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SUICIDAL BEHAVIOR ACROSS A BROAD RANGE OF PSYCHIATRIC DISORDERS

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Abstract

Suicide is a leading cause of death worldwide. In 2020, some 12.2 million Americans seriously contemplated suicide, 3.2 million planned suicide attempts, and 1.2 million attempted suicide. Traditionally, the approach to treating suicidal behavior (SB) has been to treat the "underlying" psychiatric disorder. However, the number of diagnoses associated with SB is considerable. We could find no studies describing the range of disorders reported to be comorbid with SB. This narrative review summarizes literature documenting the occurrence of SB across the lifespan and the full range of psychiatric diagnoses, not only those that comprise MDE and BPD. It also describes the relevance of these observations to clinical practice, research, and nosology.

The literature searches contained the terms "suicid*" and each individual psychiatric diagnosis and identified 587 studies. We did not include case reports, case series, studies only addressing suicidal ideation or non-suicidal self-injury (NSSI), studies on self-harm, not distinguishing between suicidal and NSSI and studies that did not include any individuals that met criteria for a specific DSM-5 diagnosis (n=366). We found that SB (suicide and/or suicide attempt) was reported to be

associated with 72 out of 145 diagnoses, although data quality varied. Thus, SB is not exclusively germane to Major Depressive Episode (MDE) and Borderline Personality Disorder (BPD), the only conditions for which it is a diagnostic criterion.

That SB co-occurs with so many diagnoses reinforces the need to assess current and past SB regardless of diagnosis, and supports the addition of charting codes to the DSM-5 to indicate current or past SB. It also comports with new data that specific genes are associated with SB independent of psychiatric diagnoses, and suggests that SB should be managed with specific suicide prevention interventions in addition to treatments indicated for co-occurring diagnoses. SB diagnostic codes would help researchers and clinicians document and measure SB's trajectory and response to treatment over time, and, ultimately, help develop secondary and tertiary prevention strategies. As a separate diagnosis, SB would preclude situations in which a potentially life-threatening behavior is not accounted for by a diagnosis, a problem that is particularly salient when no mental disorder is present, as is sometimes the case.

INTRODUCTION

Suicide is a leading cause of death worldwide. In the US, suicide is the second leading cause of death in those aged 10–34. On average, the annual U.S. suicide rate increased 30% between 2000 and 2019, from 10.4 to 13.5 suicides per 100,000 people. The number of people who contemplate or attempt suicide is even higher. In 2020, an estimated 12.2 million American adults seriously thought about suicide, 3.2 million planned a suicide attempt, and 1.2 million attempted suicide[1]. Attempts are important in their own right, associated with profound disability, disruption, and suffering, but also with higher rates of death by suicide. Although most people who attempt suicide do not die by suicide, a prior suicide attempt is the single most important risk factor for suicide in the general population. Thus, unraveling factors associated with risk for both suicide and suicide attempts, is a public health imperative.

In the main section of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), suicidal behavior is specified as a symptom of two discrete constructs, Major Depressive Episode (MDE) and Borderline Personality Disorder (BPD)[2]. This narrative review summarizes literature documenting the occurrence of SB across the lifespan and the full range of psychiatric diagnoses, not only those that comprise MDE and BPD. It also describes the relevance of these observations to clinical practice, research, and nosology.

METHODS

We defined suicidal behavior (SB) as including suicide attempt (SA) and suicide. We applied the Center for Disease Control's definition of SA: a non-fatal self-directed potentially injurious behavior with any intent to die as a result of the behavior. Literature searches were completed through PubMed from October 2019 through May 2020. Searches contained the terms "suicid*" and each of 145 individual DSM-5 diagnoses, including all variations of diagnoses' names (e.g. alcohol use disorder and alcohol dependence; persistent depressive disorder and dysthymia, etc) (See Supplement A). Studies written in English that examined

SB within any DSM-5 diagnosis and were published between 1984 and 2020, were identified (n=587). We excluded duplicates, case reports, case series, studies only addressing suicidal ideation or NSSI, studies not addressing SB, studies, including those on self-harm, that do not distinguish between suicidal and NSSI and studies that did not include any individuals who met criteria for a specific DSM-5 diagnosis (e.g. studies of substance use not substance use disorders) (n=366). Studies that examined SB risk in a given disorder within a particular population (e.g. impact of conduct disorder on SB risk in those with bipolar disorder) were included because only a small percent of studies controlled for comorbidities and many of the study populations likely had many participants with more than one diagnosis. For diagnoses comprising MDE (major depressive and bipolar disorder) and BPD, given that SB is a diagnostic criterion, we included only review papers.

In total, 221 papers were included. Two of the authors (YEX and DAB) reviewed each study, extracted key findings, and evaluated the studies based on the Oxford Center for Evidence Based Medicine's (OCEBM) 2011 Levels of Evidence guidelines (see Table 1)[3–5]. Studies were classified as level 1, 2 or 3. A third author (KS) then independently classified all studies as level 1, 2, or 3. Discrepancies were reviewed by MAO, who assigned a final rating. Although the OCEBM classification scheme allows for adjustment to the labels based on quality of the study or magnitude of the effect size, we opted to not make this type of adjustment for simplicity. However, we did downgrade studies rated 1 to level 2 if the data were more than 10 years old. Note that no studies were level 4 because case series were excluded from this review.

RESULTS

The literature revealed that SB occurs across a wide range of psychiatric diagnoses (see Tables 1 and 2). Table 1 lists each individual study summarizing its findings and the assigned OCEBM rating. Table 2 summarizes the studies (number of positive studies divided by total number of studies and highest level of evidence) for both suicide attempt and suicide. Below we describe findings based on DSM-5 diagnostic groupings.

Neurodevelopmental Disorders

Few studies focus on SB rates among individuals with intellectual disabilities. However, reviews suggest that approximately 20–21% of adolescents and 6–11% of adults with intellectual disabilities make suicide attempts in their lifetime[6–9].

In autism spectrum disorder (ASD), SA rates in youth ranged from 7–42% according to one systematic review[10], although some studies included were unclear about SA definitions. However, two additional systematic reviews of lifetime SB in ASD found similar rates (7–50%)[11–14]. Data from a national registry of ASD youth found the SA hazard ratio (HR) to be 5.38–5.79 that of the general population[15]. As for suicide, ASD suicide rates surpassed those of the general population in women, according to one statewide registry[16].

Several studies demonstrated increased risk for SB in Attention Deficit Hyperactivity Disorder (ADHD). According to one large meta-analysis[17], the odds ratio (OR) was 2.37

for SA (95% CI: 1.64–3.43) and 6.69 (95% CI: 3.24–17.39) for suicide in individuals with ADHD relative to controls. Other studies[18–23] found similar rates.

Only one study was identified for specific learning disorders (SLDs). Findings indicated that SA risk was only modestly elevated after controlling for psychiatric comorbidities (OR 1.46 [95% CI: 1.05–2.04])[24].

One study found increased rates of SI but not SA in those with tic disorders, including Tourette's[25]. In a matched case-control study, the ORs of SA and suicide in tic disorders were 3.86 (95% CI: 3.50–4.26) and 4.39 (95% CI: 2.89–6.67), respectively, relative to those without tic disorders; notably, when ORs were adjusted for psychiatric comorbidities the ORs were lower but still significant[9].

We identified no studies of SB in those with global developmental delay or communication disorders.

Psychotic Disorders

Several studies investigated the risk of SB in those with psychotic symptoms across DSM-5 diagnoses. In those with first episode psychosis, 28–40% had past SAs[26], and 12–15% attempted suicide during the 3-year follow-up[27]. Primary psychotic disorders[28, 29] were often studied as a group (including schizophrenia, schizophreniform disorder, brief psychosis, schizoaffective disorder, delusional disorder, and unspecified psychosis) and found to be associated with past SA rates of approximately 27–35%. This was similar (23%) when mood disorders with psychotic features were included[30]. A meta-analysis[31] of SB risk in psychosis found the weighted ORs of SA and suicide to be 1.36 (95% CI: 1.25–1.48) and 1.40 (95% CI: 1.14–1.72), respectively, relative to those without psychosis.

Some studies focused on SB in specific psychotic disorders. One review found that approximately 5–7% of patients with schizophrenia died by suicide[26]. A small study of patients with acute transient psychotic disorder (ATPD) observed that 19% had a SA during acute illness, and 36% over a 5-year follow-up period[32]. Subsequently, a large Danish registry study examining mortality in ATPD found the standardized mortality ratio (SMR) for suicide to be 30.9 (95% CI: 17.5–54.4)[33]. Few studies investigated SB in delusional disorder. One review indicated that 0–21% of this population had a history of SA[34].

Bipolar Disorders

Suicide risk has been frequently studied in bipolar disorder (BD). Reported lifetime SA rates in BD range from 19 to 50%[35–42]. Two factors increased the odds of past SA: 1) experiencing a mixed index episode (OR 3.39 [95% CI: 1.57–7.34]), and 2) the number of prior depressive episodes (OR 1.62 [95% CI: 1.34–1.95])[40]. Data were inconclusive on whether SAs were more prevalent in bipolar I or II disorder; however, SA rates were reported to be higher in bipolar versus unipolar depression (19% versus 12%)[39]. Two systematic reviews of BD in youth[42, 43] found SA rates to be 14–39% and 21–26%, respectively; as in adults, history of mixed episodes was a risk factor[43].

One systematic review found that individuals with BD are 20–30 times more likely to die by suicide than the general population and have more lethal SAs[44]. Suicide rates were reported at 7.77% (95% CI: 6.01–10.05) in men and 4.78% (95% CI: 3.48–6.56) in women[45] but sometimes as high as 20%[37, 38]. Moreover, 6–10% of all suicides were in those with BD[46, 47], a significant finding given that the prevalence of BD ranges between 1–4%[48].

One study examined SB in youth (ages 6–12) with cyclothymic disorder[49]. Among participants, 4% had an existing history of SAs, and 4% attempted suicide during the follow-up period. These rates were comparable to those seen in bipolar I and II disorder.

Overall, data indicate very high rates of SA and suicide in those with BD.

Depressive Disorders

As mentioned before, SB is a criterion for MDD. Lifetime SA rates in MDD approached 21–40%[45, 50, 51]. A review noted that a large Danish registry reported suicide rates of 6.67% (95% CI: 5.72–7.78) for men and 3.77% (95% CI: 3.05–4.66) for women[45] with MDD. Interestingly, psychotic features accompanying a major depressive episode increased risk for SA but not suicide[52].

Fewer, generally smaller, studies examined SB in persistent depressive disorder (PDD) and dysthymia. No differences in SA rates were found between those with dysthymia versus MDD[53] overall, although SA risk in dysthymia appeared lower relative to recurrent, but not single-episode, MDD[54].

Several studies investigated SB in premenstrual dysphoric disorder (PMDD). In a Korean sample with a 2.4% rate of the disorder, PMDD was associated with increased risk for lifetime suicidal ideation but not SA[55]. In a U.S. sample with a 4% rate of PMDD, SA risk was elevated in those with versus without PMDD (OR 2.10 [95% CI: 1.08–4.08])[56]. Evidence on the relationship between SA in PMDD and menstrual cycle phase was mixed, with some but not all studies suggesting that SAs were more common in the early follicular phase[57, 58].

Few studies examined SB in disruptive mood dysregulation disorder (DMDD), likely owing to the recency of its description. One[59] studying youth in the juvenile justice system indicated that those with DMDD exhibited higher SA rates than those with other disruptive behavior disorders (36% versus 19% in oppositional defiant disorder, conduct disorder, and ADHD), but comparable to other mood disorders in this sample.

Thus, although research clearly demonstrates increased risk for SB in MDD, fewer data are available for other specified depressive disorders.

Anxiety Disorders

Several studies examined SB in those with anxiety disorders, with mixed results[60, 61]. Two of four studies of specific phobias[62–65] showed no association between specific phobias and SB while the other two found increased risk of SA (adjusted OR [aOR] 1.6–2.7). Similarly, three of four large studies of SB in social anxiety[63–66] demonstrated increased SA risk (aOR

1.6–3.8); 18% with SA)[67]. Only two of four studies in agoraphobia without panic disorder suggested increased SA risk (aOR 1.7–4.9)[63–66]. In generalized anxiety disorder (GAD), three studies found increased SA risk (aOR 1.9–5.8)[61, 65, 66, 68], while another three did not[62–64], one suggested greater risk for suicide[67].

Findings were more consistent in panic disorder. Multiple groups found an increased SA risk in those with panic disorder (aOR 1.9–4.3) compared to those without[62, 65, 66, 69, 70]. This was further supported by a systematic review and meta-analysis which determined the SA OR in the presence of panic disorder to be 3.96 (95% CI: 2.13–7.35)[61]. Only two studies found no association between panic disorder and SA[63, 64].

Summarizing, results were mixed for anxiety disorders, with most research supporting an association between several anxiety disorders and SAs. We identified no papers examining SB in separation anxiety or selective mutism.

Obsessive-Compulsive Disorders

Results from studies investigating SB in OCD are equivocal. One cross-sectional study found that 19% of patients with OCD had prior SAs, but it did not control for psychiatric comorbidities[71]. Another study following patients with OCD for four years found that 5% attempted suicide during this time, while 0.9% died by suicide[72]. Overall, the presence of OCD appeared to have a moderate effect (Hedge's G=0.66 [95% CI: 0.49–0.82]) on SA risk[73] comporting with large case control study reporting an OR of 5. 5.45 (95% CI: 5.24–5.67)[74]. Multiple other studies, however, found more modest, if any, associations between OCD and SA risk. While one study estimated the aOR of SA in OCD to be 1.13 (95% CI: 1.04–1.24)[75], several others found no link at all[61, 63, 64]. The aforementioned study following OCD patients for four years found that 0.9% died by suicide during the period of observation, which is numerically higher than what is observed in the general population[72].

Fewer studies examined SB in body dysmorphic disorder (BDD). A large cross-sectional study found that after adjusting for age, sex and other psychiatric disorders, the OR for SA in BDD was 2.11 (95% CI: 1.12–3.98)[76]. Similarly, one systematic review and meta-analysis found the SA OR in BDD to be 3.30 (95% CI: 2.18–4.43)[77]. In other studies of BDD, 24–28% had a history of SA[78, 79], with an annual incidence of SA of 2.5%; 0.3% died by suicide during follow-up[80].

In summary, multiple studies document a link between SB and OCD and BDD, although for OCD results were mixed. We identified no papers examining SB in hoarding disorder, trichotillomania, or excoriation disorder.

Trauma- and Stressor-Related Disorders

A study of post-traumatic stress disorder (PTSD) reported that 14% of individuals with PTSD had at least one SA following their trauma[81]. Several population-based surveys and one meta-analysis documented the ORs for SA in PTSD to range from 1.8 to 5.1 compared to the general population[61, 63–66, 82–86]. A meta-analysis in adolescents found a moderate effect size (d = 0.7) of PTSD on SA risk[87]. The HR of SA in those with PTSD was 4.22

(95% CI: 1.66–10.74), comparable to that in MDD[88]. For suicide, data were less consistent with one of two studies finding an increased SMR[89, 90].

One study examined suicide risk in acute stress disorder. Controlling for depression and marital status, acute stress disorder's OR for suicide was 10 (95% CI: 7.7–14) [91].

Few studies examined SB in adjustment disorders. In adolescents with adjustment disorder, SA rates ranged from 9–19%[92, 93]. Those with adjustment disorders had decreased latency between first reported SI and subsequent suicide death compared to those with other affective disorders (2 and 22 months, respectively)[94].

Overall, there is robust evidence for increased SB risk in PTSD but fewer data for acute stress or adjustment disorders. We identified no papers examining SB in reactive attachment disorder and disinhibited social engagement disorder.

Dissociative Disorders

Studies examining SB in dissociative disorders were rare. One cohort study found that those with dissociative disorders were more likely than other outpatients to have prior SAs[95]. Moreover, relative to other psychiatric conditions, including alcohol use disorder, BPD, and PTSD, dissociative disorders were the strongest predictor of multiple prior SAs[95].

Somatoform and Related Disorders

Few studies investigated SB in somatoform disorders. A study of individuals with conversion disorder found that 35% had a history of SA; alcohol use, dissociative symptoms, and prior emotional abuse were significant predictors of SA[96]. Another study examining somatoform disorders found a history of SA in 13% of patients[97].

