content indicators were defined in Table 1.

**Table 1.** Indicators and definitions of web contents instigating suicide.

| Content indicators | Definitions |
|---|---|
| Content indicators | Netizens recommend suicide methods directly to the author of the article or to other netizens in the comment area at the bottom of the article |
| Netizens leave a message to tell specific people about suicide methods | Items or implements used to depict suicide methods |
| Items or tools for suicide preparation | Describe how to commit suicide or use certain objects or tools to commit suicide |
| Suicide detailed steps | Describe several aspects of the suicide method to show its strengths and weaknesses, describe the process of harm caused by using the suicide method, describe the body part that hurts oneself or commits suicide |
| Degree/grading/stage/site of suicidal behaviors | Depictions of physical and mental problems resulting from suicide or physical breakdown after suicide |
| Consequences of suicide | The contents used as a way to remind readers of the key details of suicide completion, such as avoiding crowds, clothing, space arrangements, etc. |

After meeting the web content indicators, we carried out the process in Figure 1 and tracked the registration results during the study period. Removal rates of local and overseas websites with contents of suicide instigation were compared in Figure 2.

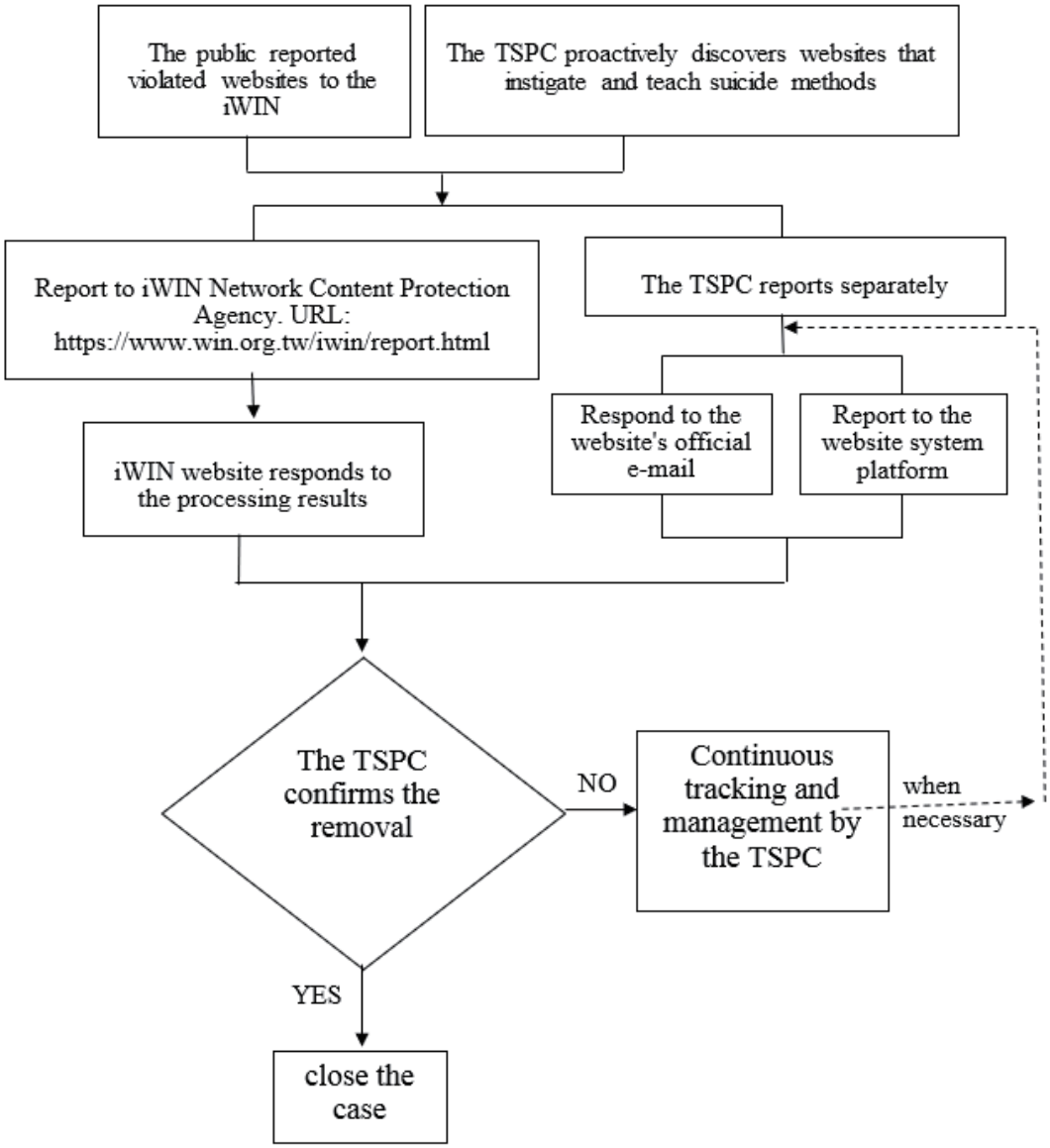


**Figure 1.** The monitoring and reporting procedure toward websites with suicide instigating information.

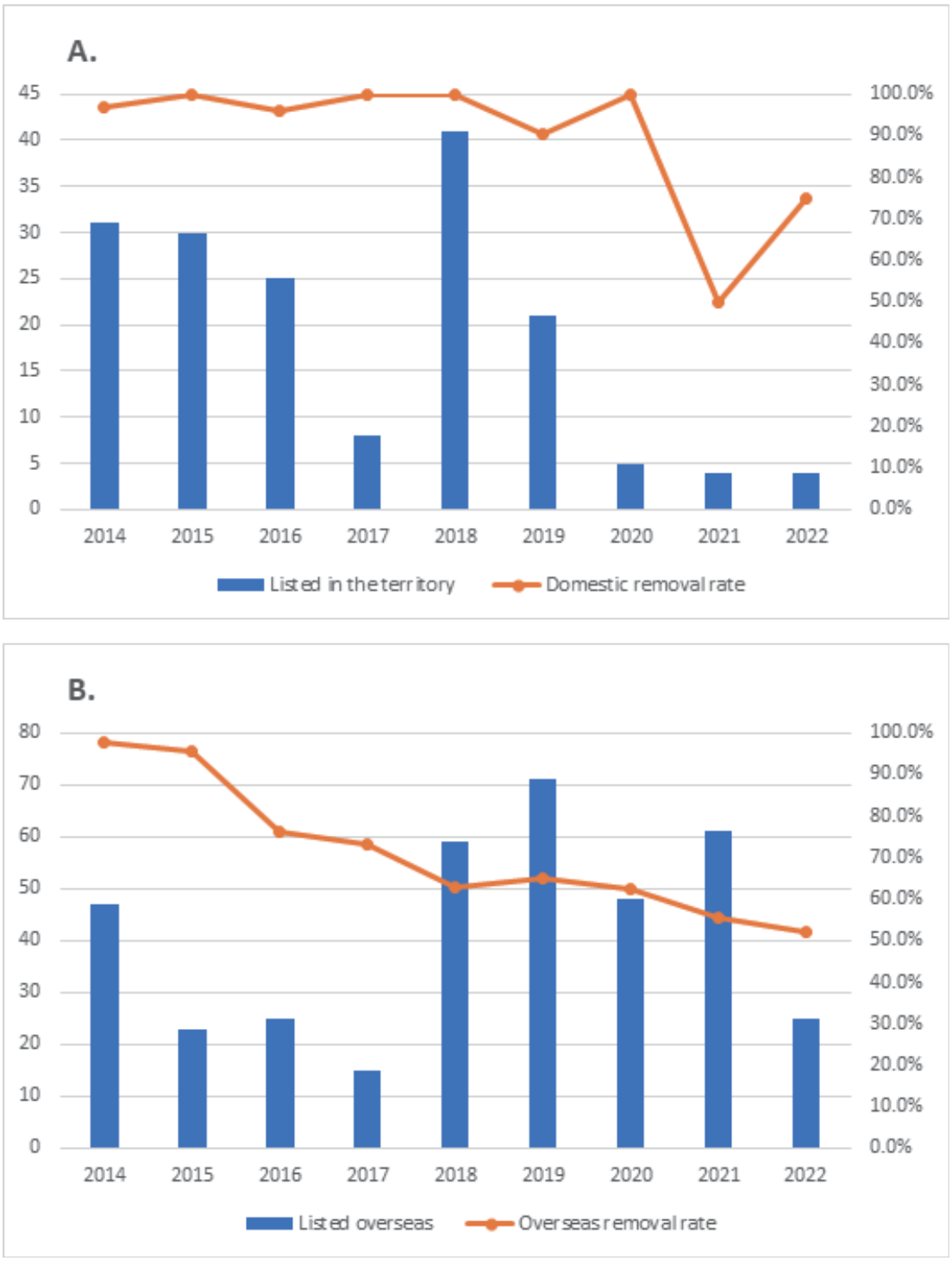


**Figure 2.** (A) The number of listings and removal rates of domestic websites instigating suicide in Taiwan; (B) the number of listings and removal rates of overseas websites abetting suicide.

## Results

We identified and registered 543 websites containing suicide-instigation content from January 1, 2014, to December 31, 2022, of which we removed or disabled the website links of 420 (77.3%) (Table 2). We removed 162 (95.9%) websites from the domestic market and did not remove 7 (4.1%) (Table 3). The domestic webpages that we did not take down (7 in total) include "original content" (5, accounting for 71.4%), "reposted content" (1, accounting for 14.3%), and "news reports" (1, accounting for 14.3%). Website content statistics: Overall, there are no "netizen messages telling specific people how to complete suicide", "degree/grading/stage/location", or "suggestions to increase the rate of completed suicide (such as personnel, time, place, and objects)", but a total of 7 web pages mentioned "items or tools for suicide preparation", 4 mentioned "operation/steps", and 2 mentioned "consequences of suicide".

We took down 258 (69.0%) overseas websites and did not take down 116 (31.0%) (Table 4). We described and categorized the 116 web pages as "original content" (96 pages, 82.8%), "Complete Suicide Manual" (13 pages, 11.2%), and "news media reports" (7 pages, 6.0%).

The most frequently mentioned items on the unremoved pages from overseas were "articles or tools for suicide preparation", which accounted for 71.6% of the total number of pages, and "consequences of death", which accounted for 45.7% of the total number of pages (Table 5). Most of the 116 overseas websites we did not take down are in the United States (72.4%). Social media platforms (31.7%) were the most popular unremoved websites, followed by forums (17.9%).

Finally, we drew a figure showing the number of listings and removal rates of domestic and overseas websites instigating suicide in Figure 2 as a reference of differences in removal difficulties between different website resources. The results showed that foreign-sourced contents instigating suicide with IP addresses overseas were significantly more difficult to take down.

**Table 2.** The total number of listings and the proportion of removals of website contents instigating suicide by year.

| | Total numbers n | Items removed from the website n (%) | Items remained in the website n (%) |
|---|---|---|---|
| 2014 | 78 | 76 (97.4%) | 2 (2.6%) |
| 2015 | 53 | 52 (98.1%) | 1 (1.9%) |
| 2016 | 50 | 43 (86.0%) | 7 (14.0%) |
| 2017 | 23 | 19 (82.6%) | 4 (17.4%) |
| 2018 | 100 | 78 (78.0%) | 22 (22.0%) |
| 2019 | 92 | 65 (70.7%) | 27 (29.3%) |
| 2020 | 53 | 35 (66.0%) | 18 (34.0%) |
| 2021 | 65 | 36 (55.4%) | 29 (44.6%) |
| 2022 | 29 | 16 (55.2%) | 13 (44.8%) |
| Sum | 543 | 420 (77.3%) | 123 (22.7%) |

**Table 3.** The total number of listed domestic websites and the proportion of delisted website contents instigating suicide information by year.

| | Total numbers n | Number of items removed from the website n (%) | Items remained in the website n (%) |
|---|---|---|---|
| 2014 | 31 | 30 (96.8%) | 1 (3.2%) |
| 2015 | 30 | 30 (100.0%) | 0 (0.0%) |
| 2016 | 25 | 24 (96.0%) | 1 (4.0%) |
| 2017 | 8 | 8 (100.0%) | 0 (0.0%) |
| 2018 | 41 | 41 (100.0%) | 0 (0.0%) |
| 2019 | 21 | 19 (90.5%) | 2 (9.5%) |
| 2020 | 5 | 5 (100.0%) | 0 (0.0%) |
| 2021 | 4 | 2 (50.0%) | 2 (50.0%) |
| 2022 | 4 | 3 (75.0%) | 1 (25.0%) |
| Sum | 169 | 162 (95.9) | 7 (4.1%) |

**Table 4.** The total number of listed overseas websites and the proportion of delisted website contents instigating suicide by year.

| | Total numbers n | Number of items removed from the website n (%) | Items remained in the website* n (%) |
|---|---|---|---|
| 2014 | 47 | 46 (97.9%) | 1 (2.1%) |
| 2015 | 23 | 22 (95.7%) | 1 (4.3%) |
| 2016 | 25 | 19 (76.0%) | 6 (24.0%) |
| 2017 | 15 | 11 (76.0%) | 4 (24.0%) |
| 2018 | 59 | 37 (62.7%) | 22 (37.3%) |
| 2019 | 71 | 46 (64.8%) | 25 (35.2%) |
| 2020 | 48 | 23 (47.9%) | 25 (52.1%) |
| 2021 | 61 | 34 (55.7%) | 27 (44.3%) |
| 2022 | 25 | 13 (52.0%) | 12 (48.0%) |
| Sum | 374 | 258 (69.0%) | 116 (31.0%) |

Note: *Items remained in the websites refer to those unlisted in the reports that have been removed by the TSPC, also called the "unlisted websites".