Feeding and Eating Disorders

Studies that examined SB in individuals with eating disorders (ED) found that 9–36% had prior SAs[98–100]. EDs conferred a 1.8-fold and 2.0-fold increase in risk for SA and suicide, respectively, even when controlling for depressive, anxiety, and substance use disorders[101].

Among those with anorexia nervosa (AN), 6–28% attempted suicide[102–105]. Other studies reported ORs for SA ranging from 1.7 to 7.9[106]. Of note, controlling for socio-demographic factors and psychiatric comorbidities, the OR for SA approached 5.4 (95% CI: 3.80–7.67)[105]. Focusing on suicide, 1.2% of those with AN died by suicide[102–105], the reported OR for suicide was 2.7[101], and the SMR was 31[107].

In bulimia nervosa (BN), 13–31% of adults and 35% of adolescents had past SAs[103, 105, 108–113], with a case-control study showing a relative risk of 5.08[114]. However, not all studies found an increased risk for SAs or suicide in BN[101, 105, 115].

Fewer studies examined SB in binge eating disorder (BED). Among those with BED, 8–28% had past SAs[103, 105, 116–118]. Although one study estimated the OR of SA in the presence of BED to be 4.8[105], another posited that BED did not increase SA risk[28]. Notably,

multiple studies found that binge/purge or purging ED subtypes increased risk of SAs[98, 105, 118–121].

Summarizing, evidence suggests that EDs significantly increased risk of SB, especially in those with purging behaviors. We identified no papers examining SB in pica, rumination, and avoidant/restrictive food intake disorders.

Elimination Disorders

We identified no studies examining SB in elimination disorders.

Sleep-Wake Disorders

Literature examining SB in sleep disturbances is growing rapidly, but studies examining sleep-wake disorders are scant. A large retrospective study using insurance data found that a diagnosis of insomnia increased odds of SA more than 3-fold, adjusting for multiple demographic and medical variables including substance use and mental disorders (aHR SA: 3.53 [3.06–4.08], $P < 0.001$)[122]. One study examining SA in individuals with restless legs syndrome found an elevated risk (aOR 2.80 [95% CI: 1.29–6.11])[123]. We identified no studies examining SB in hypersomnolence disorder, narcolepsy, obstructive sleep apnea, hypopnea, central sleep apnea, sleep-related hypoventilation, circadian rhythm sleep-wake disorders, non-rapid eye movement sleep arousal disorders, nightmare disorder or rapid eye movement sleep behavior disorder.

Sexual Dysfunctions

We identified no studies examining SB in sexual dysfunctions.

Gender Dysphoria

Very few studies examined gender dysphoria as a risk factor for SB. Cross-sectional studies suggest that suicide attempts occur in 13–30% of those with gender dysphoria, although one study appeared to use the term "transgender" and gender dysphoria interchangeably. [124–126]. Of note, not all transgender individuals have gender dysphoria.

Disruptive, Impulse-Control, and Conduct Disorders

Only a few studies explored SB in disruptive, impulse-control, or conduct disorders. Among children with oppositional defiant disorder (ODD), 11.9% had past SAs[127], with ORs for SA estimated to be 1.7–2.2 relative to those without ODD[128, 129].

Data on SB in intermittent explosive disorder (IED) revealed similar patterns, with SA rates around 12–16%[130, 131] and a SA OR range of 1.5–11.3[128, 129, 132, 133], although one study[130] diverged, finding no contribution of IED to SA risk.

Adolescents with conduct disorder (CD) had an increased risk for SA (HR 5.17, 95% CI: 2.29–11.70) compared to controls[134], although other studies reported a more modest risk (OR 1.8–2.1)[128, 129]. Among adults with opioid use disorder stable on methadone, those with comorbid CD were more likely to have prior SAs and to have been hospitalized for these attempts[135].

No studies addressed pyromania, but the sole study on kleptomania identified found a SA rate of 24.3% among those with the disorder[136].

Overall, research suggests an increased risk for SB in disruptive, impulse-control, or conduct disorders.

Substance-Related and Addictive Disorders

Alcohol-Related Disorders—Individuals with alcohol use disorder (AUD) were between 1.7 and 4 times more likely to attempt suicide[137–141]. One study stratified risk based on alcohol use severity, finding a link between SA and alcohol dependence (aOR 2.02 [CI 1.43–2.85]) but not misuse[142]. However, among suicide attempters, between 4.6–12.6% were reported to have AUD, not far from estimated world-wide estimated AUD rates for the general population (8–10%)[143, 144]. In terms of suicide, those with AUD are between 4 and 20 times more likely to die by suicide relative to the general population[145–149] and the lifetime risk of suicide in with AUD ranged from 1.8–6.2%[150, 151]. Moreover, AUD rates among suicides have been reported to range between 10–22%[152–154], observations that require evaluation in the context of the aforementioned AUD rates of 8–10%[144]. Of note, a study of suicides in an Inuit population did not find elevated rates of alcohol dependence among the decedents relative to deceased controls[155].

The patterns were similar in specific sub-populations. For example, SA risk did not seem to be affected by AUD in a sample of state prisoners[156], but for veterans with AUD comorbid with PTSD, SA risk was elevated beyond that conferred by PTSD alone[157]. On the other hand, in another study, male veterans with AUD had a higher risk of suicide than controls (HR 1.65 [95% CI 1.52–1.76])[158].

Caffeine-Related Disorders—We could find no studies of caffeine use disorder and SB although a few noted the impact of caffeine use.

Cannabis-Related Disorder—In U.S. veterans, cannabis use disorder was associated with an increased risk of SA (OR 2.31 [1.59–3.34])[159, 160]. Of note, even among those with bipolar disorder, a high risk group, cannabis use disorder increased SA risk further, albeit modestly (OR=1.35 [95% C.I. 1.08–1.70])[161]. In U.S. veterans, cannabis use disorder conferred increased risk for suicide in males (OR 1.16 [1.02–1.33]), but not females[158].

Hallucinogen-Related Disorders—No studies evaluated current hallucinogen use disorder and SB, although a few studies focused on hallucinogen use with mixed results.

Inhalant-Related Disorders—Only one study examined SB in adults with inhalant use, finding no association between lifetime misuse or dependence and SAs[162]. Studies in children and adolescents, however, did show a two- to five- fold increase in SA risk[163, 164].

Opioid-Related Disorders—Opioid dependence was found to confer a 65% increase in the risk for lifetime SA[165] with one study reporting that 39% of those with either opioid or cocaine dependence had a lifetime history of SA.[166]. Moreover, 6% of those with past year

OUD due to prescription opioids had a past year SA, after adjusting for anxiety, depression and SUD[167]. In addition, opioid use disorder (OUD) was associated with a 6- to 13-fold increased risk of suicide relative to the general population[145, 158, 168], although one study reported more modest effects, with OUD doubling the risk in women and increasing it by 30% among men[158]. These trends persisted in specific sub-populations. Among a cohort of U.S. veterans seeking pain management care, presence of OUD doubled the risk of SA in the year following the first visit[169]. However, although past-year prescription OUD was not associated with elevated risk of past-year SA, individuals with weekly or more frequent misuse were twice as likely to have past-year SAs[169].

Sedative-, Hypnotic-, and Anxiolytic-Related Disorders—A single study of nearly 5 million U.S. military veterans examined sedative, hypnotic, and anxiolytic use disorder and SB, finding that those with the disorder were twice as likely to die by suicide than those without it[158].

Stimulant-Related Disorders—Studies of SB in stimulant use disorder showed mixed results. The estimated lifetime prevalence of SA in stimulant-dependent individuals was reported to be 43.5% for cocaine and 28.7% for methamphetamine use[170, 171]. The risk for suicide in those with amphetamine use disorder was elevated with a SMR of 12.20 (95% C.I. 4.89–30.47)[172]. In contrast, among veterans, cocaine use disorder was not associated with increased suicide risk, but stimulant use disorder conferred a 30% increased risk in males only[158].

Tobacco-Related Disorders—Nicotine dependence was associated with both lifetime SA (aOR 1.78 [CI 1.48–2.15]) and past-year SA (aOR 1.77 CI 1.02–3.06)[173] in the general population, although a twin registry evinced greater risk (OR for males: 6.59 [1.91–22.70]; females: 3.37 [1.25–9.04] [174]. Correspondingly, nicotine use cessation reduced risk[173]. Both current (aOR 1.49 [CI 1.13–1.95]) and former (aOR 1.31 [CI 1.01–1.69]) tobacco use was correlated with SA[175]; this increased risk was concentrated in persistent, new, and relapsing tobacco users[175]. Individuals with past-year tobacco use were 1.7 times more likely to have attempted suicide in that year (aRR 1.7 [CI 1.38–2.12])[176] an effect that appeared to be driven by those who met criteria for nicotine dependence in the past month[176]. However, among patients with bipolar disorder, who are already at higher risk for SA, nicotine dependence did not increase risk of lifetime SA[177]. As for suicide, nicotine dependence increased risk by about 36% even after adjusting for sociodemographic factors and psychiatric and medical comorbidities[178].

These patterns persisted in specific adult sub-populations. In prisoners, nicotine use disorder (NUD) increased SA risk (OR 2.1 [1.7–2.5])[156]. In contrast, mild NUD was not associated with past-year SA in adolescents with mild NUD or in adolescent males with more severe NUD; however females with more severe NUD were at greater SA risk [OR 3.87 (1.09–13.73)] [179]. In U.S. veterans, tobacco use disorder was associated with increased risk of suicide (OR 1.36 [1.27–1.46])[158].

Gambling Disorder—Gambling disorder (GD) was associated with increased risk of SB across several studies. Reported SA rates among individuals with GD ranged from 4% to

40%[180–188], with SA risk increased 2.7-fold relative to controls[181]. Those with past-year pathological gambling were 3.4 times more likely to have a past-year SA[189] and the risk for lifetime SA was 12-fold[190]. The suicide-specific SMR was 15 times that of the general population[191]. On the other hand, 11% of suicides met criteria for GD relative to <1% of controls[192].

Neurocognitive Disorders

Data strongly support increased SB risk among individuals with dementia, with a three- to ten-fold increase in suicide risk relative to controls across all dementia subtypes. However, most studies did not control for psychiatric comorbidities[193]. Huntington's disease conferred the greatest risk with 27% of individuals reporting past SA and 5–13% dying by suicide[193–199]. In Parkinson's disease, the suicide rate is 2–5 times that of the general population[200], and in one study, 0.55% died by suicide over an 11 year period[201]. The suicide risk in PD is even greater in patients with comorbid depression, delusions, or any psychiatric disorder[202]. In frontotemporal dementia, SA risk was also elevated, especially in those with the behavioral variant[203, 204].

A study of adolescents with TBI found an increased risk of SA (HR 3.86)[205] and studies of traumatic brain injury (TBI) report a 1.5–3.3-fold increase in suicide risk relative to adults without TBI[206–211], although not all studies found an association[212].

We identified no papers examining SB in delirium, perhaps due to the difficulty in establishing intent.

Personality Disorders

Personality disorders (PDs) have consistently shown an association with SB, though not all have been equally studied. Risk of SB was found to be increased in the presence of any PD, with a SA OR of 3.4–4[213, 214] and a SMR of 31.5[215]. Not all studies supported this association, though findings may have been limited by the low incidence of SB[216].

Given that SB is a criterion for BPD, it is unsurprising that the strongest associations between SB and PD are found in this population. In fact, 50–90% of those with BPD report prior SAs[217, 218]. SA risk in youth and adults with BPD is estimated to be between two[219] and six times[213, 220] that of those with MDD, and no PDs, respectively. Moreover, studies have consistently found a 3–10% rate of suicide[221–223], reflecting a 54-fold increase in risk relative to the general population[224].

Studies of SB in antisocial personality disorder (ASPD) yielded mixed results. SA prevalence was reported to be 11%. Other studies report a 3.7-fold increase in SA risk compared to controls. Among attempters, those with ASPD were more likely to have medically serious SAs[217]. The prevalence of suicide is reported to be 5%[223, 225]. However, not all studies support an association between ASPD and SB[213].

Studies of SB in narcissistic personality disorder (NPD) have yielded interesting results. While one study found no increase in SA risk in NPD[213], another proposed that NPD is

protective against SA when comorbid with MDD[226]. Yet another found individuals with NPD, versus other Cluster B PDs, more likely to use more lethal means in SAs[227].

The one study of histrionic PD identified indicated no association with risk of SA[213].

Presence of Cluster A PDs was found to increase SA risk (OR 1.3–3)[213, 228]. Data in cluster C PDs were inconclusive. While one study[229] did not find an increased risk of SA, another[213] indicated that avoidant and dependent PDs conferred increased SA risk (OR 2.5 and 4.4, respectively).

Overall, data suggest that PDs are associated with increased risk of SB, with the most robust evidence found in BPD.

Paraphilic disorders

Only case reports of SB in paraphilic disorders were identified. They were not included in this review.

DISCUSSION

This review documents the occurrence of SB across a broad range of diagnoses, showing that nearly 50% of the 145 diagnoses reviewed have an association with SB. Thus, far from being germane to only those constructs that include SB as a specific diagnostic criterion, namely MDD, BD, and BPD, SB is ubiquitous among psychiatric disorders, but can also occur absent a psychiatric diagnosis. This has important clinical, research, and nosological implications.

From a practice standpoint, clinicians would do well to search for a history of SB regardless of diagnosis, given that SB is a harbinger of future SA and suicide. However, that clinicians tend to under-detect SB relative to what is uncovered with research tools has been known for over 2 decades[230, 231] and while recognition is important, documentation is also essential to alert others caring for the patient of the risk. How to increase detection and importantly, ensure that this crucial data point is carried forward in a salient manner in the medical record remains a vexing challenge. Second, suicidal ideation waxes and wanes and may be absent during an interview, possibly leading the clinician to underestimate suicide risk. In contrast, past SB, the most robust risk factor for future SA or suicide, may be reliably identified by history. Finally, rather than expecting SB to recede when the associated diagnosis is controlled, as one would for a diagnosis' symptom, clinicians may need to employ SB-oriented interventions, either pharmacologic such as clozapine or psychotherapeutic, such as cognitive therapy for suicidal behavior or the safety planning intervention. This is analogous to the observation that insomnia in the context of MDD may require specific additional interventions, despite sleep disturbance being a criterion for MDD[232]. Of note, insomnia can be diagnosed as a separate condition.

From a research and conceptual perspective, increased recognition of the occurrence of SB across a broad range of diagnoses would clarify why SB, a devastating public health problem, is complex, requiring multi-pronged research and prevention approaches[233]. For example, it will not suffice to focus research regarding the neurobiology or treatment of SB

to its occurrence in the context of mood disorders. While examples of biological studies of SB across diagnoses exist, the need for such work is vast[234]. Similarly, appreciation of SB's occurrence across diagnoses may improve recognition of sub-groups at risk[235] and affirm the notion that SB is a treatment target in and of itself, for which development of innovative treatments is warranted.

In terms of nosology, the observation that SB occurs in tandem with a wide variety of psychiatric diagnoses, as documented by this review, suggests SB is not simply a symptom, consequence, or epiphenomenon of psychiatric diagnoses such as MDD and BPD. Rather, it manifests like other psychiatric disorders, which are often comorbid with each other[236]. Moreover, SB meets the Robins and Guze (1970) criteria[237] for diagnostic validity: it is clinically well described, in vivo and postmortem laboratory markers have been identified, it can be subjected to a strict differential diagnosis, follow-up studies demonstrate its presence at higher rates in those with a past diagnosis, and it is familial [236, 238, 239]. Of note, SB also meets the criteria for inclusion in the DSM-5 (documented antecedent, concurrent, and predictive validators) proposed by Kendler et al[236]. In fact, the DSM-5 has a description of the diagnostic criteria for a stand-alone diagnosis of SB in Section III (see Supplement B) which contains diagnoses requiring further study. In the case of SB, future work should better refine the concept of full and partial remission given that risk for future SB remains elevated over time. However, in general, we consider the criteria appropriate.

Defining Suicidal Behavior as a separate disorder would provide both a uniform definition and a diagnostic code, which may make its identification more reliable. Additionally, it would be easier to document and measure its trajectory and response to treatment over time, which would ultimately aid in the development of secondary and tertiary prevention strategies.