**Table 5.** The analysis of unlisted websites of their number and percentage of contents in overseas web pages instigating suicide (N=116).

| Page numbers/ content indicators | Original contents n (%) | Contents related to complete suicide manual n (%) | Suicide reports of online news n (%) | Total number of pages n (%) |
|---|---|---|---|---|
| Netizens leave a message to tell specific people about suicide methods | 8 (6.9%) | 0 (0.0%) | 0 (0.0%) | 6 (5.2%) |
| Items or tools for suicide preparation | 83 (71.6%) | 13 (12.9%) | 7 (6.0%) | 90 (77.6%) |
| Suicide detailed steps | 26 (22.4%) | 12 (10.3%) | 1 (0.9%) | 35 (30.2%) |
| Degree/grading/stage/site of suicidal behaviors | 9 (7.8%) | 12 (10.3%) | 0 (0.0%) | 17 (14.7%) |
| Consequences of suicide | 53 (45.7%) | 11 (9.5%) | 3 (2.6%) | 63 (54.3%) |
| Suggestions to improve the completion rate of suicide (such as personnel, time and place) | 17 (14.7%) | 13 (12.1%) | 0 (0.0%) | 27 (23.3%) |

## Discussion

This study is the first to describe and handle websites of local or overseas IP addresses that violate the law to instigate and teach suicide and to monitor the long-term trend of the changes of such website contents after handling. During the 9-year observation period, we found 543 suicide posts in total, and we removed 420 (77.3%) of them from the Internet after attempting to report them to the police. We removed 95.9% of the posts from the domestic market, whereas we only removed 69% from overseas websites. There are a couple of possible reasons for the differences in the delisted percentage of posts between domestic websites and overseas websites. First, traditional or simplified Chinese websites located abroad are beyond our country's jurisdiction and cannot be restricted by the source.

Furthermore, our report on such web pages has no reporting counterparts in Japan, Hong Kong, the United Kingdom, and at the local state level in the United States. Second, both domestic and overseas webpages can query the precise location (such as the address) of the IP user's signal sent by the Internet Service Provider (ISP). Only the police and government agencies (telecommunications police) can contact ISP managers and request user information, and there must be clear violations. Third, we also submitted letters directly to the webpage administrators. However, due to poor management of some overseas webpages (such as the mirror webpage for backup), the reporting mechanism for webpage construction is not perfect, and the contact information of the platform administrator is not even provided (i.e., e-mail). The means of sending persuasive letters have very limited effect.

In this globalized Internet-centered era, suicide information can rapidly spread in a borderless manner through different platforms or social media in different languages, especially in more commonly used worldwide languages such as Arabic, Chinese, English, French, Portuguese, and Spanish. Thus, it is critical to establish mechanisms for people worldwide to cooperate in order to stop inadequate suicide information from circulating. Also, we call for developing an international guideline to regulate suicide postings on social media for netizens to follow. After all, self-media and social platforms are much more prominent now than 15 years ago when the WHO released guidelines with a list of 6 "Dos" and 6 "Don'ts" for media professionals. In the meantime, 6 "Don'ts", including " Do not place stories about suicide prominently and do not unduly repeat such stories, Do not use language which sensationalizes or normalizes suicide or presents it as a constructive solution to problems, Do not explicitly describe the method used, Do not provide details about the site/location, Do not use sensational headlines, Do not use photographs, video footage or social media", can be a reference guideline for Internet users while writing suicide-related posts.

The unlimited nature of Internet information transmission and the advent of the era of information explosion in recent years have resulted in a flood of information on the Internet. Thousands might read, imitate, and read any information posted online, and the influence of reposting exceeds that of traditional media and Internet news reports. People with intentions release information about abetting suicide to every corner of the Network through various methods, even causing cross-border effects. Given the seriousness of the influence of Internet instigation of suicide information and the suppression of related information dissemination on the Internet, it is necessary to plan and establish a website monitoring and reporting process to prevent the public from obtaining information on suicide methods through the website and imitating suicide.

Finally, some abetting suicide posts use real-time live videos, which have significant influence and are relatively difficult to prevent. In the future, it is necessary to raise public awareness of online suicide prevention and self-discipline, promote monitoring and reporting of inadequate suicide information by global netizens, and call on everyone to pay attention to preventing cyber suicide [14]. Everyone is involved, and everyone is the gatekeeper of suicide prevention on the Internet. We can prevent more unfortunate incidents by eliminating the spread of inappropriate information on the Internet.

## Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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# The Prevalence of Psychiatric Diagnosis before Suicidal Death for the Youth Aged 15 to 24: A National Population-Based Study in Taiwan from 2006 to 2015

**Li-Chung Huang[1], Chia-Yi Wu[2,3], Ming-Been Lee[3,4,5*], Chia-Ta Chan[3,5], Chun-Ying Chen[3]**

**Abstract:** ***Background:*** Suicide constitutes a significant public concern on a global scale, yet there is a dearth of comprehensive investigations into the utilization of medical services by individuals who have died by suicide. The primary objective of this study was to elucidate the patterns of medical service utilization and diagnosis preceding incidents of suicide. ***Methods:*** This nationwide study used data linkage from the Cause of Death Data and the National Health Insurance Research Database (NHIRD) to examine medical service utilization among individuals aged 15-24 years who died by suicide within a year before their death during 2006-2015. A control group, matched at a ratio of 10 to 1, was selected from the NHIRD. Logistic regression analysis calculated odds ratios (ORs), and the ORs and prevalence were used to determine the population attributable fraction (PAF). ***Results:*** Prevalence comparisons of diagnosis between suicide and control groups in outpatients and emergency services were similar, from 2006 to 2010 suggested that top 3 diagnosis were depressive disorders (OR = 29.95, 95% CI = 23.38–38.36, PAF = 0.18), neurotic disorders and personality disorders (OR = 12.9, 95% CI = 10.58–15.72, PAF = 0.17) and episodic mood disorders (OR = 36.44, 95% CI = 26.49–50.12, PAF = 0.13). During 2011 to 2015 period, the top 3 diagnosis between suicide and control groups in outpatients and emergency services are also depressive disorders (OR = 40.12, 95% CI = 29.08–55.36, PAF = 0.19), neurotic disorders and personality disorders (OR = 14.78, 95% CI = 11.698–18.69, PAF = 0.19) and Episodic mood disorders (OR = 33.47, 95% CI = 22.74–49.26, PAF = 0.12). ***Conclusion:*** The study presented data linkage analysis to explore the relationship between suicidal deaths, emergency services, and diagnostic patterns in young adults. Depression and personality disorders are prevalent among suicide decedents, highlighting the special attention for treatment and interventions.

**Keywords:** suicide, mental disorder, physical illness, national database.

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## Introduction

According to the most recent report from the World Health Organization (WHO), the global burden of suicide remains alarming, with over 700,000 individuals losing their lives to suicide in 2019 [1]. Shockingly, suicide accounted for more than 1% of all deaths worldwide, placing it among the top four leading causes of mortality for individuals aged 15 to 29 years [1]. While Taiwan has observed a decline in the overall ranking of suicide as a leading cause of death, it remained a significant concern, particularly among the 15 to 24-year-old age group [2], where it held the second position. The prevention of suicide among adolescents and young adults continued to be a pressing public health issue, not only for Taiwan but also for the global community as a whole. Efforts to address this critical problem and implement effective suicide prevention strategies were essential to safeguard the well-being and lives of these vulnerable populations.

Examining the medical resources utilized by individuals prior to suicide was a meaningful undertaking when developing prevention programs. It has been observed that more than 70% of individuals who died by suicide had at least one medical visit within a month before their death, and nearly 90% had visited a medical facility within a year [2,3]. Other studies have indicated that suicidal deaths were associated with recent emergency department (ED) visit or hospital admissions in the preceding three months [4-6]. Additionally, research has shown that suicide patients often received limited clinical medical treatments from the ED or outpatient departments before their fatal act [7-10]. However, it is important to recognize that not only medical treatments, but also demographic factors, recurring unresolved psychological stressors, psychiatric disorders, and medical diagnosis, could provide valuable insights into suicide events. Considering these multifaceted aspects can aid in the development of comprehensive strategies and interventions to reduce the incidence of suicide.

In accordance with a previous study [2], it was found that 99.9% of suicide patients who availed mental

[1] Department of Psychiatry, Chia-Yi Branch, Taichung Veteran General Hospital, Chia-Yi, Taiwan; [2] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan; [3] Taiwanese Society of Suicidology & Taiwan Suicide Prevention Center, Taipei, Taiwan; [4] Department of Psychiatry, National Taiwan University Hospital and National Taiwan University College of Medicine, Taipei, Taiwan; [5] Department of Psychiatry, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan.

[*]**Correspondence to:** Ming-Been Lee, M.D., Department of Psychiatry, National Taiwan University Hospital, 7 Chung-Shan South Road, Taipei 10002, Taiwan;E-mail:mingbeen@ntu.edu.tw

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of health services within a month preceding their death received a diagnosis of mental disorders. Furthermore, a meta-analysis highlighted that almost all mental disorders, expect intellectual disabilities and dementia, were associated with an elevated risk of suicide [11]. Another meta-analysis estimated the overall pooled suicide risk ratio (RR) for mental disorders to of 7.5, and a population attributable risk of 21%. Notably, psychotic disorders exhibited the highest RR (13.2) [12]. These findings diverged from the results of our previous studies, where affective disorders were identified as the primary contributors to suicide deaths [2]. However, these findings aligned with recent article published by our research team, suggesting that comorbidities with mental illness may contribute to the elevated suicide rates [13]. However, further investigation is necessary to elucidate whether adolescent suicide is predominantly associated with comorbid mental health conditions or occurs during a period characterized by a heightened risk and increased incidence of mental illness.

The wide variation in the prevalence of psychiatric diagnosis among suicide patients could be attributed to differences in study populations, cultural factors, and research designs [10,12,13]. Our previous study focused solely on psychiatric and non-psychiatric services [2], limiting the examination of the connections between suicide patients and medical treatment records specifically among adolescents and young adults. We hypothesized that a significant number of adolescents and young adults who died by suicide suffered from comorbid psychiatric disorders. This study aimed to: (1) investigate the most commonly observed subtypes of psychiatric disorders comorbid within one year prior to suicide mortality in adolescents and young adults; and (2) estimate the trends in the comorbidity of mental disorders with suicide over the years, in order to raise awareness among physicians regarding the evaluation of psychiatric disorders, particularly depressive disorders, and facilitate the design of appropriate suicide prevention programs.

# Methods

## Subjects selection

We employed a registry-based prospective cohort design to determine the prevalence of psychiatric diagnosis among suicide patients aged 15 to 24 years in Taiwan. Patient data for the suicide groups were obtained from the Cause of Death Data collected between 2006 and 2010, as well as between 2011 and 2015. To gather diagnosis codes and information on services utilized (out-patient, ambulatory departments, and in-patient departments) before to death, we established a connection between the Cause of Death Data and the National Health Insurance Research Database (NHIRD) using a classification code, which replaced the national ID number in the system.

Data were collected within one year preceding the date of suicidal death. In cases where patients made multiple visits during this year period, all visits were considered, and only the primary diagnosis for each patient was recorded. For the control group, we employed sex and birth year data as matching variables. Using a ratio of 1:10 (case: control), we searched the NHIRD on the date of death of the suicide group, aiming to ensure greater statistical power [14]. The paired subjects in the control group were either alive or had died due to non-suicidal causes. Diagnosis, identified by ICD-9-CM codes, were categorized into 18 major categories and 24 sub-categories. Mental disorders were further categorized into 30 diagnosis. A comprehensive list of all diagnosis was presented in Table 1.