A Suicidal Behavior diagnosis and diagnostic code would also move clinical epidemiological or pharmacoepidemiologic research forward in several regards[240, 241]. While there are codes for injury and suicidal behavior now (E-codes), these tend to be woefully underutilized. A study based on a Medicare Provider Analysis and Review data set reported that only 28% of injury hospitalization records included an E-code[242]. In an Emergency Department study, only 36.7% of research-classified suicide attempters received an E-code[241]. The extent of missingness of E-codes has led researchers to piece together probable suicide attempts based on ICD N-codes for injuries without regard to intent, which significantly dilutes the ability to detect a signal for SB[243]. Clearly, E-code underutilization hampers this type of research and availability of a "main diagnosis" code could be a remedy.

Similarly, research about SB based on electronic health records-- a growing source of essential scientific data-- could also be vastly improved. For example, despite their widespread underutilization, ICD E-codes are more than twice as reliable in identifying individuals with SB as documented by chart review than Natural Language Processing approaches (70% vs 30%)[244]. Availability of a suicide behavior code for a "main diagnosis" would capitalize on this greater reliability of codes and might mitigate the E-code usage problem. While these observations also support DSM-5-TR's addition of charting codes in Section II under "Other Conditions That May Be a Focus of Clinical Attention" to indicate

the presence or history of SB and non-suicidal self-injury, the impact of these codes may be limited if not adopted extensively, as has been the case with E-codes.

Interestingly, further support for SB as a separate diagnosis comes from a recent GWAS study of 29,000 individuals which identified a SNP in an intragenic region of chromosome 7 that conferred risk for SB independent of psychiatric diagnoses[245]. This finding was replicated in another large sample, the Million Veterans Program (MVP), providing biological evidence for SB heritability independent of that of other psychiatric conditions, including MDD. Of interest, pathway analyses of the MVP data support the relevance of several putative biological mechanisms in suicide risk (for a review see Oquendo et al[246]): cortisol synthesis and excretion; dopamine, oxytocin and glutamate signaling; and circadian rhythm. Nonetheless, our knowledge base about the pathophysiology of SB is still evolving[247].

Despite the many potential benefits of adding SB to the DSM-5 as a separate diagnosis, unintended adverse consequences must be considered as well. For example, patient concerns about having a suicide attempt listed as a diagnosis in the medical record may curb help-seeking. It could also create confusion among clinicians in countries or states where medical assistance in dying (MAID) is legal, and complicate access to MAID for patients with terminal conditions that make living difficult to tolerate.

This study has some limitations. First, there is considerable variability in both approach and quality of the methods used to establish rates of SB in the studies included. For example, the management of comorbidity, definitions of SB, potential misclassification of suicides as accidental or undetermined deaths, and instruments used to identify SB vary across studies and at times are not explicitly documented. These issues likely affect the validity and reliability of the findings reported and consequently, their implications. Second, we may not have included all relevant studies since some may not have identified a specific disorder in the title, abstract or key words. Moreover, although we list suicide attempts and suicide separately, some attempters ultimately die by suicide, so the distinction between these two groups is imperfect. We also did not consider the impact of age, sex, or race/ethnicity on the occurrence of SB. Finally, the level of evidence is variable across studies and many studies used samples of convenience or clinical samples which are not representative of the population. Nonetheless, the frequency with which SB is reported to be associated with a broad range of diagnoses is notable and sets the stage for future research. Next steps to delineate the path towards establishing the diagnosis of SB, or elucidating conceptual or practical limitations to it, might include field trials of the proposed SB diagnosis to verify its reliability and to test the concordance between the use of the new codes and the documentation of SB in medical records. As well, qualitative data from focus groups that include primary care, emergency medicine and psychiatry clinicians' views on the utility of the diagnosis and criteria would be instructive.

In summary and comporting with new data that specific genes are associated with SB independent of psychiatric diagnoses, this narrative review bolsters the notion that Suicidal Behavior is a stand-alone clinical condition co-occurring with many diagnoses. Defining SB as a separate diagnosis would have important research and clinical implications. From

a research perspective, diagnostic codes for SB would help researchers --and clinicians-- document and measure SB's trajectory and response to treatment over time, and, ultimately, help develop secondary and tertiary prevention strategies. Contributions to better accuracy in pharmacoepidemiologic or EHR based studies would be valuable, too. From a clinical viewpoint, SB as a separate diagnosis would support an approach to managing SB with specific suicide prevention interventions separate from treatments indicated for co-occurring diagnoses. While evaluation of suicide risk independent of comorbid psychiatric diagnoses already happens in many, but not all, clinical settings as the Joint Commission and health systems typically require documentation of suicide risk regardless of any psychiatric diagnosis, as a separate diagnosis, SB would preclude situations in which a potentially life-threatening behavior is not accounted for by a diagnosis (if the patient has neither MDE nor BPD), a problem that is particularly salient when no mental disorder is present.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1.

SUMMARY OF FINDINGS FROM STUDIES OF SUICIDAL BEHAVIOR ACROSS DSM-5 DIAGNOSES

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				NEURODEVELOPMENTAL DISORDERS			
Merrick et al. (8)	2006	Multiple	Did not discuss	**Narrative review** of suicidality in those with ID, in a variety of care settings and geographic locales.	**Intellectual disability**	6–21% had history of SA(s)	3
Lunsky et al. (6)	2012	Canada	Did not discuss	Sample 751 adults with ID in crisis; 39 adults who expressed suicidal intent; 28 who attempted; compared to 337 with aggression toward others.	Intellectual disability	7% had history of SA(s)	3
Dodd et al. (7)	2016	USA, UK, Finland	Did not discuss	**Systematic review** of 24 studies (of variety of methods) (1970 – 2012) examining different aspects of suicidality.	Intellectual disability	20–42% adolescents had SA(s); 3.8% adults had SA(s)	3
Hannon and Taylor (10)	2013	Multiple	Various	**Systematic review** of 4 studies focused on youth (ages<25); one included a population of young people who all had history of abuse. N = 241.	**Autism spectrum disorder**	7–42% had history of SA(s)	3
Kato et al. (13)	2013	Japan	DSM-IV-TR	**Retrospective study** of 587 adults who attempted suicide and were admitted to the hospital for physical injury between 4/2010–4/2011; expert opinion diagnosis.	Autism spectrum disorder	7.3% had lifetime history of SA(s)	3
Richa et al. (14)	2014	Multiple	Various	**Narrative review** of 14 publications, including clinical studies and case studies.	Autism spectrum disorder	7–15% had history of SA(s)	3
Segers and Rawana (11)	2014	USA, Sweden, UK, Japan, Turkey, Italy	Various	**Systematic review** of 11 clinical studies of suicidality (range of ages – children to adults), including ideation and behavior.	Autism spectrum disorder	7–15% rate of SA	3
Chen et al. (15)	2017	Taiwan	ICD-9-CM	**Cohort study** using National Taiwan Health Insurance Research Database, 5,618 people with ASD (ages 12–29), and 22,472 matched controls enrolled between 2001–2009 and followed through 2011. SAs were identified during follow-up period.	Autism spectrum disorder	HR for SAs was 5.79 in adolescents, 5.38 in young adults	3
Zahid and Upthegrove (12)	2017	Multiple	Various	**Systematic review** of 12 cross-sectional studies (N=2,651) across a variety of ages (children, adolescents, adults).	Autism spectrum disorder	7–47% had history of SA(s)	3
Kirby et al. (16)	2019	USA	ICD-9 or ICD-10 codes	**Retrospective cohort study** using statewide surveillance data to find incidence of suicide in those with ASD from 1998 to 2017 in 5-year intervals.	Autism spectrum disorder	Difference in suicide rates between women with and without ASD (RR 3.42 [1.63–7.20])– only in 2013–2017	1

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
					Attention Deficit Hyperactivity Disorder		
Impey and Heun (20)	2012	Australia, Finland, Turkey, USA	Various	**Review** of 25 articles: 6 looking at rates of ADHD in suicides (N range: 13–119), 7 examining rates of ADHD in those who attempted suicide (N range: 15–3609).		Suicide OR range: 1–3.6 SA OR range: 0.02–7.3	3
Stickley et al. (21)	2016	England	Adult ADHD Self-Report Scale-v1.1 (score 14 or higher)	**Survey** of 7,403 people 16 and older from 2006–2007, living in private households. Controlled for demographics, stressful life events, psychiatric comorbidities.	ADHD	OR of lifetime SA: 1.62 (1.08–2.44)	2
Stickley et al. (22)	2018	Japan	Adult ADHD Self-Report Scale (ASRS); self-report of SI and behavior	Cross-sectional analysis of the Japan Prevalence Study of Adult ADHD at Psychiatric Outpatient Care, of adults 18–65, recruited from one hospital and three outpatient clinics from 2014–2015.	ADHD	Prevalence ratio of lifetime SAs: 1.59 (1.32–1.92) (p <0.001)	3
Chen et al. (18)	2019	Taiwan	Structured interview (Chinese K-SADS-E); reflects DSM-V	National representative **cross-sectional survey** of school-based sample of 4,739 children aged 7–15, 412 with ADHD. Data adjusted for demographic variables.	ADHD	SA aOR: 4.45 (1.99–9.93)	1
Fitzgerald et al. (19)	2019	Denmark	ICD-8, ICD-10 codes	**Cohort study** of 2.9 million people (ages 10 or older) followed from 1995–2014 (46 million person-years) based on national registries.	ADHD	Suicide IRR=3.20 (95% CI, 2.29–4.47); SB (suicide + SA) IRR=4.69 (95% CI, 4.34–5.06);	1
Septier et al. (17)	2019	Multiple	Various	**Systematic review and meta-analysis** of 57 studies (total 90,805 participants with ADHD and 239,778 without ADHD).	ADHD	SA OR: 2.37 (1.64–3.43) Suicide OR: 6.69 (3.24–17.39)	3
Eddy et al. (23)	2020	USA	Self-report on the survey	**Survey** of 102 college freshmen with ADHD and 102 without from 2014–2015.	ADHD	Rate of SAs in ADHD vs. non-ADHD group: 13.7% vs. 2.9%	3
Fuller-Thomson et al. (24)	2018	Canada	Self-report	**Cross-sectional survey**, data from 2012 Canadian Community Health Survey–Mental Health, looking at ages 18 and older, including 745 people who reported SLDs.	**Specific Learning Disorder**	SA OR: 1.46 (1.05–2.04) when adjusted for MDD, GAD, ADHD, demographic and socioeconomic factors, SUDs, and 3 different ACEs	1
Storch et al. (25)	2015	USA	DSM-IV Structured diagnostic interview of parent and child	In a community sample, 196 subjects (ages 6–18) with chronic tic disorder were compared to 100 individuals without.	**Tic disorders**	Statistically significant difference in SI between the two groups (greater in those with chronic tic disorder), but not in SA	3
Fernández de la Cruz et al. (9)	2017	Sweden	ICD-8, ICD-9, ICD-10	**Matched case-cohort** study using data from the Swedish National Patient Register from 1969–2013. Examined 7,736 cases of Tourette's and chronic tic disorders. Adjusted individually for other psychiatric disorder classes, but not for all psychiatric comorbidities.	Tic Disorders	Suicide OR: 4.39 (2.89–6.67) SA OR: 3.86 (3.50–4.26) Individually adjusted ORs for suicide and SAs were lower but showed increased risk and remained significant.	1
				PSYCHOTIC DISORDERS			

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Suokas et al. (28)	2010	Finland	SCID (DSM-IV)	Random sample of 9,922 adults screened. 264 adults with psychosis (primary or substance induced).	Primary or substance-induced psychosis	SA in Schizophrenia 31.2% (21.1.–42.7) Schizoaffective disorder 44.8% (26.5–64.3) Delusional disorder 0% Psychotic disorder NOS 30.2% (16.5–44.0)	2
Ayesa-Arriola et al. (27)	2015	Spain	DSM-IV (SCID-I)	397 people with first-episode, non-affective psychosis. Examined suicide risk pre-psychosis and in 3-year follow-up.	First episode psychosis	15.11% had a SA during 3-year follow-up	3
Nordentoft et al. (26)	2015	Multiple	Various	Narrative review of SB in psychotic disorders (total participants not listed).	Schizophrenia and First Episode Psychosis	Schizophrenia: death by suicide 4.9–6.6% First episode psychosis: previous SA(s) 28–40%	3
Massons et al. (29)	2017	Spain	Calgary Depression Scale for Schizophrenia (CDSS); DSM-IV	143 people with schizophrenia spectrum disorders recruited from 2009–2014.	Schizophrenia spectrum disorders	24% of those with schizophrenia had prior SA(s)	3
Huang et al. (31)	2018	Multiple	Various	Meta-analysis of 50 longitudinal studies looking at psychosis as risk factor for SI and SB (total participants not listed).	Schizophrenia Spectrum Disorder	weighted mean ORs of 1.36 (1.25–1.48) for attempt, and 1.40 (1.14–1.72) for death	3
González-Rodríguez et al. (34)	2014	Multiple	DSM-III-TR, or DSM-IV	Narrative review of 10 studies (including 5 case reports) (N from 13–86) looking at SI and SB in delusional disorder.	**Delusional disorder**	Rates of SAs: 0–21%	3
Pillmann et al. (32)	2003	Germany	ICD-10	Case-control study of 42 patients with ATPD compared to matched controls with schizoaffective disorder bipolar type and those with schizophrenia. Data gathered retrospectively and prospectively for 5 years follow-up.	**Acute transient psychotic disorder**	19% had a SA during the acute illness. 36% had a SA over 5-year follow-up.	3
Castagnini and Bertelsen (33)	2011	Denmark	ICD-10	Survey using Danish psychiatric register of all people over age 15 who had ATPD as an admission diagnosis, examining causes of death from 1996–2001.	Acute transient psychotic disorder	SMR of death by suicide: 30.9 (17.5–54.4)	2
BIPOLAR DISORDERS							
Rihmer and Pestality (39)	1999	Multiple	DSM-IV	Narrative review of 6 studies (N=859).	**Bipolar disorders**	Lifetime SAs greater in BD than unipolar depression (19% to 12%, p<0.001). Mixed data on whether rates are greater in BD-I or BD-II.	3
Goldstein et al. (41)	2012	USA	DSM-IV, K-SADS	Prospective observational study of 413 youth with BD and rates of SA, followed on average 5 years.	BD-I, BD-II, or BD NOS	18% made at least one SA. 8% made multiple attempts.	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Gonda et al. (37)	2012	Multiple	Various	**Narrative review** of suicide in bipolar disorder (total participants not listed).	BD	Annual risk is 400–1400/100,000, about 0.9%, or 30–60 times the general population rate. 33–50% of patients with BD will attempt in lifetime, and 15–20% die by suicide. Attempts in BD are more lethal (1 out of 3–4, vs. 1 out of 30).	3
Clements et al. (46)	2013	UK	ICD-10	Comparison of suicide rates in BD versus other diagnoses (1996–2009) in a national suicide database (total N=15,465; Bipolar disorder N= 1,489).	BD	9.6% of the suicide deaths were in individuals with BD as a primary diagnosis.	2
Halfon et al. (43)	2013	Multiple	Various	**Systematic review** of 16 articles from 2002–2012 on suicide in youth with BD (N=2,593).	BD	14–39% of youth with BD had a history of SA. Increased rate in those with mixed episodes (51%).	3
Hauser et al. (42)	2013	Multiple	Various	**Systematic review** of 11 studies of suicide in youth with BD (N=1,708).	BD	21–26% have a history of SA	3
Latalova et al. (38)	2014	Multiple	Various	**Narrative review** of articles on suicide in BD (total participants not listed).	BD	25–50% of patients with BD will attempt suicide in lifetime. 8–19% will die by suicide.	3
Schaffer et al. (47)	2014	Canada	Coroner chart review	Analysis of 2,886 deaths ruled as suicide by the coroner from 1998–2010.	BD	5.9% of the suicide deaths were in individuals with BD.	2
Beyer and Weisler (35)	2016	Multiple	Various	**Narrative review** of studies looking at suicide and BD (total participants not listed).	BD	Rates of suicide are 20–30 times greater than in the general public; strongest association with suicide of all psychiatric disorders. Lifetime SA risk: 25–50%.	3
Seo et al. (40)	2016	South Korea	DSM-IV-TR and DSM-V	**Retrospective cohort study** of charts from inpatients admitted from 2005–2014. 334 patients identified. SB reported in binary fashion (present/absent).	BD	26.6% had history of SA Predictors of SA included mixed episode as index episode: OR 3.39 (1.57–7.34), and number of prior depressive episodes: OR 1.62 (1.34–1.95).	3
Bobo et al. (36)	2018	USA	DSM-IV-TR, SCID	Analysis of data on 1,465 participants (age 18 or up) in the Bipolar Biobank.	BD	32% had at least one prior SA (34% of those with BD-I, 27% of those with BD-II).	3
Plans et al. (44)	2019	Multiple	Various	**Systematic review** of 53 studies looking at suicide rates in BD (N=604,926).	BD	20–30 times increased rate of suicide in BD compared to the general population.	3
Van Meter et al. (49)	2017	USA	DSM-V, research diagnostic criteria	**Longitudinal observational** study based on data from the Longitudinal Assessment of Manic Symptoms study of youth ages 6–12, followed for 2 years. 29 youth	**Cyclothymic Disorder**	4% had past SB, and 4% had a SA during follow-up. Not statistically different from BD-I or BD-II rates (n=86).	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				met research diagnostic criteria and were included			
DEPRESSIVE DISORDERS							
Mroczkowski et al. (59)	2018	USA	DSM-V, V-DISC	**Retrospective cohort** of 2,498 juvenile justice youth. DMDD (n=314) SA rates compared vs. those with disruptive behavior disorders (DBD: ODD, CD, and ADHD) (n=1952) vs. other mood disorders (MDD, dysthymic disorder, or manic/hypomanic episode) (n=232).	**Disruptive mood dysregulation disorder**	Lifetime SA significantly higher (p<0.001) in DMDD (36.0%) than DBD (19.3%), but not compared to other mood disorders (34.5%).	3
Isometsä (45)	2014	Multiple	Various	**Narrative review** of suicide incidence in major affective disorders. Lifetime risk study: Denmark data for those born from 1955–1991 who received psychiatric treatment. Cross-sectional studies for rates of SA history (total N not listed).	MDD or BD	Lifetime risk of suicide: BD (MIF): 7.77% (6.01–10.05) | 4.78% (3.48–6.56) MDD (MIF): 6.67% (5.72–7.78) | 3.77% (3.05–4.66) MDD: 30–40% history of SA BD: 50% history of SA	3
Zalpuri and Rothschild (52)	2016	Multiple	DSM-III, DSM-IV, ICD-8, ICD-9, ICD-10	**Systematic review** of 22 studies of youth and adults with MDD (with or without PF). 8 studies examined rates of suicide, cohorts followed for 1–25 years (N=38,028). 14 studies examined risk of SA (N=4,367).	MDD with versus without PF	Most showed no difference in suicide. Increased rates of SA in MDD with PF.	3
De Crescenzo et al. (50)	2017	Multiple	Various	**Systematic review (PRISMA)** of 6 studies (total N=2,303) of youth with major affective disorders and suicidality.	BD versus MDD	BD: 31.5% had past SA MDD: 20.5% had past SA SA OR in BD compared to in MDD: 1.64 (1.26–2.15]	3
Dong et al. (51)	2018	China	Various	**Meta-analysis** of 33 studies from both English and Chinese databases from time of inception to 2017. Looking at rates of SA in MDD in China (N=29,368).	MDD	Lifetime prevalence of SA: 23.7% (19.9–28.0%) 1-month prevalence: 20.3% (12.1–32.2%)	3
Holmstrand et al. (53)	2008	Sweden	DSM-III-R	Study of 35 patients with dysthymia and 81 patients with MDD from 1987–2000.	**MDD and dysthymia**	No difference in SA rates but dysthymia group had higher rate of Axis II pathology.	3
Witte et al. (54)	2009	USA	DSM-IV	**Cluster analysis** of sample of 494 outpatients seen from 2001–2007.	MDD and dysthymia	Recurrent MDD confers more risk for SA than single episode MDD or dysthymia.	3
Hong et al. (55)	2012	South Korea	DSM-IV, (CIDI) 2.1	Study of 2,499 women in a nationwide sample in South Korea.	**Premenstrual dysphoric disorder**	2.36% of the sample diagnosed with PMDD. PMDD increased lifetime and 12-month prevalence of SA, but only for SI when adjusted for other psychiatric disorders.	2
Pilver et al. (56)	2013	USA	DSM-IV; WMH-CIDI	Analysis of data from 3 nationally representative surveys. N=3,965 women.	PMDD	4% sample had PMDD. SA OR in PMDD: 2.10 (1.08–4.08) (p<0.05)	2

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				Model adjusted for demographics, social desirability, psychiatric comorbidity.			
Owens and Eisenlohr-Moul (57)	2018	Multiple	Various	Narrative review of studies on the menstrual cycle and suicide risk (total N not listed).	PMDD	Increase in hospitalization for SB peri-menstruation. Two studies found association between early follicular/ menstrual phase and SB; one did not.	3
Shams-Alizadeh et al. (58)	2018	Iran	DSM-V	Case control study of 120 women of child-bearing age admitted for SA and 120 matched controls from 2014–2015. Women over 40, on contraceptives, with psychotic or bipolar disorders, or with ID were excluded.	PMDD	Higher rate of PMDD in attempters than in controls (30.8% v. 5%, $p<0.001$). No difference in SA rates in luteal v. follicular phase.	3
ANXIETY DISORDERS							
Sareen et al. (64)	2005	Netherlands	DSM-III-R; CIDI	**Observational study** from the Netherlands Mental Health Survey and Incidence Study, a prospective population-based survey with baseline and 2 follow-up assessments over 3-year period (N=7,076). Results adjusted for socioeconomics factors and other psychiatric comorbidities, including other anxiety disorders.	Social phobia, simple phobia, GAD, panic disorder, agoraphobia, OCD	aOR for SA (baseline|follow-up): Any anxiety disorder: 2.48 (1.70–3.62) | 3.64 (1.70–7.83) Social phobia: 0.74 (0.45–1.23) | 1.27 (0.41–4.00) Simple phobia: 1.79 (1.20–2.68) | 2.71 (1.07–6.87) Panic disorder: 2.01 (1.23–3.28) | 0.64 (0.09–4.36) Agoraphobia: 2.12 (1.16–3.86) | 1.22 (0.29–5.20) GAD: 1.07 (0.67–1.70) | 2.30 (0.64–8.25) OCD: 1.63 (0.69–3.88) | 1.57 (0.15–16.33)	2
Boden et al. (62)	2007	New Zealand	CIDI; DSM-IV	Christchurch Health and Development Study (CHDS), a 25-year longitudinal study of over 1,000 participants born in mid-1977. Studied at birth, 4 months, 1 year, every year until 16, then 18, 21, 25. At 18, 21, 25, given structured mental health interview.	Phobia, GAD, panic, any anxiety disorder	OR SA (adjusted for anxiety disorders, fixed factors, co-occurring disorders, life stress) Phobia: 1.54 (0.87–2.72) Panic: 3.93 (1.20–12.89) GAD: 2.69 (0.79–9.14)	2
Cougle et al. (82)	2009	USA	WMH-CIDI; DSM-IV; International Personality Disorder Examination	Survey data from National Comorbidity Survey-Replication to assess correlation between anxiety (and traumatic) disorders and suicidality. N=4,131. Multivariate logistic regression analyses.	Variety including anxiety disorders and PTSD	aOR for history of SAs (*$p<0.05$; ** $p<0.01$): Social anxiety disorder: 1.60 (1.06–2.41)* Specific phobia: 1.04 (0.77–1.40) Panic disorder: 1.57 (0.98–2.51) Agoraphobia without panic: 0.80 (0.45–1.43) GAD: 1.74 (1.26–2.42)** BD: 0.95 (0.62–1.44) Alcohol abuse/dependence: 2.19 (1.52–3.15)** Drug abuse/dependence: 1.11 (0.63–	2

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
						1.95) MDD: 2.80 (1.94–4.05)** PTSD: 1.96 (1.37–2.80)** BPD: 2.01 (1.45–2.78)** ASPD: 1.83 (1.26–2.64)**	
Nepon et al. (84)	2010	USA	DSM-IV; AUDADIS-IV	Data from the National Epidemiologic Survey on Alcohol and Related Conditions Wave 2. Face-to-face interviews of 34,653 adults between 2004 and 2005. Multivariate regression models controlling for sociodemographic factors, Axis I and Axis II disorders, and other anxiety disorders.	Panic disorder, social phobia, specific phobia, GAD, PTSD	aOR SA (* p<0.05, ** P<0.01): Any anxiety disorder: 1.70 (1.40–2.08)** Social phobia: 1.08 (0.85–1.38) Specific phobia: 1.04 (0.84–1.28) Panic disorder: 1.31 (1.06–1.61)* Agoraphobia without panic disorder: 1.21 (0.44–3.28) GAD: 1.10 (0.90–1.35) PTSD 1.81 (1.45–2.26)** aORs generally doubled when any anxiety disorder was comorbid with mood disorder, SUD, PD, or psychosis.	2
Chartrand et al. (66)	2012	USA	DSM-IV; WMH-CIDI	Data from the Collaborative Psychiatric Epidemiological Surveys (N=20,130; age 18 and older; response rate =72.3%). Adjusted for sociodemographic factors, any mood disorder, any SUD.	Anxiety disorders	aOR SA (***p<0.001, **p<0.01, *p<0.05) Any anxiety disorder: 5.62 (3.19–9.90) *** Social phobia: 3.39 (2.12–5.42) *** Panic disorder: 4.24 (2.40–7.47) *** Agoraphobia: 4.89 (2.62–9.13) *** GAD: 5.81 (2.80–12.09) *** PTSD: 4.18 (2.36–7.41) ***	2
Kanwar et al. (61)	2013	Multiple	Various	**Systematic review and meta-analysis** (PRISMA guidelines) of 42 observational studies. Overall evidence rated as low to moderate. Subgroup analyses of OCD, PTSD, GAD, panic disorder (N=309,974).	Anxiety disorders	ORs (SA | suicide): Any anxiety disorder: 2.47 (1.96–3.10) | 3.34 (2.13–5.25) Panic disorder: 3.96 (2.13–7.35) | no data GAD: 2.70 (1.92–3.7) | no data OCD: 0.99 (0.89–1.10) | no data PTSD: 2.21 (1.17–4.18) | 2.50 (0.47–13.41)	3
Russell et al. (60)	2013	India	SAD PERSONS scale; SCARED; BDI and BAI	**Observational study** of 501 adolescents (ages 11–19) in a rural community. Adjusted for age, gender, socioeconomic status, and depression.	Anxiety disorders	aOR for SA: Any anxiety disorder: 6.28 (0.93–42.19)	3
Thibodeau et al. (65)	2013	USA	DSM-III-TR and CIDI; DSM-IV and AUDADIS-IV	Data from National Comorbidity Survey Replication and National Epidemiologic Survey on Alcohol and Related Conditions (total N=43,935). OR after matching for dysthymia, MDD, alcohol abuse/ dependence, substance abuse/dependence,	Anxiety disorders	Matched OR SA based on NCS-R and NESARC dataset (NCS-R | NESARC): Social anxiety: 2.70 (1.93–3.79) | 1.62 (1.42–1.85) Specific phobia: 1.83 (1.35–2.50) | 1.63 (1.49–1.79)	2

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				BD-I, BD-II, all other anxiety disorders, and sociodemographic variables.		Panic disorder: 2.01 (1.35–2.99) | 2.13 (1.95–2.32) Agoraphobia: 1.72 (1.10–2.68) | 0.93 (0.68–1.27) GAD: 2.08 (1.32–3.62) | 1.91 (1.74–2.11) PTSD: 2.64 (2.01–3.46) | 4.25 (3.90–4.63)	
Cho et al. (63)	2016	South Korea	CIDI (Korean version); DSM-IV	Nationally representative sample (N=6,510), interviewed. Multivariate analysis adjusted for psychiatric comorbidity and socio-demographic factors.	Agoraphobia, panic disorder, GAD, PTSD, OCD, specific phobia, social phobia	aOR of SA (* p<0.05, ** p<0.01, *** p<0.001): Social phobia: 3.78 (1.41–10.1)** Specific phobia: 1.28 (0.69–2.37) Panic disorder without agoraphobia: 2.77 (0.53–14.4) Agoraphobia without panic disorder: 1.17 (0.13–10.7) GAD: 2.07 (0.81–5.27) PTSD: 5.13 (2.81–9.37)*** OCD: 2.36 (0.79–7.04)	1
De La Vega et al. (67)	2018	Multiple	Various	Narrative review of anxiety and obsessive-compulsive disorders, and prevalence of SA (total N not listed).	Anxiety disorders	Social anxiety: 18% with SAs Panic disorder: 33% with SAs GAD: anxiety disorder most associated with suicide (3% suicides)	3
Weissman et al. (70)	1989	USA	DSM-III; DIS	Cross sectional study of random sample of adults (N=18,011) from the Epidemiologic Catchment Study, comparing suicidality in those with and without panic disorder/attacks. Adjusted for demographics, socioeconomics, location, and other psychiatric disorders.	Panic disorder	aOR of SA: 2.62 (1.83–3.74)	2
Goodwin and Roy-Byrne (69)	2006	USA	DSM-III-R; CIDI	Data from the National Comorbidity Survey (N=5,877), a representative household sample (ages 15–54) from 1990–92. Looking at panic attacks, panic disorder, and suicidality. Adjusted for demographics, major depression, alcohol dependence, substance dependence, childhood trauma (physical and sexual abuse), and number of lifetime mental disorders.	Panic disorder	Panic disorder associated with increased aOR of SA in past 1 year (4.3 [1.3–13.7] and during lifetime 3.9 [1.4–10.8])	2
Ma et al. (68)	2009	China	DSM-III-R; CIDI	Survey of 5,926 individual over age 15 in 2003 in both urban and rural areas.	GAD	37.6% subjects with GAD had SA, compared to 4.2% in those without GAD	2