## Data source

The National Health Insurance (NHI) program in Taiwan provided comprehensive healthcare coverage to the vast majority of the population, with an enrollment rate of 99.8% of individuals enrolled [15]. The NHI claimed database, which included records for ambulatory care, hospital inpatient care, and outpatient care, was maintained by the National Health Research Institute (NHRI). Established in year 2000, the NHIRD served as a valuable source of healthcare information. The NHIRD encompassed demographic data, dates of clinical visits, diagnostic codes, and details of prescriptions. It has been extensively utilized to assess the incidence and prevalence of psychiatric disorders cases in the Taiwanese population [16]. Additionally, the Cause of Death Data, classified according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Tenth Revision (ICD-10), included demographics and information on the cause of death, including deaths by suicide. To ensure compliance with the regulations of the Computer-Processed Personal Data Protection Law, all released data adhered to the necessary guidelines. The study obtained approval from the Institutional Review Board (IRB) with the reference number (NTUH-201204034RIC).

## Statistical analysis

All statistical analyses were performed using SAS 9.4 software (SAS 9.4, Cary, NC. SAS Institute Inc.). The comparative analysis of prevalence rates for diagnosis was conducted between the suicide group and the control group in both the outpatient and ambulatory care populations. This analysis utilized odds ratios (ORs) with corresponding 95% confidence intervals (CIs) as well as the population attributable fraction (PAF). The PAF in this study refered to the proportion of suicide cases in the population that could be attributed to a specific risk factor or condition. It estimated the potential reduction in the occurrence of suicide if the particular risk factor or condition was eliminated. In the context of this study, the PAF is used to determine the contribution of certain diagnosis or conditions to the occurrence of suicide within the population studied. The PAF was calculated using the formula: (prevalence of risk factor in suicide death) x (OR-1)/OR.

# Results

In the dataset covering the period from 2006 to 2010, we conducted a comparison of the prevalence of diagnosis in the outpatient and ambulatory departments between two distinct groups: the control group, consisting of 11,350 individuals, and the suicide group, comprising of 1,135 individuals. The results of this

**Table 1.** The psychiatric diagnosis and ICD-9-CM code.

| Diagnosis | ICD-9-CM code |
|---|---|
| Mental disorders | 290-319 |
| Neurotic disorders and Personality disorders | 300,301 |
| Dementias | 290 |
| Alcohol-induced Mental disorders | 291 |
| Drug-induced Mental disorders | 292 |
| Transient Mental disorders due to conditions classified elsewhere | 293 |
| Persistent Mental disorders due to conditions classified elsewhere | 294 |
| Schizophrenic disorders | 295 |
| Episodic mood disorders | 296 |
| Delusional disorders | 297 |
| Other nonorganic psychoses | 298 |
| Pervasive developmental disorders | 299 |
| Neurotic disorders | 300 |
| Neurotic depression | 3004 |
| Personality disorders | 301 |
| Alcohol dependence syndrome | 303 |
| Drug dependence | 304 |
| Nondependent abuse of drugs | 305 |
| Physiological malfunction arising from mental factors | 306 |
| Special symptoms or syndromes, not elsewhere classified | 307 |
| Acute reaction to stress | 308 |
| Adjustment reaction | 309 |
| Specific nonpsychotic Mental disorders due to brain damage | 310 |
| Depressive disorder, not elsewhere classified | 311 |
| Conduct disorder, not elsewhere classified | 312 |
| Disturbance of emotions specific to childhood and adolescence | 313 |
| Hyperkinetic syndrome of childhood | 314 |
| Specific delays in development | 315 |
| Psychic factors associated with diseases classified elsewhere | 316 |
| Mild intellectual disabilities | 317 |
| Other specified intellectual disabilities | 318 |
| Sexual and gender identity disorders | 302 |
| Unspecified intellectual disabilities | 319 |
| Depressive disorders | 2962,2963,3004,311 |
| Diseases of the nervous system and sense organs | 320-389 |

comparison, including ORs and PAF, were displayed in Table 2. In general, the top 10 diagnosis observed in the suicide group consisted of mainly psychiatric disorders, with their prioritization based on the PAF. Within the psychiatric disorders, depressive disorders presented the highest ranking with an odds ratio (OR = 29.95, 95% CI = 23.38–38.36, PAF = 0.18), neurotic disorders and personality disorders (OR = 12.9, 95% CI = 10.58–15.72, PAF = 0.17) and episodic mood disorders (OR = 36.44, 95% CI = 26.49–50.12, PAF = 0.13), neurotic depression (OR = 21.63, 95% CI = 15.89–29.44, PAF = 0.10), schizophrenic disorder (OR = 23.45, 95% CI = 15.89–34.44, PAF = 0.07), depressive disorder, not elsewhere classified (OR = 44.40, 95% CI = 25.20–78.24, PAF = 0.05), special symptoms or syndromes, not elsewhere classified (OR = 8.01, 95% CI = 5.70–11.24, PAF = 0.04), other nonorganic psychoses (OR = 38.11, 95% CI = 20.07–72.36, PAF = 0.03), personality disorders (OR = 39.61, 95% CI = 20.34–77.16, PAF = 0.03), and adjustment reactions (OR = 10.87, 95% CI = 7.05–16.74, PAF = 0.03).

Table 3 presented the ORs and PAF depicting the prevalence of diagnosis among the suicide groups and the control groups during the period from 2011 to 2015, with their ranking determined based on the PAF. In this data set, we compared the prevalence of diagnosis in the outpatient and ambulatory departments between two distinct groups: the control group, consisting of 7,920 individuals, and the suicide group, comprising 792 individuals. The ranking according to the PAF index from high to low as follows: depressive disorders (OR = 40.12, 95% CI = 29.08–55.36, PAF = 0.19), neurotic disorders and personality disorders (OR = 14.78, 95% CI = 11.69–18.69, PAF = 0.19), episodic mood disorders (OR = 33.47, 95% CI = 22.74–49.26, PAF = 0.12), neurotic depression (OR = 39.84, 95% CI = 25.81–61.52, PAF = 0.11), special symptoms or syndromes, not elsewhere classified (OR = 12.08, 95% CI = 8.60–16.96, PAF = 0.08), depressive disorder, not elsewhere classified (OR = 37.03, 95% CI = 20.75–66.10, PAF = 0.06),

**Table 2.** The comparisons of prevalence by diagnosis between suicide group and control group in outpatients and emergency services from 2006 to 2010.

| | Diagnosis | Control groups (N=11350) | Suicide groups (N=1135) | ORs | PAF |
|---|---|---|---|---|---|
| 1 | Depressive disorders | 96 (0.01) | 231 (0.2) | 29.95 (23.38-38.36) | 0.18 (0.16-0.21) |
| 2 | Neurotic disorders and Personality disorders | 217 (0.02) | 228 (0.2) | 12.9 (10.58-15.72) | 0.17 (0.15-0.19) |
| 3 | Episodic mood disorders | 52 (0) | 163 (0.14) | 36.44 (26.49-50.12) | 0.13 (0.11-0.15) |
| 4 | Neurotic depression | 64 (0.01) | 124 (0.11) | 21.63 (15.89-29.44) | 0.1 (0.08-0.11) |
| 5 | Schizophrenic disorders | 39 (0) | 85 (0.07) | 23.45 (15.97-34.44) | 0.07 (0.05-0.08) |
| 6 | Depressive disorder, not elsewhere classified | 15 (0) | 63 (0.06) | 44.40 (25.20-78.24) | 0.05 (0.04-0.06) |
| 7 | Special symptoms or syndromes, not elsewhere classified | 80 (0.01) | 61 (0.05) | 8.01 (5.70-11.24) | 0.04 (0.03-0.06) |
| 8 | Other nonorganic psychoses | 12 (0) | 44 (0.04) | 38.11 (20.07-72.36) | 0.03 (0.02-0.05) |
| 9 | Personality disorders | 11 (0) | 42 (0.04) | 39.61 (20.34-77.16) | 0.03 (0.02-0.04) |
| 10 | Adjustment reaction | 41 (0) | 43 (0.04) | 10.87 (7.05-16.74) | 0.03 (0.02-0.04) |

Note: Abbreviations: ORs, odds ratios; PAF, population attributable fraction.

**Table 3.** The comparisons of prevalence by diagnosis between suicide group and control group in outpatients and emergency services from 2011 to 2015.

| | Diagnosis | Control groups (N=7920) | Suicide groups (N=792) | ORs | PAF |
|---|---|---|---|---|---|
| 1 | Depressive disorders | 52 (0.01) | 166 (0.21) | 40.12 (29.08-55.36) | 0.19 (0.16-0.22) |
| 2 | Neurotic disorders and Personality disorders | 147 (0.02) | 173 (0.22) | 14.78 (11.69-18.69) | 0.19 (0.16-0.22) |
| 3 | Episodic mood disorders | 36 (0) | 105 (0.13) | 33.47 (22.74-49.26) | 0.12 (0.09-0.14) |
| 4 | Neurotic depression | 27 (0) | 95 (0.12) | 39.84 (25.81-61.52) | 0.11 (0.08-0.13) |
| 5 | Special symptoms or syndromes, not elsewhere classified | 67 (0.01) | 74 (0.09) | 12.08 (8.60-16.96) | 0.08 (0.06-0.10) |
| 6 | Depressive disorder, not elsewhere classified | 15 (0) | 52 (0.07) | 37.03 (20.75-66.10) | 0.06 (0.04-0.08) |
| 7 | Adjustment reaction | 28 (0) | 49 (0.06) | 18.59 (11.61-29.75) | 0.05 (0.04-0.07) |
| 8 | Schizophrenic disorders | 11 (0) | 47 (0.06) | 45.35 (23.42-87.82) | 0.05 (0.04-0.07) |
| 9 | Other nonorganic psychoses | 7 (0) | 33 (0.04) | 49.07 (21.64-111.26) | 0.04 (0.02-0.05) |
| 10 | Gastric and duodenal ulcer | 143 (0.02) | 41 (0.05) | 2.97 (2.08-4.24) | 0.03 (0.02-0.05) |

Note: Abbreviations: ORs, odds ratios; PAF, population attributable fraction.

adjustment reaction (OR = 15.89, 95% CI = 11.61–29.75, PAF = 0.05), schizophrenic disorder (OR = 45.35, 95% CI = 23.42–87.82, PAF = 0.05), other nonorganic psychoses (OR = 49.07, 95% CI = 21.64–111.26, PAF = 0.04), gastric and duodenal ulcers (OR = 2.97, 95% CI = 2.08–4.24, PAF = 0.03). Among the compared diagnosis, gastric and duodenal ulcer emerged as the 10th condition and the sole non-psychiatric disorder in the analysis.

# Discussion

To the best of our knowledge, this study represented the recent national data linkage analysis investigating the diagnosis preceding suicidal deaths among young adults. Among the various outpatients in emergency services, patients with psychiatric disorders were found to be the most prevalent among the suicide group in the 15 to 24 age group. Additionally, when examining the diagnosis for 2 periods 2006 to 2010 and 2011 to 2015, depressive disorders, neurotic disorders, and combined personality disorders were identified as the most common diagnosis in outpatient and ambulatory departments. The prioritization of diagnosis based on the PAF highlighted the consistent importance of addressing neurotic depression, personality disorders, and unipolar or bipolar disorders during both periods (2006-2010 and 2011-2015). The findings focused on the relationship between suicide deaths, emergency services, and diagnostic patterns in young adults, emphasizing the importance of treatment and interventions for depression and personality disorders.

Mental disorders, including depressive disorders and anxiety disorders, are prevalent among children and adolescents. According to Bitsko et al., the most prevalent disorders diagnosed among U.S. children and adolescents aged 3-17 years were attention-deficit/hyperactivity disorder and anxiety, each affecting approximately one in 11 (9.4%-9.8%) children [17]. The study by Gomes et al. assessed the prevalence of mental disorders and suicide risk in youths. The study found that major depressive disorder (MDD), generalized anxiety disorder (GAD), social anxiety disorder (SAD), attention-deficit/hyperactivity disorder (ADHD), bipolar disorders type 1 and 2, post-traumatic stress disorder (PTSD), and antisocial personality disorder (APD) were prevalent among young adults aged 22 years [18]. The study also found an association between mental disorders and suicide risk.

Our study findings revealed that mental disorders exhibited a greater risk of suicide compared to physical illnesses in young adults. Nevertheless, it is important to acknowledge that mental disorders often coexist with physical conditions [13,19]. Therefore, future investigations should consider exploring this relationship further, as our study solely focused on primary diagnosis codes. Additionally, it is crucial to take into account the presence of multiple physical comorbidities, as a previous study indicated that 38% of multimorbidity was associated with a two-fold increased risk of suicide.

In sum, our study contributes the understanding of the utilization of psychiatric services by individuals who died by suicide and highlights the significance of specific diagnosis in the context of suicide risk. Previous findings also emphasize the need for targeted interventions and treatment strategies, particularly for depressive disorders, neurotic disorders and personality disorders, and episodic mood disorders. Further research is warranted to explore the effectiveness of different interventions and strategies in reducing suicide rates among young adults.