OBSESSIVE-COMPULSIVE DISORDERS

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Alonso et al. (72)	2010	Spain	DSM-IV; HAM-D, Beck Suicide Intent Scale	**Observational study** (from 1998–2007) of 218 outpatients with OCD followed for mean of 4.1 years.	**Obsessive-Compulsive Disorder**	5% attempted suicide 0.91% died by suicide	3
Angelakis et al. (73)	2015	Multiple	Various	**Systematic review and meta-analysis** (PRISMA) of suicidality in OCD. Included 48 studies (N=40,269).	OCD	Effect size of 0.64 (0.47–0.80) of OCD on SA.	3
Velloso et al. (71)	2016	Brazil	YBOCS, DYBOCS, SCID (DSM-IV), BDI, BAI	**Cross sectional study** of 548 patients with OCD from the Brazilian OCD Consortium. Results were not controlled for comorbid psychiatric conditions.	OCD	19.4% had history of SA	3
Fernández de la Cruz et al. (74)	2017	Sweden	ICD-8, ICD-9, ICD-10	**Case-control** study of 36,788 patients with OCD compared to general population controls; data from the Swedish National Patient Register (1969–2013). Controlled for parental level of education and different groups of psychiatric comorbidities.	OCD	SA OR: 5.45 (5.24–5.67) Suicide OR: 9.83 (8.72–11.08) ORs reduced but similar when adjusted.	1
Phillips et al. (79)	2005	USA	DSM-IV	**Observational study** of 200 patients with BDD from 2001–2003.	**Body dysmorphic disorder**	27.5% with SA, 45.5% of those attributed SA to BDD. SA predicted by PTSD (p=0.011), SUD (p=0.011), greater lifetime impairment by BDD (p=0.005).	3
Phillips and Menard (80)	2006	USA	DSM-IV	**Prospective observational study** of 185 people, followed for up to 4 years.	BDD	2.5% SA/year 0.3% death by suicide/year	3
Phillips (78)	2007	Multiple	Various	**Narrative review** of studies on BDD and suicidality (total N not listed).	BDD	24–28% had history of SA (cross-sectional data).	3
Angelakis et al. (77)	2016	Multiple	Various	**Systematic review and meta-analysis** of 17 studies (N=11,347).	BDD	SA history OR = 3.30 (2.18–4.43)	3
Snorrason et al. (76)	2019	USA	Mini International Neuropsychiatric Interview (DSM-IV); C-SSRS	**Cross-sectional study** of 498 patients in a partial hospitalization. Adjusted for age, gender, and other psychiatric disorders.	BDD	SA history aOR = 2.11 (1.12–3.98)	3
TRAUMA- AND STRESSOR-RELATED DISORDERS							
Sareen et al. (85)	2005	USA	DSM-III-R, CIDI	**Survey** of 5,877 individuals (ages 15–54), using data from the National Comorbidity Survey. Adjusted for sociodemographic factors, lifetime DSM-III-R diagnosis of MDD, dysthymia, BD, alcohol abuse or dependence, substance abuse or dependence, nonaffective psychosis, and ASPD.	**Post-traumatic stress disorder**	SA aOR: 2.67 (1.82–3.91), p<0.01	2
Krysinska and Lester (90)	2010	USA, Israel, Sweden, Canada,	DSM-IV; various instruments	**Systematic review** of 52 studies on suicidality in PTSD (N=1,584,611).	PTSD	Conflicting data from 5 studies on whether PTSD associated with suicide.	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
		Norway, Australia				22 studies suggested correlation between PTSD and non-fatal SA.	
Pompili et al. (89)	2013	USA	Various	**Systematic review (PRISMA)** of 18 articles on suicide risk among veterans from 1980–2010 (N=66,125).	PTSD	PTSD associated with increase in SMR (OR=6.74, 4.4–9.87), compared to veterans without PTSD (OR=1.67, 1.05–2.53). Deaths mostly from MVAs and suicides.	3
Uebelacker et al. (88)	2013	USA	DSM-III-R	**Prospective study** of 676 individuals with an anxiety disorder, followed for an average of 12 years. Data from HARP study (1989–1991). 52 people with PTSD.	PTSD	SA during study period HR: 4.22 (1.66–10.74), p<0.01 Compared to: MDD: 2.99 (1.35–6.63), p<0.01 IED: 2.93 (1.26–6.80), p<0.01 History of suicidality prior to study period: 11.64 (5.24–25.86), p<0.01	3
LeBouthillier et al. (81)	2015	USA	DSM-IV-TR, AUDADIS-IV	Analysis of data from the National Epidemiologic Survey of Alcohol and Related Conditions (N = 34,653) of adults. About 2,500 individuals identified with PTSD.	PTSD	13.6% reported SA following trauma. Higher number of traumatic events associated with more SAs. SAs associated with being female, non-partnered, younger, of lower income, presence of childhood trauma, sexual trauma, being kidnapped/POW, and doing peace or relief work in a war zone.	2
Lopez-Castroman et al. (86)	2015	France	DSM-IV, MINI	**Retrospective cohort study** of 726 adults who had attempted suicide. Assessed their history of psychiatric diagnoses and childhood abuse.	PTSD	History of sexual abuse increased odds of earlier first SA (OR 1.57, 1.10–2.24, p=0.01). PTSD increased odds of having >2 SA (OR 1.70, 1.07–2.72, p=0.03), and suicidal intent (OR 2.27, 1.42–3.64, p=0.0006). Both were higher when both sexual abuse and PTSD present.	3
Panagioti et al. (87)	2015	USA, Israel, Australia, China, Austria, Russia, Turkey, Germany	DSM-IIIR, DSM-IV, various instruments	**Systemic review (PRISMA) and meta-analysis** of 25 studies on suicidality in adolescents with PTSD (N=19,650).	PTSD	Effect size of PTSD on SA: 0.697 (p<0.001). Rates of SA in adolescents with PTSD: 15–50% (same or greater than rates in adults, 10–40%).	3
Guo et al. (83)	2018	China	Questionnaires, Impact of Event Scale-Revised	**Cross-sectional study** of 1369 people from 2 areas heavily affected by Wenchuan earthquake.	PTSD	SA OR: 1.96 (1.53–2.52)	3
Gradus et al. (91)	2010	Denmark	ICD-8, ICD-10	**Case control** study based on data from the nationwide Danish health and administrative registries from 1994–2006, including 9,612 cases of suicide and 199,306 controls. Among	**Acute stress disorder**	Controlled for history of depression and marital status: Suicide OR: 10 (7.7–14)	2

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				these, 95 cases and 165 controls had a diagnosis of acute stress reaction.			
Pelkonen et al. (93)	2005	Finland	DSM-III-R	**Cross-sectional** study of 89 adolescents (ages 12–22, 33 male and 56 female) diagnosed with adjustment disorder.	**Adjustment disorder**	9% had history of SA (all female).	3
Portzky et al. (94)	2005	Belgium	ICD-10; semi-structured interviews of relatives and other informants.	**Case control** psychological autopsy study of 19 adolescents who died by suicide. 13 diagnosed with affective disorders, 4 with adjustment disorder.	Adjustment disorder	Those with AD had shorter time between first communication of their SI and subsequent death by suicide (2 months) than those without AD (22 months). Those with AD had no prior history of SB.	3
Ferrer and Kirchner (92)	2014	Spain	DSM-IV	**Cross-sectional** study of 97 adolescents aged 13–17 years old diagnosed of AD.	Adjustment disorder	19% of girls in the study (n=66) reported at least one prior SA; 0% of boys had history of SA (n=31).	3
				DISSOCIATIVE DISORDERS			
Foote et al. (95)	2008	USA	DSM-IV, DDIS, SCID-IV	**Cohort** study of 82 outpatients at one center in NY. Population 50% Hispanic, 64% women, and 96% Medicaid-insured. 24 diagnosed with a dissociative disorder.	**Dissociative disorders**	Those with dissociative disorders were significantly more likely to have history of SA (p<0.001) (X^2=18.67). Compared to other predictors of multiple SAs (AUD, BPD, PTSD, childhood trauma), having a dissociative disorder was the most robust predictor (OR=15.09) (2.67–85.21, p<0.01).	3
				SOMATOFORM AND RELATED DISORDERS			
Güleç et al. (96)	2014	Turkey	DSM-IV	**Case control** study of 94 adults with conversion disorder looking at risk factors for SA.	**Conversion disorder**	35% with history of SA. Risky alcohol use, dissociation, history of emotional abuse were significant predictors of SA in conversion disorder.	3
Kämpfer et al. (97)	2016	Germany	DSM-IV; SCID	**Cross-sectional** study of 155 patients diagnosed with somatoform disorders.	**Somatoform disorders**	12.9% had at least one prior SA	3
				FEEDING AND EATING DISORDERS			
Favaro and Santonastaso (98)	1997	Italy	DSM-IV	**Cross-sectional** study of 495 outpatients.	**Eating disorders**	13% with history of SA(s). Attempts associated with binge/purge or purging subtypes. In AN: attempters more likely to be older, have longer illness duration, weigh less, have more substance use, be more obsessive. In BN: attempters with more psychiatric symptoms, and history of previous sexual abuse.	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Preti et al. (107)	2011	Multiple	Various	**Meta-analysis** of 40 studies on AN (16,342 patients), 16 on BN (1,768 patients), and 3 on BED (246 patients). All studies had at least 40 participants and a follow up of at least 5 years.	AN, BN, BED	SMR | suicide rate: AN: 31.0 (21.0–44.0) | 0.124 per 100 person-years BN: 7.5 (1.6–11.6) | 0.030 per 100 person-years BED: no suicides	3
Pisetsky et al. (106)	2013	Sweden	DSM-IV, SCID	**Case control** study of 13,035 female twins born 1959–1985 in the Swedish Twin study of Adults: Genes and Environment (STAGE).	Eating disorders	OR of lifetime SA: AN-R: 4.77 [1.94, 11.72] AN-BP: 7.92 [3.86, 16.20] Both dx of AN and BN: 10.74 [3.70, 31.25] BN: 8.12 [4.50, 14.65] BED: 7.84 [2.08, 29.59] PD: 6.59 [3.18, 13.65] No statistical difference between the different EDs.	2
Kostro et al. (103)	2014	Multiple	Various	**Narrative review** of SB and self-injury in eating disorders. 66 studies from 2005–2013 (N=163,735).	Eating disorders	AN: Rate of SA: 17–28% Rate of suicide 1.2% BN: Rate of SA: 25–27% Weighted mortality rate of 1.7/1000 person-years BED: Rate of SA: 19%	3
Portzky et al. (121)	2014	Belgium	Eating Disorder Inventory II, self-report	**Observational** study of 1,435 inpatients and outpatients at an ED treatment facility.	Eating disorders	ED subtypes with binge/purge had significantly increased OR of SA (2.42–2.81).	3
Runfola et al. (104)	2014	Sweden	Structural Analysis of Social Behavior, DSM-IV	**Observational study** of 2,269 women ages 12–45 presenting to specialty ED clinics between 2005 and 2009. Suicide data obtained from National Patient Register and Cause of Death Register.	AN, BN, BED, EDNOS	SA rates across EDs: AN-R: 4.51% AN-BP: 11.3% All AN: 5.91% BN: 4.03% EDNOS: 2.90%	3
Suokas et al. (114)	2014	Finland	ICD-10	**Case-control** study of 2,462 patients and 9,676 controls looking at risk of suicide attempts in eating disorders. RRs controlled for age, sex, place of residence.	Eating disorders	RR of SA for all EDs: 4.70 (1.41–15.74) RR in AN: 8.01 (5.40–11.87) RR in BN: 5.08 (3.48–7.42); no statistical difference between AN and BN RR in BED: 2.66 (0.82–8.63) History of previous SA RR: 11.30 (6.90–18.50)	3
Noma et al. (100)	2015	Japan	DSM-IV-TR	**Cross-sectional** study of 76 women treated at a university clinic for eating disorders in 2010. Ages 15 and up.	Eating disorders	11.8% had SB in the past 3 months. 35.5% had SB in the past, prior to the last 3 months.	3
Koutek et al. (99)	2016	Czech Republic	Child Adolescent Suicidal Potential Index, CDI	**Study** of 74 girls admitted for ED. Ages 10–18.	AN, atypical AN, BN	9% of patients had history of SA	3

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Yao et al. (101)	2016	Sweden	ICD-9, ICD-10, DSM-IV	**Cohort study** of N = 2,268,786 born from 1979 through 2001, followed from age 6 through 2009. OR adjusted for MDD, anxiety disorder, and SUDs.	Eating disorders	Any ED: SA OR: 1.82 (1.72–1.93) Suicide OR: 2.04 (1.49–2.80) AN: SA OR: 1.70 (1.56–1.85) Suicide OR: 2.67 (1.78–4.01) BN: SA OR: 1.88 (1.68–2.10) Suicide OR: 1.48 (0.81–2.72)	2
Forrest et al. (115)	2017	USA	DSM-IV-TR, CIDI	**Survey** of 10,123 adolescents and 2,980 adults from two nationally representative surveys. ORs adjusted for age (in adolescent sample) and psychiatric comorbidities.	BED and BN	aOR SA (*p≤0.01, **p<0.0001) Adolescents: BED 1.45 (0.59, 3.59) BN 7.96 (3.54, 17.91)** Adults: BED and BN both non-significant	2
Goldstein and Gvion (120)	2019	Multiple	Various	**Systematic review** (PRISMA) of 38 studies looking at SB (included SI, SA and suicide together) in ED (N=2,321,645).	Eating disorders	AN, BN, binge/purge ED subtypes were linked to SB. Posited that binging and purging may relate to impulsivity, which is more important than diagnostic category in determining suicide risk in ED patients.	3
Mandelli et al. (118)	2019	Multiple	DSM-IV, DSM-V, ICD-10	**Meta-analysis** (PRISMA) of 43 studies (N=26,609).	Eating disorders	AN-R had a statistically lower rate of SA than BN and AN-BP (9.3% versus 20.5% and 25%). BED SA rate was 11.4%.	3
Udo et al. (105)	2019	USA	DSM-V; AUDADIS-5	National **survey** (Third National Epidemiological Survey on Alcohol and Related Conditions (NESARC-III)). N=36,171 adults. Adjusted for sociodemographic factors and psychiatric comorbidities.	Eating disorders	Rates of SA: 24.9% (for AN), 15.7% (for AN-R), 44.1% (for AN-BP), 31.4% (for BN), 22.9% (for BED). aORs of SAs (compared to those without EDs): AN: 5.40 (3.80–7.67), AN-R: 3.16 (1.82–5.42), AN-BP: 12.09 (6.29–23.24), BN: 6.33 (3.39–11.81), BED: 4.83 (3.54–6.60).	1
Bulik et al. (102)	2008	Multiple	DSM-IV	**Cross-sectional** study of 432 persons (22 male, 410 female) enrolled in the NIH funded Genetics of Anorexia Nervosa Collaborative Study. Ages 16+.	**Anorexia nervosa**	16.9% had SA. AN-R: 7.4%, purging AN: 26.1%, AN with binge eating: 29.3%, mixed AN and BN: 21.2%.	3
Forcano et al. (119)	2011	Spain	DSM-IV-R	**Case control** study of 172 outpatients with AN and 146 controls.	AN	SA rate: control =0%, AN-R =8.7%, and AN-purging =25.0%.	3
Anderson et al. (108)	2002	USA	DSM-III-R, SCID	**Cross-sectional** study of 152 women with BN.	**Bulimia nervosa**	18% had history of SA	3
Corcos et al. (113)	2002	France, Switzerland, Belgium	DSM-IV	**Cross-sectional** study of 295 women (202 with BN purging type, 68 with BN non-purging type, 25 with anorexia nervosa	BN and AN binge/purge-type	27.8% had history of SA	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				binge/eating purging type) from outpatient clinics.			
Favaro et al. (110)	2008	Italy	DSM-IV, SCID-II	**Cross-sectional** study of 95 adults with BN.	BN	21% had history of SA	3
Crow et al. (109)	2014	USA	DSM-IV, CIDI ver. 3	**Survey** of 10,123 adolescents and 2,980 adults in National Comorbidity Survey-Adolescent supplement (NCS-A) and National Comorbidity Survey Replication (NCS-R). 0.9% of adolescents, 1.0% of adults met BN criteria.	BN	35.1% of adolescents, and 21.3% of adults with BN had history of SA	1
Pisetsky et al. (112)	2015	USA	DSM-IV, SCID	**Cross-sectional** study of 2 samples of adult women (n=185, 133) from community ED clinics and campuses, respectively.	BN	Sample 1: 29.7% had SA Sample 2: 20.3% had SA SAs associated with emotion dysregulation and comorbid depression and anxiety.	3
Gordon et al. (111)	2016	USA	DSM-IV	**Cross-sectional** study of 195 adult women with BN recruited through outpatient ED clinics, colleges, communities.	BN	12.8% had SA in the past 2 years	3
Conti et al. (117)	2017	USA, Italy, Poland, Sweden, Belgium, Finland, Turkey, Germany	DSM-IV-TR or DSM-5	**Systematic review** (PRISMA) of 17 studies on BED and suicidality (N=71,610).	**Binge eating disorder**	15–28% of adolescents had history of SA	3
Brown et al. (116)	2018	USA	CIDI, DSM-IV	**Survey** of 14,497 adults (Collaborative Psychiatric Epidemiologic Surveys). Model 5: Adjusted for BMI, race, gender, age, education, marital status, income to needs ratio, number of chronic conditions and smoking status. Did not adjust for co-morbid psychiatric conditions.	BED	7.8% had history of SA Lifetime SA aOR (model 5): 2.31 (1.60–3.32), p<0.001	2
				SLEEP-WAKE DISORDERS			
Lin et al. (122)	2018	Taiwan	ICD-9	**Retrospective cohort** study of 479,967 patients ages 15 and older using 2000–2013 hospitalization data from the National Health Insurance Research Database (NHIRD). Adjusted for sex, age, low income, catastrophic illness, urbanization, Charlson comorbidity index, drug dependence, alcohol dependence, and mental disorders.	**Insomnia Diagnosis**	aHR SA: 3.53 (3.06–4.08), P < 0.001	1
Para et al. (123)	2019	USA	Cambridge-Hopkins RLS Questionnaire; International RLS	**Case control** study of SB in those with RLS. Case = 192. Control = 158. Adjusted for age, sex, race, marital status, education,	**Restless legs syndrome**	aOR SA: 2.80 (1.29–6.11)	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
			Study Group Severity Scale; Suicidal Behavior Questionnaire-revised	income, drug and alcohol abuse history, and depression.			
GENDER DYSPHORIA							
Chen et al. (126)	2016	USA	Did not discuss	**Cross-sectional** study of 38 patients with Gender Dysphoria seen in a Pediatric Endocrinology clinic	**Gender Dysphoria**	13% had a history of SA/self-harm	3
Peterson et al. (125)	2017	USA	"psychological assessment"	**Cross-sectional** study of 96 transgender adolescents and young adults with Gender Dysphoria (age 12–22).	Gender Dysphoria	30.3% had history of SA	3
García-Vega et al. (124)	2018	Spain	DSM-5, ICD-10	**Cross-sectional** study of 151 people (age 12–79) seeking care at a clinic for transgender health.	Gender Dysphoria	23.8% had history of SA	3
DISRUPTIVE, IMPULSE-CONTROL, AND CONDUCT DISORDERS							
Nock et al. (128)	2009	Various	DSM-IV, CIDI	**Survey** data from WHO World Mental Health Surveys from 21 countries (N=27,963).	**Oppositional Defiant Disorder, Intermittent Explosive Disorder, Conduct Disorder**	OR of past SA: ODD: 2.2 (95% CI: 1.6–3.0) IED: 1.8 (95% CI: 1.2–2.5) CD: 2.1 (95% CI: 1.4–3.0)	2
Nock et al. (129)	2010	USA	DSM-IV, SCID, CIDI	**Survey** data from National Comorbidity Survey Replication (NCS-R) (N=5692).	ODD, IED, CD	OR of past SA: ODD: 1.7 (95% CI: 1.2–2.3) IED: 1.5 (95% CI: 1.1–2.1) CD: 1.8 (95% CI: 1.3–2.6)	2
Dickerson Mayes et al. (127)	2015	USA	DSM-IV, DSM-V, Pediatric Behavior Scale (PBS)	**Cross-sectional** study of 596 children (ages 6–18) with ODD.	**ODD**	11.9% had a history of SA	3
McCloskey et al. (131)	2008	USA	DSM-IV and IED-IR criteria. SCID	**Cross-sectional** study of 376 adults with IED.	**Intermittent Explosive Disorder**	12.5% had history of SA	3
Fanning et al. (130)	2016	USA	DSM-IV, SCID	**Cross-sectional** study of 1,460 adults with PTSD and IED.	IED	15.7% of those with IED only had past SA OR of past SA(s) in those with IED only: 1.6 (95% CI: 1.0–2.6)	3
Gelegen and Tamam (132)	2018	Turkey	DSM-IV, DSM-V, Minnesota Impulse Disorders Interview (MIDI)	**Cross-sectional** study of 406 adults with IED.	IED	OR of past SA(s): 2.7 (95% CI: 1.3–5.6)	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Millner et al. (133)	2019	USA	DSM-IV, C-SSRS, CIDI	**Survey** data from the Consolidated All-Army Survey of active-duty Army soldiers (N=5,456 men, 479 women).	IED	OR of past SA(s): Men: 5.4 (95% CI: 3.4–8.5) Women: 11.3 (95% CI: 3.5–36.2)	1
Darke et al. (135)	2003	Australia	DSM-IV, BDI, Opiate Treatment Index	**Cross-sectional** study of 97 adults with history CD and 84 controls, all maintained on methadone for OUD.	**Conduct Disorder**	CD group had higher rate of SA (c^2 = 4.8, p<0.05) and was more likely to be hospitalized following SA (c^2 = 4.4, p<0.05) than the non-CD group.	3
Wei et al. (134)	2016	Taiwan	ICD-9	**Longitudinal cohort** study of 3,711 adolescents (ages 12–17) with CD and 14,844 controls enrolled 2001–2009 and followed through 2011. Adjusted for demographics and psychiatric comorbidities.	CD	aHR for SA: 5.17 (95% CI: 2.29–11.70)	3
Odlaug et al. (136)	2012	USA	DSM-IV	**Cross-sectional** study of 107 adolescents and adults with kleptomania.	Kleptomania	24.3% had history of SA	3
SUBSTANCE RELATED AND ADDICTIVE DISORDERS							
Multiple Substances							
Roy (166)	2003	USA	DSM-IV	**Cross-sectional** study of 449 drug-dependent patients (opioid or cocaine as drug of choice).	Opiate dependence Cocaine dependence	39% of substance-dependent patients had attempted suicide at some point in time.	3
Wilcox et al. (145)	2004	Various	Various	**Systematic review and meta-analysis,** expansion of Harris and Barraclough's 1997 meta-analysis. Included studies from that review and added 42 new studies, all of which examined suicide in alcohol and substance use disorders (N=1,583).	AUD OUD	Estimated SMRs (95% Confidence Interval) for suicide death as follows: AUD 9.79 (8.98–10.65) OUD 13.51 (10.47–17.15)	3
Carra et al. (138)	2014	Various	Various	**Systematic review and meta-analysis;** examined studies of SA in co-occurring BD and SUD. 29 studies were included (N=31,294). 4 studies (N=3,439) included specific information on the association between CaUD and SA in BD.	AUD CaUD	Association with SA: AUD OR: 1.72 (1.52–195), I^2=28.0% SUD OR: 1.77 (1.49–2.10), I^2=25.0% CaUD OR: 1.44 (1.07–1.94)	3
Chachamovich (155)	2015	Canada	DSM-IV	**Case control** study of 120 Inuit suicides and equal number of community-matched controls, adjusted for Axis I diagnoses in the last 6 months and demographic factors.	MDD Alcohol dependence Cannabis dependence	Association with suicide: MDD aOR: 75.72 (10.19–562.31) Cannabis abuse or dependence aOR: 1.56 (0.34–7.12) Alcohol abuse or dependence aOR: 1.07 (0.19–5.99)	3
Ashrafioun et al. (167)	2017	USA	DSM-IV	**Cross sectional** study N=41,053 from 2014 National Survey of Drug Use and Health. Adjusted for anxiety, depression,	SUD OUD (prescription opioids)	Association with past year SA: Past year SUD: 43% Past year OUD 6%	1

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				and SUD, self-reported general health, and sociodemographic characteristics.	Opioid abuse (prescription opioid)		
Bohnert et al. (158)	2017	USA	ICD-9 and ICD-10-CM	Retrospective cohort study of N=4,863,086 Veterans Health Administration users in fiscal year 2005 with 6-year follow-up interval (2006–2011). Adjusted for demographic factors, Charlson Comorbidity index, and co-morbid psychiatric disorders (MDD, schizophrenia, BD, PTSD, anxiety disorders).	AUD Stimulant use disorders CaUD Sedative, hypnotic, or anxiolytic use disorder OUD	Association with suicide: Any SUD males aHR: 1.67 (1.55–1.79); females aHR: 2.15 (1.44–3.21) AUD males aHR: 1.65 (1.52–1.76); females aHR: 1.67 (1.01–2.45) Cocaine use disorder males aHR: 0.74 (0.64–0.84); females aHR: 1.10 (0.57–2.15) CaUD males aHR: 1.16 (1.02–1.33); females aHR: 1.01 (0.45–2.26) OUD males aHR 1.31 (1.08–1.58); females aHR 2.33 (1.05–5.18) Stimulant use disorder males aHR: 1.30 (1.02–1.64); females aHR: 1.50 (0.52–4.38) Sedative, hypnotic, or anxiolytic use disorder males aHR: 1.97 (1.51–2.57); females aHR: 2.41 (0.79–7.44)	2
Gates et al. (156)	2017	USA	ICD-9	Retrospective cross-sectional study of N=10,988 state prisoners imprisoned from 2005–2010.	AUD CaUD NUD	Associations with past SA: AUD OR: 0.6 (0.4–1.1) CaUD OR: 0.8 (0.5–1.3) Nicotine use disorder OR: 0.7 (0.3–1.7)	2
Icick et al. (177)	2019	France and Norway	DSM-IV; SCID-I, MADRS, YMRS	Cross-sectional study of 916 adult participants with BD presenting to specialized clinics.	Nicotine dependence Comorbid SUD Comorbid CaUD	37% of sample had at least one SA. Rate of 0.11 SAs/year. Association with lifetime SA: ND aOR: 1.36 (0.92–2.08) ND + AUD aOR: 3.7 (2.05 – 6.67) ND + CaUD aOR: 1.71 (0.68–4.26) ND + AUD + CaUD aOR: 3.73 (1.67 – 8.18) Association with recurrent SA: ND OR: 1.75 (1.16 – 2.63) ND + AUD OR: 3.58 (1.94 – 6.59) ND + CaUD OR: 2.65 (1.15 – 6.1) ND + AUD + CaUD OR: 1.11 (0.35 – 3.5)	3
Ashrafioun et al. (169)	2020	USA	ICD-9CM	Retrospective cohort study. N =226,444 Veterans seeking pain care from 2012 to 2014. Multivariate analyses adjusted for each diagnosis (OUD, AUD, Depression, PTSD, Anxiety, Bipolar disorder) as well as age, sex, opioid prescription filled, and medical comorbidity.	OUD AUD	Associations with SA within the year following first pain care visit: OUD aHR: 1.98 (1.62–2.41) AUD aHR: 2.09 (1.78–2.45)	3
Alcohol Use Disorder							

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Rossow and Amundsen (146)	1995	Norway	ICD 7/8/9 for suicide.	**Retrospective longitudinal** study of N=40,000 Norwegian military conscripts (~ 77.8% of men born in 1932 and 1933). Alcohol abuse disorder was defined by admission to alcohol treatment clinic or alcohol-related cause of death, or both.	**Alcohol abuse**	Alcohol abuse conferred a RR of suicide of 6.9 (5.5–9.2)	2
Rossow et al. (147)	1999	Sweden	ICD-8 / ICD-9	**Retrospective longitudinal (25 years)** study. N=46,490 Swedish Conscripts born 1950–51. Indicators of alcohol abuse during follow-up were obtained from inpatient care registers. Adjusted for presence of any psychiatric comorbidity (ICD 10 codes 290–315) at conscription or during follow-up.	Alcohol abuse	aOR of suicide in those with alcohol abuse: 2.4 (1.6–3.4)	2
Sher (151)	2006	Various	Various	**Narrative review** of literature on the relationship between alcoholism and SB.	**Alcohol Use Disorder**	SA rate 24%; as high as MDD. Suicide rates: 2.2–3.4%.	3
Ilomaki et al. (139)	2007	Finland	DSM-IV	**Cross sectional** study of 141 adolescent psychiatry inpatients with CD. Adjusted for age, living with primary family, and regular drug use.	AUD	Association with SA: Females aOR: 3.8 (1.1–13.4) Males aOR: 2.3 (0.5–11.4)	3
Flensborg-Madsen et al. (148)	2009	Denmark	ICD both 8 and 10;	**Longitudinal Cohort** study with N=18,146 adults from Copenhagen City Heart Study. Adjusted for all psychiatric comorbidity (including psychotic, anxiety, mood, and personality disorders and drug abuse).	AUD	Association with suicide: AUD HR: 7.98 (5.27–12.07) AUD aHR: 3.23 (1.96–5.33)	2
Shoval et al. (140)	2014	Israel	PRISM, AUDADIS, DSM-IV	**Cross sectional** study of N=1,349 adult household residents.	AUD	Association with SI and SA: Alcohol dependence OR: 3.09 (1.05–9.13) MDD OR: 13.79 (7.08–26.86) Alcohol dependence + MDD OR: 14.52 (5.40–39.10).	2
Darvishi et al. (137)	2015	Various	Various	**Meta-analysis,** 31 studies (N=420,732) of AUD and SB.	AUD	AUD and SA OR: 3.13 (2.45–3.81) AUD and suicide OR: 2.59 (1.95–3.23)	3
Joo et al. (152)	2016	South Korea	DSM-IV	**Cross-sectional (psychological autopsy)** study. N=320 patients admitted to the ER; included 222 suicide attempters and 98 suicides.	AUD	AUD more frequent in suicides than in SA (10.2% versus 0.9%; P < 0.001).	3
Kolves et al. (153)	2017	Australia	DSM-IV	**Retrospective cross-sectional (psychological autopsy)** study; N=259 suicides, ages 35+.	AUD	21.6% of suicides had AUD at time of death.	3
Abdalla et al. (141)	2019	Brazil	DSM-5	**Cross-sectional** study; N=4,225 participants aged 14 and older. Adjusted for sociodemographic factors, tobacco	AUD	Associations with past SA: Major depression OR: 3.4 (2.5–4.7) AUD aOR: 2.6 (1.8–3.9)	1

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				use, family history of suicide, depressive symptoms, and mutually adjusted for AUD, cannabis use, and cocaine use.			
Boenisch et al. (143)	2010	Germany	ICD-10	**Cross sectional** study of 1,921 suicide attempters.	AUD Alcohol intoxication	63% of attempters had no acute/ chronic alcohol involved; 4.6% had AUD but no acute alcohol was involved; 19.7% had acute alcohol consumption but no AUD; 12.6% had both AUD and acute alcohol use.	3
Pompili et al. (149)	2010	Various	Various	**Narrative Review**, a broad overview of studies examining the relationship between alcohol and suicide.	Alcohol abuse AUD Alcohol intoxication	Suicide risk for heavy alcohol drinkers was 5-fold that of social drinkers. Alcohol dependence and abuse increased risk of suicide 20-fold in women and 4-fold in men. Rate of AUD or alcohol misuse among suicides was from 20–68%. Among people with AUD, the lifetime risk of suicide is about 10–15%.	3
Norstrom and Rossow (150)	2016	Various	Various	**Systematic review** (review of reviews), 14 studies on individual level, 16 studies on population level.	Alcohol abuse Alcohol intoxication	Prevalence of alcohol abuse in suicide: 15–61%. Prevalence of alcohol abuse in SA: 12–35%. Lifetime of suicide risk in alcohol abuse: 1.8%–6.2%. SMR for alcohol abuse and suicide: 9.8. Youth with alcohol abuse, suicide OR: 8.	3
Sung et al. (142)	2016	USA	DSM-IV	**Cross-sectional** study; N=43,093, NESARC Wave 1 non-institutionalized adult population in the US. Current drinkers with lifetime period of 2 weeks of low mood (9,173). Adjusted for sociodemographic factors, psychiatric disorder (mood, anxiety, non-alcohol SUD), and family history of depression and/or AUD.	AUD Alcohol abuse	Association with SA: Alcohol dependence aOR: 2.02 (1.43–2.85) Alcohol abuse only aOR: 0.70 (0.46–1.07)	2
Pfeifer et al. (154)	2017	Switzerland	ICD-9CM codes	**Retrospective cross-sectional** study of N=2,946 suicides tested for acute alcohol use at the time of death.	Alcohol intoxication AUD	12.4% of suicides had AUD. The prevalence of positive blood alcohol concentration was 39.5%.	2
Norman et al. (157)	2018	USA	AUDIT-C, PCL-S, and PHQ-9	**Cross sectional** study of 3,157 US Veterans aged 21 and older with AUD alone, PTSD alone, and comorbid AUD/PTSD. Adjusted for age, sex, education, marital status, employment	AUD PTSD	Probable AUD, probable PTSD, and combined AUD+PTSD had lifetime SA rates of 4.1%, 22.8%, and 46.0%, respectively. PTSD vs AUD aOR: 3.39 (1.77–	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				status, household income, enlistment status, combat veteran status, and number of lifetime traumatic events.		6.47) AUD + PTSD vs AUD only aOR: 10.46 (4.86–22.50) AUD+PTSD vs PTSD only aOR: 3.09 (1.80–5.30)	
Cannabis use disorder							
Kimbrel et al. (160)	2017	USA	DSM-IV SCID; various others including BSS	**Cross-sectional** study, N=3,233 Iraq/Afghanistan era veterans. Adjusted for sex, PTSD, depression, AUD, non-cannabis substance use disorder, history of childhood sexual abuse, and combat exposure.	**Cannabis use disorder**	CaUD associated with SA, aOR: 2.31 (1.59–3.34)	3
Kimbrel et al. (159)	2018	USA	DSM-IV SCID	**Cross-sectional** study, N=292 Iraq/Afghanistan era veterans. Adjusted for sex, sexual orientation, age, PTSD, depression, AUD, other drug use disorder, TBI, combat exposure, and trauma history.	CaUD	CaUD associated with suicidal self-injury, aOR: 3.10 (1.03–9.33)	3
Bartoli et al. (161)	2019	USA and Various European countries	Various	**Systematic review and meta-analysis.** Adult patients with BD-I and BD-II (N = 6,375).	CaUD	Cannabis use disorder was associated with increased risk of suicide attempts in BD, OR: 1.35 (1.08–1.70). I²=41.7%	3
Inhalant Use Disorder							
Sakai et al. (163)	2004	USA	DSM IV	**Cross sectional** study, N=847 residential and day treatment adolescents (ages 13–19).	**Inhalant Use Inhalant Abuse and Dependence**	Both lifetime inhalant use and lifetime inhalant abuse/dependence were significantly associated with lifetime SA. No OR reported but lifetime inhalant abuse/dependence increased SA risk about two-fold.	3
Freedenthal et al. (164)	2007	USA	DSM IV	**Cross sectional**, N=723 incarcerated children and adolescents (mean age 15.5) in Missouri. Adjusted for age, gender, prior residential location type, number and frequency of substance used besides inhalants, psychiatric symptoms, and trauma history.	IUD	Association of lifetime inhalant use, abuse, or dependence with lifetime SA: Inhalant use only, aOR: 1.41 (0.84–2.37) IUD: aOR: 5.13 (2.73–9.65)	3
Howard et al. (162)	2010	USA	DSM IV	**Cross sectional** study, N=13,552 adult non-institutionalized NES ARC survey respondents (2001–2002). Adjusted for socio-demographics, ASPD, anxiety and mood disorders, alcohol use, and other drug use.	IUD	Association with SA: Inhalant use only aOR: 1.23 (0.80–1.90) IUD aOR: 1.09 (0.58–2.06)	2
Opioid Use Disorder							