## Limitations of the study

This study has several limitations that need to be acknowledged. First, while the sample size was large, important demographic variables such as sex, age, educational level, socioeconomic status and were not included in the analysis. For example, schizophrenic disorder in females had late onset than males, the risk of female schizophrenia patients may be underestimated in the study. Previous researches have shown that these demographic factors could have significant impacts on suicidal death [20]. Second, although the study accounted for repeated visits before death, it did not analyze the specific number of visits made by each patient. Additionally, the distinction between patients with chronic conditions requiring regular visits or medical seeking convenience and those with specific diagnosis was not taken into consideration. Thirdly, while the study explored the effects of mental disorders and physical illnesses on suicide, it did not consider the comorbidity or the subgroup classifications of these conditions. Previous research has indicated that up to 20% of suicidal decedents have comorbid physical illnesses [21]. Take personality disorders for instance, the diagnosis of personality disorder might be divided into detailed classification which led to different suicidal risks. Fourthly, relying solely on the diagnosis may not fully capture the psychopathological profile or the severity of physical diseases in each patient, such as pain or disability. Some researchers have attempted to incorporate medication data to provide a more comprehensive understanding [22]. Finally, due to limited data availability in the ambulatory department, the analysis combined outpatient and ambulatory data, potentially introducing ambiguity regarding the severity of mental disorders or physical illnesses.

# Conclusions

According to the results of the current study, several important conclusions could be drawn, which had implications for clinical practice and public health initiatives. First, the findings emphasized the significance of co-morbid mental illness in relation to suicide risk. The study highlighted the strong association between mental disorders and an increased propensity for suicide, surpassing the risk posed by physical diseases in adolescents and young adults. This finding aligned with previous research that has consistently demonstrated the crucial role of mental health in suicidal tendencies [13]. Thus, it is essential to prioritize the identification and management of co-existing mental illnesses in individuals at risk of suicide.

Second, our study highlighted the age range of 15–24 as a critical period for the onset of numerous diseases [23,24]. This age group was particularly vulnerable to the development of various health conditions, as evidenced by previous studies [23,24]. Recognizing

the heightened susceptibility to diseases during this age range could guide targeted interventions, early detection, and appropriate management strategies to mitigate the adverse consequences of these conditions. Lastly, our study underscored the importance of early intervention and treatment for specific mental disorders such as schizophrenia, major depressive disorder, and personality disorders. Identifying and addressing these disorders at an early stage is crucial to preventing adverse outcomes, including suicide. By initiating timely interventions, healthcare professionals can potentially reduce the risk of suicide and improve overall health outcomes.

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Original Articles

# The Association between Belief in Suicide as A Human Right and Suicidality in Taiwan: A 12-Year Nationwide Population Survey

**Cheng-Chen Chang[1,2,3], Chia-Yi Wu[1,4], Ming-Been Lee[1,5,6*], Chia-Ta Chan[1,6], Shih-Cheng Liao[1,5], Chun-Ying Chen[1]**

**Abstract:** ***Background:*** Suicide is a major public health issue worldwide and multiple risk factors remain questioned. The present study aimed to explore the personal preference of belief in suicide as an individual's right (S-IR) and its associated demographics, psychopathology, and suicidality among community residents in Taiwan. ***Methods:*** A computer-assisted telephone interview system was applied to collect data from 10 consecutive annual surveys using a representative sample of the general population aged 15 and above from 2009 to 2020. S-IR was based on a single yes/no question. Suicidality in this study included suicidal ideation (SI) and suicide attempt (SA) in the lifetime and past year. The five-item Brief Symptom Rating Scale (BSRS-5) was used to measure the global severity of psychological distress. ***Results:*** In total, 24,122 participants completed the survey. The weighted prevalence of positive response to S-IR was 59% with predominance in ages of 15-34 and 65 and above. Since 2015, a sharp and steady increase to the top two in prevalence has been observed for ages of 15 -24 and 25-34. Overall, a positive response to S-IR was significantly associated with general psychological distress, SI, and SA in the lifetime and in the recent year. Multinomial logistic regression revealed that positive S-IR could significantly predict the higher odds of suicidality across different age groups (e.g., OR= 1.368 for SI and 1.625 for SA among ages of 15-24; OR=1.277 for SI and 1.576 for SA for ages of 25-34). ***Conclusion:*** The positive response to S-IR had an age difference and was positively associated with suicidality and general psychological distress. Promoting mental health literacy and increasing awareness about suicidality to modify the myth of S-IR are important in suicide prevention.

**Keywords:** suicidal ideation, suicide attempts, suicide myth, suicide as an individual right, BSRS-5.

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## Introduction

Suicide is a major public health concern worldwide. In 2014, the World Health Organization (WHO) advocated a global imperative to prevent suicide worldwide [1]. In 2015, the United Nations (UN) listed the suicide mortality rate as an indicator of the Sustainable Developmental Goals (SDGs) [2]. In Taiwan, there was a more than two-fold increase in suicide rates since the early 1990s, followed by a downward trend in 2006-2014. However, Taiwan's suicide rates have turned upward since 2014 and the age-standardized rate in 2018 was 17% [3], which was higher than the world average [4].The Taiwan Suicide Prevention Center (TSPC), launched by the government in 2005 to implement national suicide prevention strategies, has conducted annual nationwide population surveys on suicidality and psychological distress since 2006 [5]. Suicide attempts outnumbered suicides by far and represented one of the strongest risk factors for suicide in a meta-analysis of 50-year research [6].

However, the suicide rate was found to increase in young age groups, even though the overall suicide rates trends remained steady between 2011 and 2018 [7]. Suicide was the fourth leading cause of death among 15-29 year-olds. Although suicide behavior is affected by complex factors, at the individual, relationship, community, and societal levels, which can increase risk [8], individual attitudes toward suicide are related to suicide intensity and behavior. The right to die is the right to decide whether a person dies (when they could continue living). Assisted suicide or euthanasia is proposed if someone feels life is unbearable because of a severe untreatable illness. On the contrary, the culture has shifted toward more tolerance of suicide [9] in the US and Korea [10]. Higher-educated, single individuals have been linked to permissive attitudes toward suicide [9, 11]. However, the belief in suicide as the individual's right (S-IR) is less discussed both in the general population and in the young age group.

To summarize, understanding the risks and protective factors related to the attitude toward suicide

[1] Taiwan Suicide Prevention Center, Taipei, Taiwan; [2] Department of Psychiatry, Chung Shan Medical University Hospital, Taichung, Taiwan; [3] School of Medicine, Chung Shan Medical University, Taichung, Taiwan; [4] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan; [5] Department of Psychiatry, National Taiwan University Hospital and College of Medicine, Taipei, Taiwan; [6] Department of Psychiatry, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan.
[*]**Correspondence to:** Ming-Been Lee, MD, Professor emeritus, Department of Psychiatry, National Taiwan University College of Medicine & National Taiwan University Hospital; 7 Chung-Shan South Road, Taipei 100, Taiwan (ROC); Email: mingbeen@ntu.edu.tw
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is important in establishing suicide prevention policies to tackle future socio-demographic changes. This study aimed to investigate the prevalence of S-IR and explore its associations with demographic covariates, psychopathology, and suicidality among community dwellers in Taiwan over the past decade.

# Methods

## Participants

The study collected the data from 15 consecutive annual nationwide community surveys, which recruited participants from a representative sample of the general population aged 15 and above in Taiwan from 2006 to 2020. A computer-assisted telephone interview (CATI) system was used to identify potential respondents by selecting telephone numbers with a stratified proportional randomization method according to the distribution of sex, age, and population size in 22 different geographic areas in Taiwan [12]. The target sample size was set as 1600 a priori. The number of participants was allocated from a total of 700 million data points, covering almost all landline telephone numbers in Taiwan. The chi-square goodness-of-fit test was used to test the representativeness of the final sample by comparing the household statistics from the Ministry of Interior. The raking method was performed to ensure an accurate representation of the sample. The study was approved by the Institutional Review Board of the National Taiwan University Hospital (No. 201204034RIC). Oral consent was obtained from all participants before the telephone interviews. In total, 24,122 respondents aged more than 15 years completed the anonymous telephone surveys. The survey questionnaire comprised demographics (age and sex), questions about the belief in suicide as an individual's right (S-IR), psychopathology, and suicidality.

## Measurements

### Psychological distress assessment

The five-item Brief Symptom Rating Scale (BSRS-5) was used to measure the level of psychological distress of the respondents over the past week (including the current day). The BSRS-5 includes the following five items: 1) insomnia; 2) anxiety; 3) hostility; 4) depression, and; 5) inferiority. Each item of the BSRS-5 was rated by a five-point Likert scale as follows: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; 4, extremely. A total score was calculated for each respondent. The presence of psychiatric morbidity was defined as a BSRS-5 score of ≥6 [12]. The BSRS-5 has been reported to have satisfactory psychometric properties in detecting psychiatric morbidity and suicidal ideation in medical and community settings [13-15].

### Suicidality

Suicidality was defined as suicidal ideation or suicide attempts in two-time points (in the lifetime and in the recent year) with a dichotomous response as "Yes = 1" and "No = 0".

### Statistical analysis

Group comparisons of sociodemographic characteristics among participants with and without suicidality (i.e., ideation, and attempt) were carried out using the $\chi 2$ test. In addition to descriptive statistics, cross-tabulation of the prevalence of S-IR by gender and age across different timespans was conducted. Chi-square tests were used to examine the significance of group differences. Finally, we modeled multinomial logistic regression to investigate the associations between S-IR and psychiatric morbidity and suicidality. The statistical analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, NC). The significance level was set at $p < 0.05$, 2-tailed.

# Results

The profile of year trends in the prevalence of belief in S-IR from 2009 to 2020 was depicted in the general population by age (Figure 1 & Supplement 1) and gender (Figure 2 & Supplement 2). The endorsement of belief in S-IR has increased since 2013 in both men and women.

In total, 24,122 participants (11,959 men, 12,162 women) completed the survey questions during 2009-2020. The sociodemographic characteristics of the participants were presented in Table 1. There is no gender difference regarding the belief in S-IR (p=0.263). The prevalence estimate for positive response to S-IR was 59% with predominance in ages of 15-34 and 65 and above (more than 60%, Table 1). The proportions of age distribution, occupation, SI in the lifetime, SI in the recent year, SA in lifetime, SA in recent year, BSRS scores, and suicidality were significantly different among the two groups (Table 1 & 2). There is a significant positive association between S-IR and the prevalence of SI and SA in the lifetime and the recent year and psychiatric morbidity in the recent week (p<0.001, Table 3). Regarding the suicidality, multinomial logistic regression indicated the significant association between positive S-IR and higher odds ratios of lifetime SI across the different age groups (OR=1.368, 95% CI=1.102-1.698 for ages of 15-24; OR=1.277, 95% CI=1.062-1.536 for ages of 25-34; OR=1.258, 95% CI=1.142-1.386 for ages>=35, Table 4). However, the significant association between positive S-IR and higher odds of lifetime SA only in ages more than 25 years (OR=1.576, 95% CI=1.013-2.452 for ages of 25-34; OR=1.424, 95% CI=1.160-1.747 for ages >= 35, Table 5). Table 8 showed no interaction between S-IR and age in regard to lifetime SI or SA.