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Maloney et al. (165)	2007	Australia	ICD 10	**Case control** study of N=726 opioid dependent cases and 399 controls. Adjusted for sex, gender, and employment status.	**OUD**	Association with lifetime SA, aOR: 1.65 (1.20–2.29)	3
Degenhardt et al. (168)	2013	Australia	ICD 9/10	**Cohort** study, N=43,789. 412,216 person-years of follow-up of opioid-dependent people in New South Wales who entered opioid substitution therapy. Adjusted for age and sex.	OUD	Risk of suicide OUD: 1985–1989: SMR: 4.9 (3.0–7.6) 1990–1994: SMR: 6.5 (5.2–8.1) 1995–1999: SMR: 5.9 (5.0 – 6.9) 2000–2005: SMR: 6.4 (5.6–7.3) Total: SMR: 6.2 (5.6–6.7)	3
				Stimulant Use Disorder			
Stockings et al. (172)	2019	Various	Various	**Systematic review and meta-analysis**, N=74,139. 4240 total papers, 25 cohorts. Cohorts of people with regular or dependent use of amphetamines with data on mortality.	**Amphetamine use and Amphetamine use disorder**	Pooled estimates of suicide-specific mortality rate (95% CI): Crude mortality rate: 0.20 per 100 person-years (0.07–0.55) SMR: 12.20 (4.89–30.47)	3
Glasner-Edwards et al. (171)	2008	USA	DSM-IV	**Cross sectional** study of 526 methamphetamine dependent adults in the Methamphetamine Treatment Project.	**Methamphetamine use disorder**	28.7% of meth dependent patients had a lifetime SA	3
Roy (170)	2009	USA	DSM-IV	**Retrospective cross-sectional** study of 406 cocaine dependent patients.	**Cocaine dependence**	43.5% of cocaine dependent patients had attempted suicide	3
				Nicotine Use Disorder			
Riala et al. (179)	2009	Finland	DSM-IV; K-SADS-PL Semi-structured interview; 7-item mFTQ for adolescents	**Cross-sectional** study of 508 adolescent inpatients (ages 12–17), 208 males and 300 females.	**Nicotine use disorder**	10.8% of study sample had attempted suicide. Associations with history of SA: Females with mild ND OR 2.20 (0.80 – 6.07) Females with high ND OR 3.87 (1.09–13.73) Males with mild ND OR 1.11 (0.34 – 3.63) Males with high ND 0R 0.39 (0.07 – 2.26)	3
Yaworski et al. (173)	2011	USA	DSM-IV via the AUDADIS-IV	**Cross-sectional** study, N=34,653 community dwelling American adults. National Epidemiologic Survey on Alcohol and Related Conditions (Wave 1 +2), Adjusted for sociodemographic factors, any psychotic, substance use, mood, anxiety, and personality disorder, and physical disease. Reference group for all analyses was lifetime abstainers from nicotine.	**NUD**	Associated with SA in both lifetime and past-year timeframe [aOR (95% CI)]:: Lifetime ND: 1.78 (1.48 – 2.15) Past year ND: 1.77 (1.02 – 3.06) Nicotine dependence cessation versus continued use decreased the likelihood of SA in the past year: 0.15 (0.05 – 0.43). Higher frequency of daily cigarettes smoked was not associated with lifetime SA: 1–10 daily average cigarettes: 1.00	2

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
						11–20 daily average cigarettes: 1.31 (0.98–1.75) 20 daily average cigarettes: 1.40 (0.95–2.06)	
Scherrer et al. (174)	2012	USA	DSM III-R; Semi-Structured Assessment for the Genetics of Alcoholism	Cross-sectional study, N=1,919. Vietnam Era Twin Registry, offspring between ages 12–32 years.	NUD	In both genders, NUD associated with suicidal ideation + plan + attempt or ideation + attempt: Males OR: 6.59 (1.91–22.70) Females OR: 3.37 (1.25–9.04)	2
Bohnert et al. (178)	2014	USA	ICD-10-CM	Prospective Cohort study, N=4,863,086. 2004–05 Veteran's Health Administration (VHA) National Patient Care Database records with follow-up in 2006–2008. Adjusted for sociodemographic factors, Charlson comorbidity score, VHA service connection, SUD, BD, MDD, anxiety disorders, PTSD, and schizophrenia.	NUD	Associated with increased risk of suicide, aHR: 1.36 (1.27 – 1.46)	2
Berlin et al. (175)	2015	USA	DSM-IV via the AUDADIS-IV	Prospective longitudinal study, N=34,653. National Epidemiologic Survey of Alcohol and Related Conditions; data from interviewed US adults at Wave 1 (2001–02) and Wave 2 (2004–05). Mean interval between Wave 1 and Wave 2 was 3.1 years. Adjusted for sociodemographic factors, previous SA(s), and lifetime psychiatric disorder ('Axis I' including SUD, and 'Axis II').	NUD	Tobacco use (at Wave 1) increased risk of SA (at Wave 2) compared to people who never used tobacco: NUD was not predictive aOR 1.15 (0.93,1.40) Subgroup analysis: Long-term former tobacco use (in Wave 1 and 2) aOR: 1.09 (0.78 – 1.52) Recent former tobacco user (current tobacco user in Wave 1, former tobacco user in Wave 2) aOR: 0.88 (0.46 – 1.70) Persistent tobacco user (in Wave 1 and 2) aOR: 1.89 (1.47 – 2.42) New tobacco user (never used in Wave 1, current use in Wave 2) aOR: 3.16 (2.23 – 4.49) Relapse (former tobacco user in Wave 1, current tobacco user in Wave 2) aOR: 4.66 (3.49 – 6.24)	2
Han et al. (176)	2017	USA	Survey; Nicotine Dependence Syndrome Scale	Cross sectional study, N=325,800 US adults who participated in the 2008–2014 National Surveys on Drug Use and Health (NSDUH). Adjusted for sociodemographic factors, self-rated health, and 12-month anxiety disorder, major depressive episode or substance use disorders. Reference group was tobacco never-users.	NUD	Tobacco use was associated with an increased 12-month risk of SA: Former Tobacco users aOR: 1.1 (0.87 – 1.39) Past-year Tobacco users aOR: 1.7 (1.38 – 2.12) In past-year tobacco users, past month NUD was associated with SA, compared to no NUD, aRR: 1.2 (1.05 – 1.47)	1

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Gambling Disorder							
Moghaddam et al. (181)	2015	USA	DSM-IV	**Cross sectional** study, N=13,578 NESARC survey respondents. Multivariate analyses adjusted for demographic variables.	**Pathological gambling (5–10 criteria)**	Problem gambling aOR: 2.42 (1.60–3.67) Pathological gambling aOR: 2.77 (1.72–4.47)	2
Petry and Kiluk (182)	2002	USA	South Oaks Gambling Screen	**Cross sectional** study, N=175 participants at gambling treatment programs.	**Gambling Disorder**	17% of the sample had past SAs	3
Kausch (183)	2003	USA	DSM-IV	**Retrospective cross-sectional** study, N=114 admissions to a VA Medical Center gambling treatment program.	GD	39.5% reported a history of SA	3
Ledgerwood and Petry (188)	2004	USA	DSM Gambling Problems screen	**Cross sectional** study, N=125 adult participants recruited from gambling treatment programs.	GD	12% of the sample reported at least one gambling related SA	3
Newman and Thompson (189)	2007	Canada	Canadian Problem Gambling Index	**Cross sectional** study, N=36,984 subjects (age 15+). Adjusted for depression, alcohol dependence, mental health care, and demographic factors.	GD	Association with past-year SA, aOR: 3.43 (1.37–8.60)	2
Wong et al. (192)	2010	Hong Kong	DSM-IV-IR	**Retrospective case-control** (psychological autopsy) study: 150 suicides and 150 age/sex matched controls.	GD	11.3% of suicide cases and 0.6% of controls had pathological gambling, *p*<0.001.	3
Thon et al. (185)	2014	Austria	ICD-10	**Cohort** study, N=862.	GD	9.7% had a lifetime SA	3
Manning et al. (184)	2015	Singapore	DSM-IV-TR	**Cross sectional** study, N=2187 (n=554 with GD).	GD	Rate of lifetime SA was 11.2%	3
Black et al. (190)	2015	USA	DSM-IV	**Case control** study, 95 cases (problematic gambling) and 91 controls matched by age, sex, and education level.	GD	SA OR: 12.12 (4.09–35.93)	3
Nautiyal et al. (180)	2017	Austria, Germany, and USA		**Narrative review**, aimed to integrate key findings from human and animal studies focused on the biological basis of phenotypes that are central to gambling disorder.	GD	Rates of SI and SA are from 17% to 80% and 4% to 23%, respectively. 17% SA in treatment-seeking populations.	3
Karlsson and Hakansson (191)	2018	Sweden	ICD-10	**Cross sectional** study, N=2,099 individuals with diagnosis of gambling disorder in specialist heath care (2005–2016).	GD	Higher suicide rates compared to general population in 2016: SMR: 15.1 (8.7–21.6)	3
Mallorqui-Bague (186)	2018	Spain	DSM-5	**Cross sectional** study, N=249 patients with gambling disorder.	GD	Of the 83 participants with SI, 14 (16.9%) had a history of SA (6% of total sample).	3
Potenza et al. (187)	2019	Various	DSM (various)	**Narrative review**, of the epidemiology, comorbidity, genetics, neurobiology, prevention, and treatment.	GD	17–24% report SA	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
NEUROCOGNITIVE DISORDERS							
Draper (193)	2015	Multiple	Various	**Narrative review** on risk of SB in dementia.	**Dementia**	HD: highest suicide risk among dementias. Dementia increased suicide risk by 3–10x. Greater risk in 6–24 months after diagnosis. Most studies did not control for other psychiatric symptoms.	3
Conejero et al. (194)	2018	Multiple	Various	**Narrative review** of 31 studies on suicide and dementia.	Dementia	Overall, dementias carried 3–10x the risk of death by suicide relative to controls, highest in HD (13%).	3
Schoenfeld et al. (198)	1984	USA	Family interviews	**Case control** study of 506 deceased individuals with HD, compared to a control group of 54,049 deceased individuals representing the general population.	**Huntington's disease**	In those ages 10–49, the OR of suicide in HD was not significant. Suicide in HD (age 50–69) OR: 8.19 (4.21–15.91)	3
Farrer (196)	1986	USA	Questionnaires	**Retrospective** analysis of 452 deceased individuals with HD from the National Huntington Disease Research Roster. Also looked at rate of SA from sample of 727.	HD	5.7% of deaths were suicides 27.6% had at least one SA	3
Di Maio et al. (195)	1993	USA	Did not discuss	Analysis of data from the National Huntington's Disease Research Roster (N=2793).	HD	7.3% died by suicide	3
van Duijn et al. (199)	2018	Multiple European countries	C-SSRS	**Cross-sectional** study of SB in 1451 HD carriers.	HD	6.5% carriers had SA - significantly more in motor-symptomatic group than pre-motor-symptomatic group - significantly more in those with more severe disease	3
Kachian et al. (197)	2019	Multiple	Various	**Systematic review** of 28 studies looking at SB in HD (N=39,725).	HD	SA: 6.4–16% (typically ~ 7%) Suicide: 2.2–10%	3
Lee et al. (202)	2016	South Korea	ICD-10	**Retrospective case-control** study of 4,362 patients with Parkinson's disease. Mean observation period (SD) was 7.1 (4.1) years.	**Parkinson's disease**	SMR for suicide: 1.99 (95% CI: 1.33–2.85) Risk factors for suicide: -depressive disorder: OR 3.21 (95% CI: 1.24–8.29) -delusions: OR 3.65 (95% CI: 1.04–12.75) -any psychiatric disorder: OR 3.71 (95% CI: 1.62–8.52)	3
Li et al. (201)	2018	Singapore	Singapore coroner's office	**Case-control** study of 2012 participants from the National Neurosciences Institute's movement disorders database followed from 2002–2012.	Parkinson's disease	0.55% died by suicide over an 11-year follow-up; 3% of all the deaths during this period.	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Shepard et al. (200)	2019	Multiple	Various	**Review** of 116 articles on suicide risk in Parkinson's disease.	Parkinson's disease	Rates of suicide 2–5x that of the general population.	3
Fonseca and Machado (203)	2014	Portugal	DSM-IV-TR	**Retrospective case control** study of 59 patients with FTD (average age 68) and 59 matched controls.	**Frontotemporal dementia**	OR SA: 3.810 (p = 0.040) All SAs were in those with the behavioral variant	3
Zucca et al. (204)	2019	Italy	Scale for Suicide Ideation	**Case-control** study of 35 patients with FTD and 25 controls.	FTD	4/35 patients had SA. Patients had SA more than controls.	3
Fralick et al. (208)	2019	Multiple	Various	**Systematic review and meta-analysis** (PRISMA) of 10 cohort, 5 cross-sectional, and 2 case-control studies of suicide following concussion (N=721,620).	**Concussion/mild TBI**	Suicide RR: 2.03 (95% CI: 1.47–2.80)	3
Brenner et al. (206)	2011	USA	ICD-9	**Retrospective cohort** study from VHA data on those seeking treatment (2001–2006). Adjusted for demographics and other psychiatric diagnoses. N= 49,626 subjects, 389,053 controls.	**Traumatic brain injury**	aHR of suicide in TBI: 1.55 (95% CI: 1.24–1.92)	3
Fazel et al. (207)	2014	Sweden	ICD	**Retrospective cohort** study of 218,300 individuals who sought treatment for TBI from 1969 to 2009, compared with 2,163,190 controls. Adjusted for income, marital, and immigration status.	TBI	Suicide aOR: 3.3 (95% CI: 2.9–3.7)	3
Richard et al. (211)	2015	Canada	ICD-9	**Retrospective cohort** study of 135,703 children (ages 0–17) from the Quebec population-based physician reimbursement database in 1987 and followed until 2008, looking at TBI and death by suicide.	TBI	Suicide HR: 2.41 (95% CI: 1.91–3.02)	2
Madsen et al. (210)	2018	Denmark	ICD-8, ICD-10	**Retrospective cohort** study looking at suicide and TBI, using nationwide registers in Denmark, covering 7,418,391 individuals from 1980–2014. 164,265,624 person-years follow-up. Adjusted for demographics and pre-TBI psychiatric diagnoses.	TBI	Adjusted IRR of suicide Any TBI: 1.90 (95% CI: 1.83–1.97) Mild TBI: 1.81 (95% CI: 1.74–1.88) Severe TBI: 2.38 (95% CI: 2.20–2.58)	1
Chang et al. (205)	2019	Taiwan	ICD-9	**Retrospective cohort** study on suicide in adolescents and young adults with TBI. Data from National Health Insurance program. HRs adjusted for demographic data and psychiatric comorbidities. N=31,599 subjects, 126,396 controls.	TBI	SA HR: 3.86 (95% CI: 3.58–4.18) No sex differences. Multiple TBIs conferred greater risk.	1
Hostetter et al. (209)	2019	USA	ICD-9, ICD-10	**Retrospective cohort** study from VHA data from 2006–2015. Adjusted for age, gender, depressive disorder, BD, psychotic disorder, PTSD, anxiety disorder, SUD, nerve damage/neuropathy, plegia/paralysis,	TBI	TBI aHR of suicide: 1.71 (95% CI: 1.56–1.87).	1

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
				dementia, and epilepsy. N=215,610 subjects, 1,187,639 controls.			
Campbell-Sills et al. (212)	2020	USA	C-SSRS Scale; ICD-9; Post-Concussive Symptom Scale (PCS-8); DSM-IV	Prospective longitudinal study of 7,677 US Army soldiers deployed. Total 221,234 person-months. Adjusted for demographic/ Army career correlates of SA and lifetime mental disorder.	TBI	Any lifetime TBI aOR of suicide: 0.92 (95% CI: 0.56–1.52). More severe post-concussive symptom aOR of suicide: 1.38 (95% CI: 1.09–1.73).	1
PERSONALITY DISORDERS							
Zaheer et al. (223)	2008	Multiple	Various	Narrative review of studies examining suicidality in personality disorders.	**Personality disorders**	ASPD: 3.7x risk for SA after controlling for other mental disorders (M>W). 11% SA, 5% suicide. BPD: lifetime 3–10% risk of suicide. Other PDs: less conclusive information available	3
Bolton et al. (213)	2010	USA	DSM-IV, AUDADIS-IV, survey questions	Cross-sectional study of data from the NESARC, looking at factors that increase risk of SB in those with MDD. ORs adjusted for age, marital status, income, and some features of depression (anhedonia, feeling worthless, excessive guilt, lifetime SI, lifetime SA, and number of depressive symptoms).	Personality disorders	SA aORs: Paranoid PD: 2.13 (95% CI: 1.29–3.51) Schizoid PD: 2.22 (95% CI: 1.31–3.76) Schizotypal PD: 3.12 (95% CI: 1.85–5.26) ASPD: 1.05 (95% CI: 0.61–1.80) BPD: 6.61 (95% CI: 4.07–10.72) Histrionic PD: 1.43 (95% CI: 0.77–2.64) NPD: 1.16 (95% CI: 0.67–2.01) Avoidant PD: 2.46 (95% CI: 1.47–4.12) Dependent PD: 4.43 (95% CI: 1.93–10.18) OCPD: 1.13 (95% CI: 0.63–2.01) Any PD: 4.00 (95% CI: 1.95–8.22)	2
Kulkarni et al. (214)	2013	India	DSM-IV, ICD-10	Case-control study of 100 patients who survived a SA and 100 controls.	Personality disorders	Any PD OR: 3.43 (95% CI: 1.88–6.27) Comorbid Axis I and II OR: 10.61 (95% CI: 4.67–24.15)	3
Ansell et al. (220)	2015	USA	Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV)	Prospective cohort study of 431 individuals with PDs followed over 10 years compared to individuals with only MDD. Multivariate model of risk of SA with all 10 PDs.	Personality disorders	BPD SA OR: 1.77 (CI not reported) All other PDs in multivariate analysis were not significant.	3
Björkenstam et al. (215)	2016	Sweden	ICD-10	Prospective cohort study of 25,217 hospitalized individuals (ages 15–64) with main diagnosis of PD during 1987–2013, and followed until end of 2013, covering 323,508.8 person-years. Mean follow-up 11.7 years.	Personality disorders	SMR any PD: 31.5 (95% CI: 29.3–34.0) Cluster A SMR: 20.7 (95% CI: 13.5–31.8) Cluster B SMR: 33.9 (95% CI: 30.5–37.8)	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
						Cluster C SMR: 24.9 (95% CI: 15.7–39.6)	
Tong et al. (216)	2016	China	ICD-10, SCID-I, SCID-II	Case-control study of 151 suicides, 118 SA and 140 controls. OR adjusted for age, sex, years of education, marital status, employment status, and Axis I disorders.	Personality disorders	aOR any PD = 4.95 (95% CI: 0.46–53.29) aOR any PD and subthreshold PD = 3.56 (95% CI: 1.33–9.58)	3
McCloskey and Ammerman (217)	2018	Multiple	Various	Narrative review of SB in aggression-related disorders.	Personality disorders	BPD 10% suicide rate; 50–90% engage in SB ASPD 5% suicide rate; more medically serious attempts	3
Blasco-Fontecilla et al. (227)	2009	Spain	DSM-IV; International Personality Disorder Examination-Screening Questionnaire	Cross-sectional study of 254 individuals with cluster B PDs after being admitted to the ER following a SA. Compared to 515 controls.	**Cluster B PDs**	Those with NPD more likely to use more lethal means ($t = -4.24$, $df = 439$, p<0.001) than controls. BPD ($t = -7.44$, $df = 442$, p<0.001), ASPD ($t = -3.96$, $df = 442$, p<0.001), and histrionic PD ($t = -3.88$, $df = 442$, p<0.001) more impulsive than controls.	3
Chioqueta and Stiles (229)	2004	Norway	SCID-I, SCID-II	Cross-sectional study of 87 outpatients meeting diagnostic criteria for a PD and 53 outpatients meeting criteria for an Axis I disorder only.	**Cluster C PDs**	Not significantly associated with risk for suicide attempts	3
Lentz et al. (228)	2010	USA	DSM-IV	Cross-sectional study using data from Waves 1 and 2 of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). Adjusted for sociodemographic factors, Axis I and II and childhood adversity (N=307).	**Schizotypal PD**	SA aOR: 1.34 (95% CI: 1.03–1.74) Men aOR: 1.78 (95% CI: 1.12–2.84) Women aOR: 1.09 (95% CI: 0.75–1.60)	2
Verona et al. (225)	2001	Multiple	Various	Narrative review examining psychopathy, ASPD, and suicidality.	**Antisocial PD**	5% death by suicide; 11% with SA	3
Pompili et al. (224)	2005	Multiple	Various	Systematic review and meta-analysis of 8 studies from 1980–2005 (N=1179).	**Borderline PD**	Risk of death by suicide = 898/100,000	3
Oldham (218)	2006	Multiple	Various	Narrative review of suicidality in BPD.	BPD	60–70% of those with BPD have history of SA	3
Leichsenring et al. (221)	2011	Multiple	Various	Narrative review of BPD.	BPD	8–10% die by suicide	3
Winsper et al. (219)	2016	Multiple	Various	Systematic review and meta-analysis of 61 studies examining BPD in youth (N=29,659).	BPD	SA OR: 2.10 (95% CI: 1.21–3.66) compared to clinical controls; OR 21.62 (95% CI: 2.67–174.77) compared to healthy controls	3
Paris (222)	2019	Multiple	Various	Narrative review of suicidality in BPD.	BPD	3–6% died by suicide in longitudinal cohort studies; compared to up to 10% in follow-back studies	3

STUDY (citation #)	YEAR	ORIGIN	DIAGNOSTIC CRITERIA	METHODS	DIAGNOSES	SUICIDAL BEHAVIOR RATE	OXFORD LEVEL OF EVIDENCE*
Coleman et al. (226)	2017	USA	SCID, SCID-II	**Cross-sectional** study of suicidality in patients with MDD or BD, with comorbid NPD.	**Narcissistic PD**	Presence of NPD SA OR = 0.41 (95% CI: 0.19–0.88)	3
Bowen et al. (75)	2018	UK	CIS-R, SCID-II	**Survey** of 7,839 people (ages 16–74) from the 2000 British Adult Psychiatric Morbidity Survey. Examining OCD symptoms and OCPD traits, and their relationship with suicidality. Adjusted for sex, age, depression symptoms, and mood instability.	**OCPD**	OCPD traits aOR of SA: 1.09 (1.01–1.17)	2

Suicidal behavior = attempts + deaths by suicide. If death by suicide not specifically mentioned, rates indicated are for attempts.

Color coding with white versus light blue rows indicate transition to another diagnosis within the general diagnostic category.

*
The Oxford Center for Evidence Based Medicine's (OCEBM; 2011) guidelines level 1 signifies data is derived from systematic review of surveys that allow matching to local circumstances; and 3 signifies data is derived from a "local and current random sample surveys (or censuses);" 2 signifies data is derived from a local non-random sample. For more information see http://www.cebm.net/index.aspx?o=5653

Abbreviations: ID=intellectual disability; SA=suicide attempt; ASD=autism spectrum disorder; SB=suicidal behavior; HR=hazard ratio; RR=relative risk; ADHD=attention deficit hyperactivity disorder; (a)OR=(adjusted) odds ratio; IRR=incident rate ratio; SLD=specific learning disorder; MDD=major depressive disorder; GAD=generalized anxiety disorder; SUD=substance use disorder; ACE=adverse childhood events; SI=suicidal ideation; BD=bipolar disorder; PF=psychotic features; ATPD=acute transient psychotic disorder; SMR=standardized mortality ratio; DMDD=disruptive mood dysregulation disorder; ODD=oppositional defiant disorder; CD=conduct disorder; PMDD=premenstrual dysphoric disorder; PMS=premenstrual syndrome; FDA=Food and Drug Administration; PTSD=post-traumatic stress disorder; OCD=obsessive compulsive disorder; PD=personality disorder; OCPD=obsessive-compulsive personality disorder; BDD=body dysmorphic disorder; MVA=motor vehicle accident; IED=intermittent explosive disorder; POW=prisoner of war; AD=adjustment disorder; AN=anorexia nervosa; BN=bulimia nervosa; BED=binge eating disorder; BMI=body mass index; SIB=self-injurious behavior; AN-R=anorexia nervosa restricting type; AN-BP=anorexia nervosa binging/purging type; ED=eating disorder; aHR=adjusted hazard ratio; NM=nightmares; NSSI = non-suicide self-injury; RLS=restless leg syndrome; WHO=World Health Organization; CaUD=cannabis use disorder; OUD=opioid use disorder; AUD=alcohol use disorder; TBI=traumatic brain injury; ND=nicotine dependence; HD=Huntington's disease; FTD=frontotemporal dementia; ASPD=antisocial personality disorder; BPD=borderline personality disorder; NPD=narcissistic personality disorder; C-SSRS=Columbia Suicide Severity Rating Scale.

TABLE 2:

PROPORTION OF POSITIVE STUDIES FOR SUICIDE AND SUICIDE ATTEMPT AND HIGHEST LEVEL OF EVIDENCE FOR EACH

Diagnosis	Suicide (N positive/total N)	Highest Evidence Level for Suicide	Suicide Attempt (N positive/total N)	Highest OCEBM Evidence Level for Suicide Attempt[#]
Intellectual Disability	0		3/3	3[*]
Autism Spectrum D/O	1/1	1	6/6	3[*]
Attention Deficit Hyperactivity D/O	3/3	1[*]	6/7	1[*]
Specific Learning D/O	0		1/1	1
Tic D/O	1/1	1	1/2	1
Psychotic D/O NOS	0		1/1	2
Schizophrenia	1/2	3	2/2	2
Schizoaffective D/O	1/1	3	1/1	2
First Episode Psychosis	0		2/2	3
Delusional D/O	0		1/2	3
Acute Transient Psychotic D/O	1/1	2	1/1	3
Bipolar D/O	8/8	2[*]	8/9	3[*]
Cyclothymic D/O	0		1/1	3
Disruptive Mood Dysregulation D/O	0		1/1	3
Major Depressive D/O	--	--	--	--
Dysthymia	0		2/2	3
Premenstrual Dysphoric D/O	0		4/4	2[*]
Anxiety D/O	1/1	3	5/5	2[*]
Social Phobia	0		5/7	1[*]
Simple/Specific Phobia	0		2/5	1[*]
Panic D/O	0		9/11	1[*]
Agoraphobia	0		2/5	1[*]
Generalized Anxiety D/O	1/1	3	6/9	1[*]
Obsessive-Compulsive D/O	2/2	1	4/7	1[*]
Body Dysmorphic D/O	1/1	3	5/5	3[*]
Post-Traumatic Stress D/O	1/3	3[*]	13/13	2[*]
Acute Stress D/O	1/1	2	0	
Adjustment D/O	1/1	3	2/2	3
Dissociative D/O	0		1/1	3
Conversion D/O	0		1/1	3
Somatoform D/O	0		1/1	3
Eating D/O	2/2	2	7/7	1[*]

Diagnosis	Suicide (N positive/total N)	Highest Evidence Level for Suicide	Suicide Attempt (N positive/total N)	Highest OCEBM Evidence Level for Suicide Attempt#
Anorexia Nervosa	2/2	**2**	9/9	**1***
Bulimia Nervosa	2/3	**2***	13/13	**1***
Binge Eating D/O	0/1	2	7/9	**1***
Insomnia	0		1/1	1
Restless Legs Syndrome	0		1/1	3
Gender Dysphoria	0		3/3	**3***
Conduct D/O	0		4/4	**2***
Oppositional Defiant D/O	0		3/3	**2***
Intermittent Explosive D/O	0		6/6	**1***
Kleptomania	0		1/1	3
Substance Use D/O	1/1	2	3/4	**1***
Alcohol Use D/O, Abuse/ Dependence	9/10	2*	9/11	**1***
OUD And Opioid Abuse	3/3	1*	3/3	**1***
Sedative, Hypnotic, Anxiolytic Use D/O	1/1	2	0	
Nicotine Use D/O And Dependence	1/1	2	3/6	**1***
Cannabis Use D/O	0/2	2	4/5	**2***
Inhalant Abuse/ Dependence	0		2/3	**2***
Stimulant Use D/O	1/1	2	0	
Amphetamine Use D/O	1/1	3	0	
Methamphetamine Use D/O	0		1/1	3
Cocaine Dependence	0/1	2	1/1	3
Gambling D/O	2/2	3	11/11	**2***
Dementia	2/2	3	0	
Huntington's Disease	6/6	**3***	3/3	3
Parkinson's Disease	3/3	**3***	0	
Frontotemporal Dementia	0		2/2	3
Traumatic Brain Injury	6/7	**1***	1/1	1
Personality D/O	2/2	3	2/2	2
Cluster A PDs	1/1	3	0	
Cluster B PDs	1/1	3	1/1	3
Cluster C PDs	1/1	3	0/1	3
Schizoid PD	0		1/1	2
Paranoid PD	0		1/1	2
Schizotypal PD	0		2/2	2
Antisocial PD	3/3	3	2/3	**2***

Diagnosis	Suicide (N positive/total N)	Highest Evidence Level for Suicide	Suicide Attempt (N positive/total N)	Highest OCEBM Evidence Level for Suicide Attempt[#]
Borderline PD	--	--	--	--
Histrionic PD	0		0/1	2
Narcissistic PD	0		1/2	2
Obsessive Compulsive PD	0		1/2	2
Avoidant PD	0		1/1	2
Dependent PD	0		1/1	2

D/O=Disorder; PD=Personality Disorder; GRAY=no published studies with evidence level$\geq$3; GREEN = 100–75% positive studies; YELLOW = 74–50% positive studies; RED=<50% positive studies; Note Some D/O Have Only a Few Studies About SB

[*] 3 studies

There is evidence for association with SB in 72/144 disorders (69 if Personality Disorder Clusters are excluded)

[#] The Oxford Center for Evidence Based Medicine's (OCEBM; 2011) guidelines level 1 signifies data is derived from a "local and current random sample surveys (or censuses);" 2 signifies data is derived from systematic review of surveys that allow matching to local circumstances; and 3 signifies data is derived from a local non-random sample. See also http://www.cebm.net/index.aspx?o=5653