**Table 1.** Prevalence of belief in suicide as an individual's right (S-IR) among the general population aged 15 and older from 2009 to 2020.

| | Yes<br>N=14244<br>(55.7%)<br>n (%) | No<br>N=9878<br>(38.6%)<br>n (%) | Total<br>N=24122<br>(94.3%)<br>n (%) | $\chi^2$ | p-value |
|---|---|---|---|---|---|
| Gender | | | | 1.254 | 0.263 |
| Male | 7019 (55.4) | 4940 (39.0) | 11959 (94.4) | | |
| Female | 7225 (55.9) | 4938 (38.2) | 12163 (94.1) | | |
| Age | | | | 124.392 | < 0.001 |
| 15-24 | 2388 (60.5) | 1449 (36.7) | 3837 (97.2) | | |
| 25-34 | 2753 (59.6) | 1754 (38.0) | 4507 (97.6) | | |
| 35-44 | 2612 (54.1) | 2045 (42.4) | 4657 (96.5) | | |
| 45-54 | 2427 (51.7) | 2014 (42.9) | 4441 (94.6) | | |
| 55-64 | 2015 (53.0) | 1503 (39.6) | 3518 (92.6) | | |
| >=65 | 2042 (55.6) | 1108 (30.2) | 3150 (85.8) | | |
| Occupation | | | | 99.446 | < 0.001 |
| White collar | 2607 (55.1) | 1995 (42.2) | 4602 (97.3) | | |
| Public employees | 648 (48.8) | 639 (48.1) | 1287 (96.9) | | |
| Blue collar | 3305 (56.7) | 2206 (37.8) | 5511 (94.5) | | |
| Store owner, | 724 (55.8) | 517 (39.8) | 1241 (95.6) | | |
| Corporate investors | 384 (51.5) | 343 (46.0) | 727 (97.5) | | |
| Professionals | 1781 (60.2) | 1098 (37.1) | 2879 (97.3) | | |
| Students | 1989 (55.6) | 1280 (35.8) | 3269 (91.4) | | |
| Housewife | 1719 (51.7) | 1201 (36.2) | 2920 (87.9) | | |
| Retired | 760 (60.5) | 411 (32.7) | 1171 (93.2) | | |
| Jobless | 303 (61.6) | 174 (35.4) | 477 (97.0) | | |

**Table 2.** Prevalence of belief in suicide as an individual's right among the general population aged 15 and older from 2009 to 2020.

| | Yes<br>n (%) | No<br>n (%) | Total<br>n (%) | $\chi^2$ | p-value |
|---|---|---|---|---|---|
| SI in lifetime | | | | 47.821 | < 0.001 |
| Yes | 2293 (64.3) | 1273 (35.7) | 3566 (100) | | |
| No | 11917 (58.1) | 8583 (41.9) | 20500 (100) | | |
| SI in recent year | | | | 36.862 | < 0.001 |
| Yes | 468 (70.8) | 193 (29.2) | 661 (100) | | |
| No | 13736 (58.7) | 9660 (41.3) | 23396 (100) | | |
| SA in lifetime | | | | 15.798 | < 0.001 |
| Yes | 389 (67.1) | 191 (32.9) | 580 (100) | | |
| No | 13846 (58.9) | 9680 (41.1) | 23526 (100) | | |
| SA in recent year | | | | 5.484 | 0.019 |
| Yes | 39 (75) | 13 (25) | 52 (100) | | |
| No | 14194 (59) | 9858 (41) | 24052 (100) | | |
| BSRS-5 | | | | 44.649 | < 0.001 |
| <6 | 13072 (58.5) | 9290 (41.5) | 22362 (100) | | |
| >=6 | 1172 (66.6) | 588 (33.4) | 1760 (100) | | |
| Suicidality in life time | | | | 49.844 | < 0.001 |
| No SI and SA | 11947 (58.1) | 8605 (41.9) | 20552 (100) | | |
| Only SI | 1909 (63.8) | 1081 (36.2) | 2990 (100) | | |
| SI and SA | 384 (66.8) | 191 (33.2) | 575 (100) | | |
| Total | 14240 (59) | 9877 (41) | 24117 (100) | | |

Note: SI= suicidal ideation; SA= suicide attempt; BSRS-5= five-item Brief Symptom Rating Scale.

**Table 3.** Prevalence of belief in suicide as an individual's right (S-IR) among the general population by suicidality gender from 2009 to 2020.

| | S-IR | | |
|---|---|---|---|
| | Yes n (%) | No n (%) | By $\chi^2$ |
| No suicidality in life time | 11832 (83.7) | 8565 (86.5) | <0.001 |
| Only suicidal ideation in life time | 1946 (13.8) | 1159 (11.7) | |
| Suicidal ideation and suicide attempt in life time | 355 (2.5) | 174 (1.8) | |

Note:1. S-IR= suicide is an individual's right.
2. Only suicide attempt in life time with positive S-IR, n=3; not displayed in the Table.

**Table 4.** Multinomial logistic regression on suicidality by belief of suicide as an individual's right (S-IR) in different age groups from 2009 to 2020.

| | | 15-24 years old | | 25-34 years old | | >=35 years old | |
|---|---|---|---|---|---|---|---|
| | | Only suicidal ideation (SI) in life time | SI and SA in life time | Only SI in life time | SI and SA in life time | Only SI in life time | SI and SA in life time |
| S-IR (0: no; 1: yes ) | B | 0.314 | 0.485 | 0.245 | 0.455 | 0.230 | 0.353 |
| | Wald | 8.095 | 2.948 | 6.737 | 4.061 | 21.600 | 11.466 |
| | P | 0.004 | 0.086 | 0.009 | 0.044 | <0.001 | 0.001 |
| | Exp(B) | 1.368 | 1.625 | 1.277 | 1.576 | 1.258 | 1.424 |
| | 95% C.I. | (1.102, 1.698) | (0.934, 2.827) | (1.062, 1.536) | (1.013, 2.452) | (1.142, 1.386) | (1.160, 1.747) |

Note: 1. Using individuals without suicide ideation or attempts in their lifetime as the reference group.
2. Only suicide attempt (SA) in lifetime not displayed in Table: n=3.

**Table 5.** Multinomial logistic regression on on suicidality by belief of suicide as an individual's right (S-IR) in different age groups from 2009 to 2020.

| Variable | B | Wald | P | EXP (B) | 95% confidence interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Higher |
| Only SI in life time [1] | | | | | | |
| Suicide is an individual's right (S-IR) | 0.230 | 21.600 | <0.001 | 1.258 | 1.142 | 1.386 |
| 15-24 years old | -0.230 | 5.425 | 0.020 | 0.795 | 0..655 | 0.964 |
| 25-34 years old | -0.021 | 0.062 | 0.803 | 0.979 | 0.828 | 1.157 |
| >=35 years old | 0 | | | 1 | | |
| 15-24 * S-IR | 0.084 | 0.484 | 0.486 | 1.088 | 0.858 | 1.378 |
| 25-34 * S-IR | 0.015 | 0.020 | 0.888 | 1.015 | 0.824 | 1.250 |
| >=35 *S-IR | 0 | | | 1 | | |
| SI and SA in life time [2] | | | | | | |
| S-IR | 0.353 | 11.466 | 0.001 | 1.424 | 1.160 | 1.747 |
| 15-24 years old | -0.611 | 5.797 | 0.016 | 0.543 | 0.330 | 0.893 |
| 25-34 years old | -0.298 | 2.071 | 0.150 | 0.743 | 0.495 | 1.114 |
| >=35 years old | 0 | | | 1 | | |
| 15-24 * S-IR | 0.132 | 0.192 | 0.662 | 1,141 | 0.632 | 2.059 |
| 25-34 * S-IR | 0.101 | 0.166 | 0.684 | 1.107 | 0.680 | 1.801 |
| >=35 * S-IR | 0 | | | 1 | | |

Note: 1.Suicide is an individual's right (1: yes , 0:no).
2.Using individuals without suicide ideation or attempts in their lifetime as the reference group.

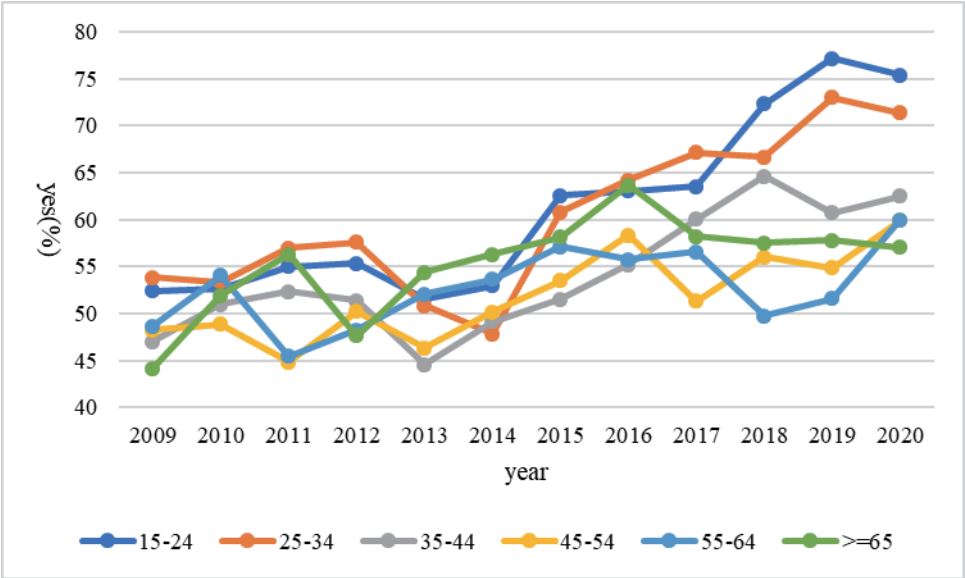


**Figure 1.** Prevalence of belief in suicide as an individual's right among the general population by age from 2009 to 2020.

**Supplement 1.** Prevalence (%) of belief in suicide as an individual's right among the general population by age from 2009 to 2020.

| year | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | >=65 |
|---|---|---|---|---|---|---|
| APC | 3.9 (2.7-5.1)*** | 3.1 (1.5-4.6)** | 2.8 (1.5-4.1)** | 2.1 (1-3.1)** | 1.2 (-0.1-2.6) | 1.7 (0.3-3.1)* |
| 2009 | 52.5 | 53.9 | 47 | 48.3 | 48.8 | 44.2 |
| 2010 | 52.7 | 53.5 | 50.9 | 48.9 | 54.2 | 52 |
| 2011 | 55 | 56.9 | 52.4 | 44.8 | 45.4 | 56.3 |
| 2012 | 55.4 | 57.6 | 51.4 | 50.2 | 48.3 | 47.6 |
| 2013 | 51.6 | 50.8 | 44.6 | 46.3 | 52.1 | 54.4 |
| 2014 | 53 | 47.8 | 49.1 | 50.1 | 53.6 | 56.3 |
| 2015 | 62.6 | 60.8 | 51.5 | 53.5 | 57.1 | 58.1 |
| 2016 | 63.1 | 64.2 | 55.2 | 58.3 | 55.8 | 63.6 |
| 2017 | 63.5 | 67.2 | 60.1 | 51.3 | 56.6 | 58.2 |
| 2018 | 72.3 | 66.7 | 64.6 | 56 | 49.7 | 57.5 |
| 2019 | 77.2 | 73 | 60.7 | 54.9 | 51.6 | 57.8 |
| 2020 | 75.4 | 71.4 | 62.5 | 59.9 | 60 | 57.1 |

Note: APC= annual percent change,***<0.001,**<0.01,*<0.05.

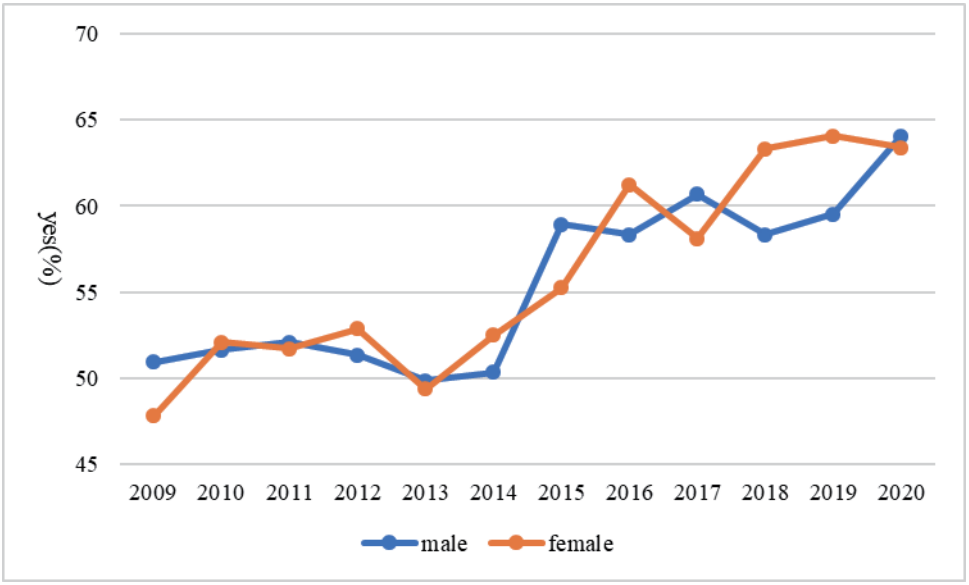


**Figure 2.** Prevalence of belief in suicide as an individual's right among the general population by gender from 2009 to 2020.

**Supplement 2.** Prevalence (%) of belief in suicide as an individual's right among the general population by gender from 2009 to 2020.

| Year | Male | Female | Total |
|---|---|---|---|
| 2009 | 50.9 | 47.8 | 49.4 |
| 2010 | 51.7 | 52.1 | 51.9 |
| 2011 | 52.1 | 51.7 | 51.9 |
| 2012 | 51.3 | 52.9 | 52.1 |
| 2013 | 49.9 | 49.4 | 49.6 |
| 2014 | 50.3 | 52.5 | 51.4 |
| 2015 | 58.9 | 55.2 | 57 |
| 2016 | 58.3 | 61.2 | 59.8 |
| 2017 | 60.7 | 58.1 | 59.3 |
| 2018 | 58.3 | 63.3 | 60.9 |
| 2019 | 59.5 | 64.1 | 61.8 |
| 2020 | 64.1 | 63.4 | 63.7 |

## Discussion

Our study presented data on the prevalence and demographic correlates of lifetime SI & SA, recent 1-year SI & SA, as well as the associated belief in S-IR in different age groups from a nationwide representative sample. Our result showed that a strong preference for S-IR was highly correlated with lifetime SI & SA, and recent 1-year SI & SA. The correlation was even higher in individuals with recent 1-year SI & SA. The stronger belief in S-IR was positively associated with higher BSRS-5 score and suicidality (SI or SA).

Although the prevalence rates of SI and SA in the general population vary widely due to study method, populations, definition of SI and SA, cultural factor and applied measures [16]In short, the reported prevalence of SI in the general population ranged widely from 2.3% to 14.6% for 1-year SI and from 10% to 14% for lifetime [17, 18]In our previous study of a nationwide community survey using a computer-aided telephone interview system, the weighted prevalence of SI was 2.84% in the past week, 5.50% in the past year, and 18.49% during a lifetime [19].

In this study, we went further to know that those with SI or SA had a higher rate of belief in S-IR than those without. The increasing trend in the preference of belief in S-IR was noted after 2013 in both genders, although the real reason was obscure (Figure 2), several factors can influence personal preference towards suicide as a right, such as autonomy and individualism, cultural and religious beliefs[20],legal and policy environment [21], social Influence and media [22], and mental health stigma [23]. It is important to note that these factors could vary across individuals and societies, and their influence might interact in complex ways.

We also found the prevalence estimates for positive response to S-IR increased esp. in younger adults (ages 15-34; Figure 1 & Supplement 1). The more permissive the attitude of a younger adult about suicide, the more frequently the suicidal behaviors might occur. Two studies of the US and Korea populations indicated that the culture has shifted towards more tolerance of suicide[9, 10],interestingly, suicide rates in adolescents and young adults have demonstrated a continuous increase in the past decade[5, 24]. Furthermore, one of the suicide myths is that 'once a person has made up his or her mind about suicide, no one can stop him or her, " [25],a frequent debate is if one has the right to die (rational suicide), no one should stop him. However, the concept of rational suicide is elusive and controversial. To make a rational decision about ending one's life, a person may be unwittingly influenced by mental illness such as depression and morbid suicidal ideas.

Our results revealed positive S-IR was highly associated with odds ratios of suicidality across the different age groups, however, there was no interaction between S-IR and age regarding lifetime SI and SA. This implies S-IR is highly associated with SI or SA regardless of the aging effect. Even in the younger groups, personal preference for S-IR could not justify the myth of increasing suicidality. Early identification of suicide risk and provision of timely and effective mental health resources are crucial to reduce potential harm to vulnerable individuals.

The limitations of the study cannot be overlooked. Telephone interviews have intrinsic drawbacks, the issue of self-selection and possible overestimation of the prevalence of psychopathology and suicide ideation could not be ruled out. Further, although we randomly recruited from a nationwide population, it could only reveal the cross-sectional prevalence and associated correlation of SI or SA with psychopathology. Moreover, we focused only on SI or SA and psychological distress in the study, not including the influence of environmental and social factors within the family. These issues must be clarified in detail for comprehensive care of at-risk people.

## Conclusion

Suicide is preventable and everyone has a role to play in saving lives and creating healthy and strong individuals, families, and communities. The personal preference in S-IR cannot persuade us in educating and promoting the importance of mental health. Suicide prevention requires a comprehensive public health approach.

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Original Articles

# A Nationwide Survey on Utilization of Mental Health Service and Associated Psychopathology and Suicidality among the General Population in Taiwan during 2017 and 2022

**Jun-Kwan Chen[1], Chia-Yi Wu[2,3], Ming-Been Lee[1,3,4*], Chia-Ta Chan[3,4], Chun-Ying Chen[3]**

**Abstract:** ***Background:*** Suicide is a major health and psychosocial issue worldwide. Of the numerous long-term and short-term risks, intolerable psychological distress associated with psychiatric disorders and stressors was the imminent trigger. The study aimed to investigate the prevalence of psychological distress and associated help-seeking utilization among community residents in Taiwan. ***Methods:*** A computer-assisted telephone interview method was used to collect data from six consecutive nationwide annual surveys from 2017 to 2022. The participants were recruited from a representative sample of the general population aged 15 and over in Taiwan. The five-item Brief Symptom Rating Scale (BSRS-5) was used to assess psychopathology including insomnia, anxiety, hostility, depression, and inferiority over the past week. A total BSRS-5 score of 6 and more defined psychiatric morbidity. The utilization of help-seeking was categorized into psychiatric services in hospitals and clinics, non-psychiatric physicians, other mental health professionals, and folk therapy. Logistic regression analysis was performed to estimate the associations between psychological distress and the utilization of help-seeking services. ***Results:*** In total, 12,638 participants completed the anonymous telephone interview during the study period. The estimated prevalence of one-week psychiatric morbidity (BSRS-5 total >5) ranged from 5.9% to 8.3% across 6 years. Among the individuals with psychiatric morbidity, the distribution of help-seeking service use was 21.9% seeking for psychiatric service, and 22.4% for folk therapy. The presence of any item of psychopathology measured by BSRS-5 and suicidal ideation (SI) presented a significantly higher rate to seek help for four types of services except for the distress of insomnia. The individuals seeking help from psychiatric services and non-psychiatric mental health professions presented a higher BSRS-5 total score than those seeking help from the other types of service. Logistic regression analysis indicated that higher levels of BSRS-5 total presented a significantly higher odds ratio to see psychiatrists and non-psychiatric mental health workers. The level of different psychological distress had a positive correlation to seeking mental health services with dose-response effects. Although there were higher rates to seek help for a psychiatrist than non-psychiatric mental health professionals, higher odds ratios to seeing non-psychiatric professionals than psychiatrists were noted for items of inferiority (OR= 8.08 vs 2.76), hostility (OR=8.74 vs 5.85) and suicidal ideation (OR=8.43 vs 3.06). ***Conclusion:*** Higher levels of general psychological distress could influence the choice to see mental health professionals. A lower rate (21.9%) of the individuals with psychiatric morbidity sought mental health services. Increasing mental health literacy and related treatment indication is critical for effective suicide prevention.

**Keywords:** help-seeking, psychiatric morbidity, psychopathology, five-item Brief Symptom Rating Scale (BSRS-5), suicidal ideation, Taiwan.

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## Introduction

Suicide is a paramount global public health concern. In 2014, the World Health Organization (WHO) advocated a global imperative to prevent suicide worldwide [1]. Next year, in 2015, the United Nations (UN) listed the suicide mortality rate as an indicator of the Sustainable Development Goals (SDGs). The goal was set to reduce suicide mortality by one-third before 2030 [2].

A history of previous suicide attempts is widely accepted as one of the strongest risk factors for suicide mortality [3]. However, suicide involves multifaceted factors, making it difficult to predict individual suicide. The hypothesis of the suicide continuum conceptualizes suicide as a process starting from suicidal ideation, with progression to plans, attempts, and eventual death. Indeed, suicidal ideation increases the risk of subsequent suicide attempts and death [4]. In short, both suicidal ideation and suicide attempts may serve as indicators warranting attention in suicide prevention strategies.

[1] Department of Psychiatry, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan; [2] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan ; [3] Taiwan Suicide Prevention Center, Taipei, Taiwan; [4] Department of Psychiatry, National Taiwan University Hospital and College of Medicine.

[*]**Correspondence to:** Ming-Been Lee, M.D., Department of Psychiatry, National Taiwan University Hospital, 7 Chung-Shan South Road, Taipei 10002, Taiwan;E-mail:mingbeen@ntu.edu.tw

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In Taiwan, we previously conducted the Taiwan Psychiatric Morbidity Survey (TPMS), the first cross-sectional survey using a sample representative of the whole population to investigate the lifetime prevalence of suicidal behaviors and common mental disorders between 2003 and 2005 [4,5]. The Taiwan Suicide Prevention Center (TSPC), launched by the authority in 2005 to implement national suicide prevention strategies, has conducted annual nationwide community surveys on suicidal behaviors and psychological distress since 2006 [5,6]. This study aimed to investigate the prevalence of suicidality and its associations with demographic covariates and psychopathology among community residents in Taiwan over the past decade. Help-seeking behaviors, as well as the relations between help-seeking behaviors and psychopathology, were also explored.

# Methods

## Participants and procedure

The study recruited participants from six consecutive annual nationwide community surveys on mental health in Taiwan from 2017 to 2022. The participants for each year were selected from a representative sample of the general population aged 15 and above using a computer-assisted telephone interview (CATI) method to identify potential respondents by selecting telephone numbers with a stratified proportional randomization method according to the distribution of sex, age, and population size in 22 different geographic areas in Taiwan [7]. The target sample size was set as 1600 a priori. The number of participants was allocated from a total of 700 million data points, covering almost all landline telephone numbers in Taiwan. The representativeness of the final sample was examined by a chi-square goodness-of-fit test compared to registered household statistics from the Ministry of Interior. The raking method was applied to ensure that the demographic distribution of the sample accurately represented the population. Oral consent was obtained from participants prior to the telephone interviews following the ethical approval of the Institutional Review Board of the National Taiwan University Hospital (No. 201204034RIC). The survey questions comprised demographics (age and sex), psychopathology, suicidality, and related mental health service utilization.

## Assessment for psychopathology

The five-item Brief Symptom Rating Scale (BSRS-5) was used to measure participants' level of psychological distress in the past week. The BSRS-5 contained the following five items: 1) having trouble falling asleep (insomnia); 2) feeling tense or keyed up (anxiety); 3) feeling easily annoyed or irritated (hostility); 4) feeling low in mood (depression), and; 5) feeling inferior to others (inferiority) [7-12]. An item of "suicidal thoughts over the past week" was added following the above five items. Each question was rated by a five-point Likert scale: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; 4, extremely. A total score was calculated for each respondent. The presence of psychiatric morbidity was defined as a BSRS-5 score of ≥6 [7-12]. The total score of the BSRS could define the severity of psychological distress: 0-5, normal; 6-9, mild; 10-14, moderate; and ≥15, severe [7-12]. The BSRS-5, either self-rated or administered through interviews, has been reported to have satisfactory psychometric properties (Cronbach's alpha: 0.89) in detecting psychiatric morbidity and suicidal ideation in medical settings and the general population [7-12].

## Types of mental health service used

When the participants answered positive responses to any item of the above-mentioned psychopathology, the service of seeking help was enquired: psychiatrists in hospitals or medical clinics, non-psychiatrist mental health professionals in general medical settings, social workers, non-psychiatric mental health workers including clinical psychologists, counselling psychologist, social workers and mental health nursing practitioners.

## Statistical analysis

In addition to descriptive statistics, cross-tabulation of type of mental health service usage by psychological distress, suicidal ideation (SI), and demographics (gender and age groups) was performed. Suicide-related variables were crossly tabulated by the status of psychiatric morbidity (i.e., BSRS-5 score ≥6 or not). Chi-square tests were used to examine whether there were significant between-group differences. Finally, we modeled multivariable logistic regression to investigate the associations between mental health service usage and SI and individual and total psychopathology domains contained in the BSRS-5 (i.e., insomnia, anxiety, hostility, depression, and inferiority). The statistical analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, NC). The significance level was set as $p < 0.05$, 2-tailed.

# Results

In total, 12,638 respondents aged more than 15 years completed the anonymous telephone interview (sampling error of ± 2.10% in a 95% confidence interval) during the study period. The estimated prevalence of one-week psychiatric morbidity (BSRS-5 total >5) was 5.9% -8.3% across 6 years (Figure 1). The profiles of percentages of seeking help due to psychological distress were paralleled with the prevalence of psychiatric morbidity across years for four types of service usage except for both psychiatric and non-psychiatric medical services during the COVID-19 pandemic period. Regarding the service usage among the individuals with any type of psychological distress (having a positive response in any item of BSRS-5), as displayed in Figure 2, the use of non-medical service (i.e., folk therapy, 15.5%; and non-psychiatric mental health workers, 6.9%) was dramatically increased at the peak of COVID-19 in 2022.

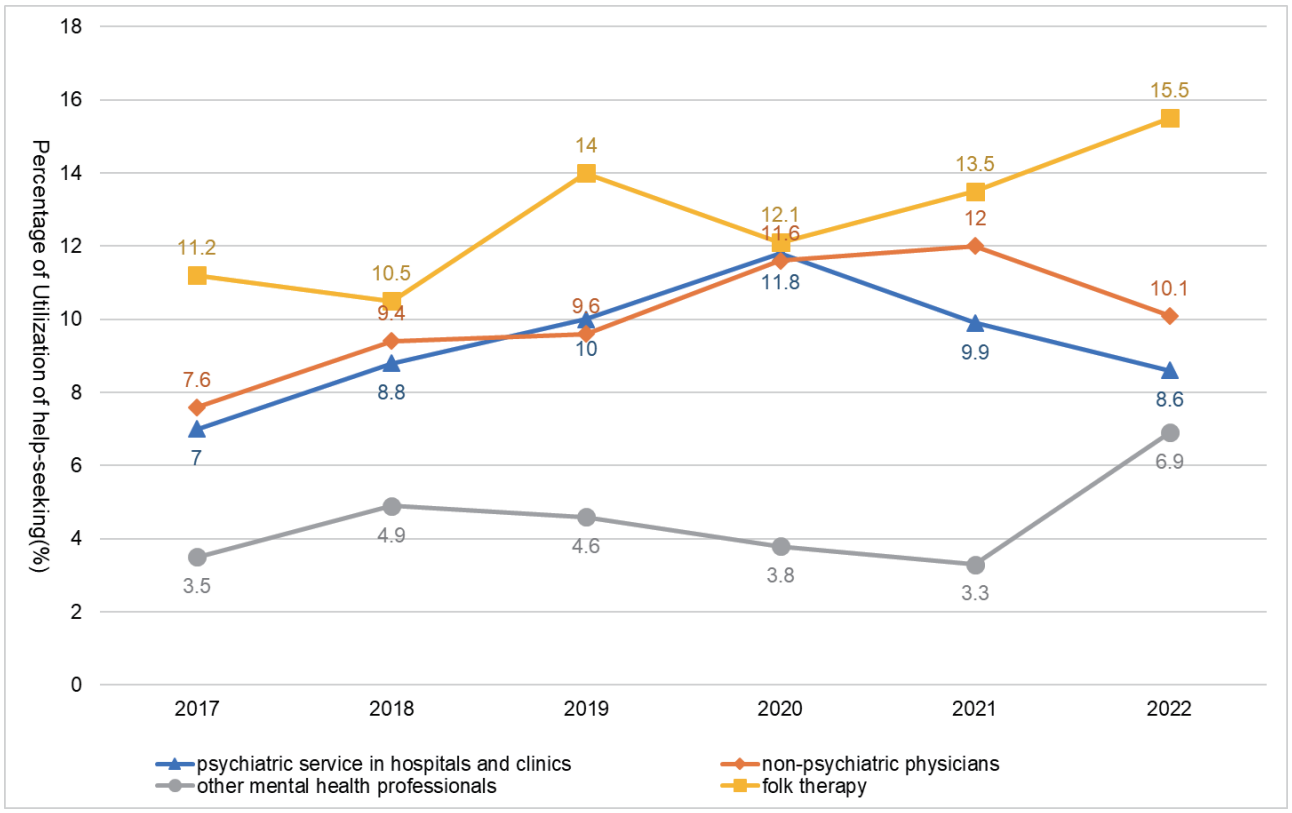


**Figure 1.** Weighted prevalence of psychiatric morbidity (BSRS-5 > 5) and percentages of help-seeking services by year among the total participants.

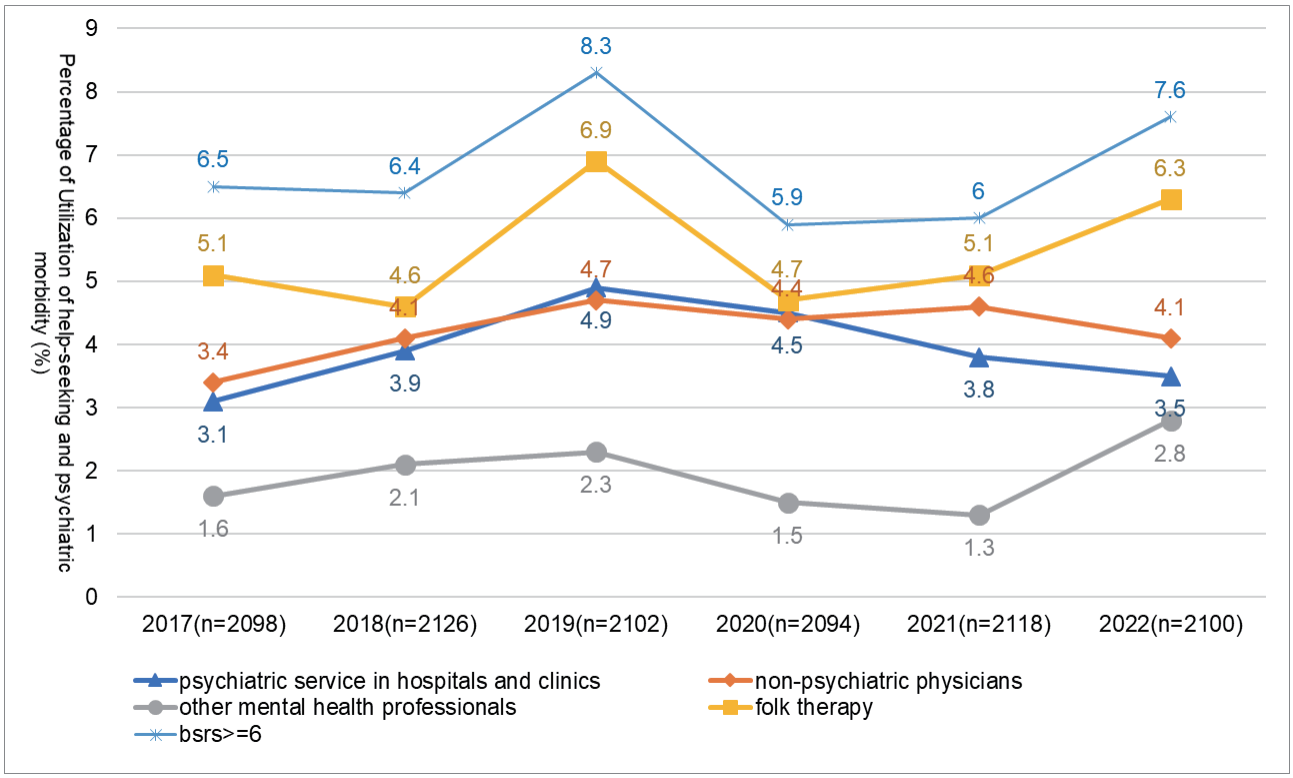


**Figure 2.** Percentages of help-seeking services by year among the individuals with positive psychological distress (score of any item of BSRS-5 > 0).

With respect to the relationship between demographics and seeking-help services among individuals with psychological distress, as shown in Table 1, the female gender had a significantly higher percentage to seek help in terms of usage of non-psychiatric medical services and folk therapy. No gender difference was observed for the usage of mental health services including psychiatric or non-psychiatric mental health services. There was a significance in age groups; aged higher utilization of psychiatric and non-psychiatric medical services for the aged over 50; the highest usage rates for non-psychiatrist mental health services for the aged 25-29; higher use of folk therapy for the aged over 30. Regarding the association between psychological distress and service use, as Table 2 showed, the presence of any item of psychopathology measured by BSRS-5 and SI presented a significantly higher rate to seek help for four types of services except for the distress of insomnia; there is no difference in rates of seeking help from the non-psychiatric mental health professionals and folk therapy. In sum, the individuals seeking help from psychiatric services and non-psychiatric mental health professions presented higher distress levels of psychopathology (e.g., the general total score of BSRS-5 was 5.33+4.00 for each) than those seeking help for the other types of service (4.19+-3.35 for non-psychiatric physicians; 4.38+-3.53). That meant that higher levels of general psychological distress could influence the choice to see mental health professionals.

Table 3 depicted the associations between psychological distress and SI and the utilization of mental health services based on the logistic regression. The results indicated that higher levels of BSRS-5 total presented a higher odds ratio to seeking help for psychiatric services and non-psychiatric mental health workers. There was a similar finding that the level of different psychological distress had a positive correlation to seeking mental health services with dose-response effects. It was interesting that although there were higher rates to seek help from psychiatrists than non-psychiatric mental health professionals, higher odds ratios to seeing non-psychiatric professionals than psychiatrists noted for items of inferiority (OR=8.08 vs 2.76), hostility (OR=8.74 vs 5.85) and suicidal ideation (OR=8.43 vs 3.06).

**Table 1.** Help-Seeking service among the individuals with positive psychological distress by demographics.

| | Psychiatric service | Chi-Square | Non-Psychiatric medical service | Chi-Square | Non-Psychiatrist mental health workers | Chi-Square | Folk therapy | Chi-Square |
|---|---|---|---|---|---|---|---|---|
| | Yes n (%) | | Yes n (%) | | Yes n (%) | | Yes n (%) | |
| Gender | | | | | | | | |
| Male | 220 (9.9) | 0.76 | 226 (10.1) | 0.026 | 85 (3.8) | 0.08 | 222 (10) | <0.001 |
| Female | 307 (10.1) | | 367 (12.1) | | 146 (4.8) | | 448 (14.8) | |
| Age | | | | | | | | |
| 15-19 | 10 (3.4) | <0.001 | 6 (2) | <0.001 | 14 (4.7) | 0.013 | 22 (7.4) | 0.001 |
| 20-24 | 15 (5.2) | | 14 (4.9) | | 14 (4.9) | | 19 (6.6) | |
| 25-29 | 23 (8.9) | | 19 (7.4) | | 23 (8.9) | | 29 (11.3) | |
| 30-34 | 25 (7.6) | | 17 (5.2) | | 16 (4.9) | | 42 (12.8) | |
| 35-39 | 34 (10.3) | | 14 (4.2) | | 20 (6) | | 51 (15.4) | |
| 40-44 | 30 (5.8) | | 28 (5.4) | | 23 (4.4) | | 62 (12) | |
| 45-49 | 31 (8.1) | | 34 (8.9) | | 21 (5.5) | | 65 (17) | |
| 50-54 | 72 (10.4) | | 85 (12.3) | | 29 (4.2) | | 97 (14) | |
| 55-59 | 49 (9.6) | | 62 (12.1) | | 22 (4.3) | | 75 (14.6) | |
| 60-64 | 88 (14.1) | | 88 (14.1) | | 20 (3.2) | | 78 (12.5) | |
| 65-69 | 59 (14.2) | | 69 (16.6) | | 10 (2.4) | | 55 (13.3) | |
| 70-74 | 57 (17) | | 85 (25.3) | | 12 (3.6) | | 41 (12.2) | |
| 75-79 | 18 (11.3) | | 46 (28.9) | | 2 (1.3) | | 25 (15.6) | |
| 80 and over | 16 (12.9) | | 26 (20.8) | | 5 (4) | | 9 (7.2) | |

**Table 2.** Help-Seeking service by psychological distress among the individuals with positive psychological distress.

| | Psychiatric service | Chi-Square | Non-Psychiatric medical service | Chi-Square | Non-Psychiatrist mental health workers | Chi-Square | Folk therapy | Chi-Square |
|---|---|---|---|---|---|---|---|---|
| | Yes n (%) | | Yes n (%) | | Yes n (%) | | Yes n (%) | |
| Insomnia | 431 (13.5) | <0.001 | 480 (15) | <0.001 | 141 (4.4) | 0.928 | 417 (13) | 0.403 |
| Anxiety | 263 (13.6) | <0.001 | 238 (12.3) | 0.072 | 137 (7.1) | <0.001 | 366 (18.9) | <0.001 |
| Hostility | 253 (10.4) | 0.358 | 235 (9.7) | 0.001 | 147 (6.1) | <0.001 | 389 (16) | <0.001 |
| Depres-sion | 290 (14.5) | <0.001 | 264 (13.2) | 0.001 | 142 (7.1) | <0.001 | 371 (18.5) | <0.001 |
| Inferiority | 197 (11.6) | 0.007 | 157 (9.3) | 0.001 | 108 (6.4) | <0.001 | 273 (16.1) | <0.001 |
| Suicide | 46 (29.7) | <0.001 | 30 (19.4) | 0.001 | 17 (10.9) | <0.001 | 36 (23.1) | <0.001 |
| BSRS<6 | 312 (6.9) | <0.001 | 397 (8.8) | <0.001 | 146 (3.2) | <0.001 | 494 (11) | <0.001 |
| BSRS>=6 | 188 (21.9) | | 137 (16) | | 96 (11.2) | | 192 (22.4) | |

**Table 3.** Regression analysis on utilization of Psychiatrists by levels of psychological distress.

| | Total | Psychiatrists | Odds ratios psychiatrists | Adjust odds ratios |
|---|---|---|---|---|
| Insomnia | | | | |
| 0 | 2242 | 97 (4.3) | ref | ref |
| 1 | 1908 | 140 (7.3) | 1.75 (1.34-2.28)*** | 1.88 (1.43-2.48)*** |
| 2 | 783 | 126 (16.1) | 4.25 (3.22-5.62)*** | 3.7 (2.76-4.96)*** |
| 3 | 273 | 74 (27.1) | 8.21 (5.87-11.48)*** | 6.62 (4.6-9.53)*** |
| 4 | 152 | 63 (41.4) | 15.68 (10.7-22.96)*** | 11.74 (7.62-18.09)*** |
| Anxiety | | | | |
| 0 | 3317 | 234 (7.1) | ref | ref |
| 1 | 1443 | 133 (9.2) | 1.34 (1.07-1.67)* | 1.39 (1.09-1.77)** |
| 2 | 417 | 80 (19.2) | 3.12 (2.36-4.12)*** | 1.85 (1.3-2.64)*** |
| 3 | 132 | 33 (25) | 4.32 (2.85-6.56)*** | 1.81 (1.04-3.14)* |
| 4 | 54 | 20 (37) | 7.59 (4.29-13.44)*** | 1.26 (0.55-2.92) |
| Hostility | | | | |
| 0 | 2774 | 244 (8.8) | ref | ref |
| 1 | 1767 | 121 (6.8) | 0.76 (0.61-0.96)* | 0.69 (0.53-0.88)** |
| 2 | 599 | 87 (14.5) | 1.76 (1.35-2.29)*** | 0.66 (0.47-0.93)* |
| 3 | 155 | 24 (15.5) | 1.86 (1.18-2.95)** | 0.38 (0.2-0.71)** |
| 4 | 63 | 23 (36.5) | 5.85 (3.45-9.94)*** | 1.3 (0.61-2.77) |
| Depression | | | | |
| 0 | 3298 | 215 (6.5) | ref | ref |
| 1 | 1441 | 147 (10.2) | 1.63 (1.31-2.03)*** | 1.72 (1.34-2.19)*** |
| 2 | 448 | 80 (17.9) | 3.11 (2.35-4.11)*** | 1.64 (1.13-2.39)** |
| 3 | 127 | 40 (31.5) | 6.64 (4.46-9.9)*** | 3.19 (1.87-5.45)*** |
| 4 | 45 | 17 (37.8) | 8.71 (4.7-16.14)*** | 3.8 (1.45-9.93)** |
| Inferiority | | | | |
| 0 | 3467 | 289 (8.3) | ref | ref |
| 1 | 1240 | 93 (7.5) | 0.9 (0.7-1.14) | 1.01 (0.77-1.31) |
| 2 | 449 | 67 (14.9) | 1.94 (1.46-2.58)*** | 0.99 (0.7-1.4) |
| 3 | 121 | 31 (25.6) | 3.75 (2.45-5.75)*** | 1.63 (0.96-2.77) |
| 4 | 69 | 14 (20.3) | 2.76 (1.51-5.04)*** | 0.41 (0.18-0.96)* |
| Suicidal ideation | | | | |
| 0 | 5198 | 454 (8.7) | ref | ref |
| 1 | 104 | 17 (16.3) | 2.04 (1.2-3.46)** | 0.8 (0.43-1.46) |
| 2 | 37 | 21 (56.8) | 13.36 (6.93-25.77)*** | 4.22 (1.95-9.15)*** |
| 3 | 15 | 5 (33.3) | 5.18 (1.75-15.32)** | 1.75 (0.45-6.72) |
| 4 | 13 | 3 (23.1) | 3.06 (0.82-11.45) | 0.49 (0.1-2.45) |
| BSRS-Total | | | | |
| 0-5 | 4509 | 312 (6.9) | ref | |
| 6-9 | 602 | 102 (16.9) | 2.74 (2.15-3.49) | |
| 10-14 | 212 | 67 (31.6) | 6.26 (4.58-8.54) | |
| 15+ | 44 | 19 (43.2) | 10.21 (5.55-18.78) | |

Note: ***p<0.001; **p<0.01; *p<0.05.

## Discussion

According to Figure 1, we could observe that between 2017 and 2022, the total number of cases seeking assistance for psychological distress roughly paralleled the curve of psychiatric morbidity (BSRS-5 > 5). However, between 2020 and 2022, there was a decrease in seeking non-psychiatric medical services and psychiatric services, which was likely related to the COVID-19 pandemic. Similar findings have been reported in a Chinese study [13].

From Figure 2, we could further observe that if we considered cases with BSRS-5 > 0 as the population, the total sum and proportion of those seeking assistance have remained relatively stable, fluctuating around 40% between 2019 and 2022. This indicated that during the COVID-19 pandemic, individuals who were hesitant to seek medical care at healthcare facilities often sought help from folk therapy or non-psychiatric mental health workers.

Table 1 showed that across all assistance modalities, there was a general trend of "higher usage rates with increasing age," with a plateau between 50 and 75 years old. Individuals below 25 years old had lower usage rates, possibly due to their limited access to resources (such as being students). Those aged 25 and above might seek help more due to increased psychological distress or higher chances of decompensation. The only exception was the utilization rate of non-psychiatric mental health workers, which was not as low for individuals below 25 years old compared to other age groups. This could be related to the presence of mental health resources in schools. However, among those aged 50 and above (especially 60 and above), there might be a generational difference leading to a tendency not to utilize non-psychiatric mental health workers' resources. This finding may be related to less psychological health literacy of the generation.

Tables 3 and 4 demonstrated that as psychological distress severity increased (indicated by higher BSRS-5 scores), the proportion of individuals seeking psychiatric service or non-psychiatric mental health workers also increased, which was understandable. Among different symptoms, cases primarily presenting with insomnia, anxiety, or depression tended to seek psychiatric services more than non-psychiatric mental health workers, especially for those with insomnia as the main problem. On the other hand, individuals presenting with hostility, inferiority, or suicidal ideation as the main issues tend to seek help from non-psychiatric mental health workers rather than psychiatric services, especially for those with inferiority as the primary concern. It was evident that people tended to view inferiority as a psychological problem rather than a psychiatric symptom.

Both Figure 1 and Figure 2 showed that when individuals experienced psychological distress, folk therapy became the most sought-after avenue for help. To address this, apart from enhancing health education and improving health literacy to encourage prompt professional assistance-seeking, establishing collaborative relationships with relevant social institutions and increasing opportunities for referral to mental health professionals should be future efforts [14].

It was demonstrated in Table 1 that the younger the age, the lower the help-seeking rate. Therefore, although Taiwan has established mental health resources in various levels of education above secondary school, there may still be an inadequate supply to meet the demand. There may also be issues with individuals' willingness to seek help or frontline workers' ability to make timely referrals. Strengthening the mechanisms for timely referrals to psychiatric care as needed could help reduce psychiatric morbidity and/or suicidal behavior [7].

For cases primarily troubled by suicidal ideation, if they only sought help from non-psychiatric mental health workers without collaboratively accessing psychiatric services, their prognosis could be concerned, as only psychiatric services could provide inpatient treatment for individuals at high risk of suicide. Therefore, it was important to reinforce the concept that individuals with suicidal ideation should also seek psychiatric medical assistance and enhance the coordination and cooperation between non-psychiatric mental health workers and psychiatric services. This remained a direction for future efforts.

Based on the authors' findings, previous studies have examined the impact of factors such as race, family functioning [15-17], family finance status [17], and stigma [18] on help-seeking behavior but there was a lack of literature specifically focusing on the association between help-seeking behaviors and symptomatology. This study could be considered as the first of its kind. A study that came closer to this topic was reported [19], but it mainly focused on the proportions of different stress sources or diagnoses among help-seekers rather than the proportions of seeking help and the channels used among individuals with different symptoms and severities.

Therefore, this study could provide important references for further research on how to enhance help-seeking motivation, provide assistance, and establish collaborative relationships among different professionals for individuals with different symptoms.

However, the study also had its limitations. Firstly, it did not mention information on variables such as marital status, education, employment status, socioeconomic status, and geographical location (accessibility to healthcare), which could have been used for comparison and analysis of their influence on the relationship between help-seeking behaviors and symptomatology.

Secondly, in the relationship between different symptoms and healthcare-seeking behaviors, it is unclear whether symptomatology exhibits clustering or whether certain symptoms have particular determinative significance. Furthermore, the progression of the illness and its impact on symptoms, healthcare-seeking behavior, and the presence of mediating variables or confounding factors were not thoroughly addressed in this study.

**Table 4.** Regression analysis on utilization of other mental health service by levels of psychological distress.

| | Total | Other mental health workers | Odds ratios other mental health workers | Adjust odds ratios |
|---|---|---|---|---|
| Insomnia | | | | |
| 0 | 2242 | 104 (4.6) | ref | ref |
| 1 | 1908 | 53 (2.8) | 0.59 (0.42-0.82)** | 0.68 (0.48-0.96)* |
| 2 | 783 | 43 (5.5) | 1.2 (0.83-1.72) | 0.89 (0.6-1.32) |
| 3 | 273 | 26 (9.5) | 2.14 (1.36-3.36)** | 1.51 (0.92-2.48) |
| 4 | 152 | 17 (11.2) | 2.65 (1.55-4.54)*** | 1.43 (0.74-2.76) |
| Anxiety | | | | |
| 0 | 3317 | 89 (2.7) | ref | ref |
| 1 | 1443 | 93 (6.4) | 2.5 (1.86-3.37)*** | 1.97 (1.44-2.69)*** |
| 2 | 417 | 37 (8.9) | 3.56 (2.4-5.3)*** | 1.59 (0.99-2.56) |
| 3 | 132 | 15 (11.4) | 4.66 (2.62-8.29)*** | 1.65 (0.81-3.35) |
| 4 | 54 | 7 (13.2) | 5.68 (2.53-12.74)*** | 0.78 (0.25-2.4) |
| Hostility | | | | |
| 0 | 2774 | 81 (2.9) | ref | ref |
| 1 | 1767 | 90 (5.1) | 1.77 (1.3-2.41)*** | 1.4 (1.02-1.94)* |
| 2 | 599 | 49 (8.2) | 2.95 (2.04-4.25)*** | 1.26 (0.81-1.96) |
| 3 | 155 | 9 (5.8) | 2.05 (1.01-4.17)* | 0.56 (0.24-1.29) |
| 4 | 63 | 13 (20.6) | 8.74 (4.59-16.65)*** | 2.73 (1.12-6.63)* |
| Depression | | | | |
| 0 | 3298 | 90 (2.7) | ref | ref |
| 1 | 1441 | 78 (5.4) | 2.03 (1.49-2.76)*** | 1.51 (1.08-2.1)* |
| 2 | 448 | 48 (10.7) | 4.29 (2.98-6.18)*** | 2.37 (1.48-3.79)*** |
| 3 | 127 | 17 (13.5) | 5.47 (3.14-9.52)*** | 2.98 (1.47-6.03)** |
| 4 | 45 | 8 (17.4) | 7.58 (3.44-16.69)*** | 1.98 (0.6-6.52) |
| Inferiority | | | | |
| 0 | 3467 | 117 (3.4) | ref | |
| 1 | 1240 | 53 (4.3) | 1.28 (0.92-1.79) | 1.06 (0.75-1.49) |
| 2 | 449 | 41 (9.1) | 2.85 (1.96-4.13)*** | 1.5 (0.98-2.3) |
| 3 | 121 | 15 (12.4) | 3.94 (2.21-7.01)*** | 1.81 (0.95-3.46) |
| 4 | 69 | 15 (21.7) | 8.08 (4.44-14.69)*** | 2.87 (1.31-6.31)** |
| Suicidal ideation | | | | |
| 0 | 5198 | 221 (4.3) | ref | |
| 1 | 104 | 10 (9.6) | 2.41 (1.24-4.68)** | 1.04 (0.51-2.11) |
| 2 | 37 | 5 (13.5) | 3.83 (1.52-9.65)** | 1.14 (0.41-3.15) |
| 3 | 15 | 3 (20) | 4.98 (1.32-18.79)* | 2.25 (0.52-9.67) |
| 4 | 13 | 3 (25) | 8.43 (2.43-29.28)*** | 0.73 (0.11-4.76) |
| BSRS-Total | | | | |
| 0-5 | 4509 | 146 (3.2) | ref | |
| 6-9 | 602 | 63 (10.5) | 3.49 (2.56-4.75) | |
| 10-14 | 212 | 24 (11.4) | 3.92 (2.49-6.16) | |
| 15+ | 44 | 9 (20.5) | 7.73 (3.66-16.33) | |

Note: ***p<0.001; **p<0.01; *p<0.05.

## Conclusion

The study highlighted that health literacy and increasing self-awareness of psychopathology remain key elements of suicide prevention strategies for individuals at risk of suicide.

## Acknowledgments

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