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ORIGINAL ARTICLE

Suicide Attempts Among Adolescents with Self-Reported Disabilities

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Abstract This study examines the relative risk for suicide attempts (SA) among high-school students self-identifying with one or more disability classifications (nine); assesses the extent to which youth with disabilities are disproportionately vulnerable to risk factors that predict suicidal behavior among all adolescents; and explores whether disability status adds to risk for SA after accounting for a comprehensive set of known risk and protective factors for SA. Analyses using Wisconsin's 2012 Dane County Youth Assessment Survey data found that youth in each disability category were 3–9 times more likely to report suicide attempt(s) relative to peers, and the endorsement of multiple disabilities tripled the risk SA relative to youth reporting a single disability. Some disability sub-groups, including youth reporting autism spectrum disorder, hearing, and vision impairments reported surprisingly high rates of SA. While youth with disabilities reported disproportionate exposure to adversity in every life domain examined, similar to youth reporting SA, disability status added unique risk for suicidal behavior. This suggests that disability may be a 'fundamental cause' of suicidal behavior, a question that requires further investigation.

Keywords Adolescents · Disabilities · Suicide attempts · Risk factors · Fundamental cause

Abbreviations

CDC	Centers for disease control
SA	Suicide attempts
GLBT	Gay, lesbian, bisexual and transsexual
CWS	Child welfare system
YWD	Youth with disabilities
YSA	Youth reporting having attempted suicide(s)
ADHD	Attention-deficit hyperactivity disorder
ASD	Autism spectrum disorder
DCYA	Dane county youth assessment

Youth suicide remains a dire problem, accounting for about 13% of all deaths in the 15–24 age-group, which amounts to approximately 4600 lives each year [1]. In the United States, in 2011, according to the CDC's Youth Risk Behavior Survey, 15.8% of high school students seriously considered suicide in the past year, 12.8% made a suicide plan, and 7.8% attempted suicide one or more times [2]. Suicide attempts (SA) have been a primary focus of suicide research, prevention, and intervention efforts. With rates vacillating between 6.3 and 8.8% since 1991 according to national risk surveillance studies [3], SA are far more common relative to completed suicide in teens, with about 100–200 SA for every 1 completed suicide [4]. SA, especially multiple attempts, are a prominent risk factor for subsequently completing suicide [5, 6]. Because unsuccessful SA offer a precious window of opportunity for intervention, these have been a focus of much research.

A large body of prospective and retrospective research has identified a common set of biopsychosocial and environmental correlates of SA among American youth [7–9]. These factors, often inter-related, can be organized along individual-level, family, peer, and environmental domains. Common risk factors in the *individual domain*, aside from previous suicide attempts, include (but are not limited to): a genetic predisposition [10]; poor mental health, especially depression and anxiety disorders, but also externalizing symptoms including aggression or violent behavior [11–13];

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deficits in problem-solving or positive coping, pessimism, and low self -esteem [9, 14]; substance use behavior and disorders; high risk sexual behavior including newer risk manifestations involving sexting or posting nude self-photos online [7, 15]; poor physical health such as asthma [16, 17]; and poor school performance and achievement [18]. Some demographic characteristics such as age (older), gender (female), have also been linked to suicidal behavior [9, 19].

Family level risk factors commonly implicated in adolescents' suicidal behavior include a family history of suicide, poor family relationships/discord, parental neglect or abuse, divorce/separation and parental loss. *Peer-related/social factors* predictive of suicidal behavior involve social rejection/isolation, social bullying (as victim and perpetrator) [13, 20], dating violence [21], as well as exposure to peers who have attempted or succeeded in committing suicide (social contagion) [22]. *Environmental factors* commonly found among youth who attempt or complete suicide include exposure to negative life events [19, 23], low socio-economic status (SES) and neighborhood poverty [14, 24, 25].

In addition to isolating risk factors for suicidal behavior, identifying sub-groups of adolescents at high risk of suicide attempts is important for creating targeted prevention and intervention efforts for specific populations [4, 26]. For example, gay, lesbian, bisexual and transsexual (GLBT) youth are 2–6 times at greater risk for suicidal behavior relative to straight and cisgender peers [27]. Adolescents in the child welfare system (CWS) comprise another high-risk group for suicidal ideation and behavior; these youth are nearly 4 times more likely to have attempted suicide relative to peers [28, 29]. Homeless and runaway youth (often involved in CWS) report very high rates of attempted suicide (as high as 50%) [30, 31]. Awareness of suicide rates and risk factors for these populations has led to local efforts to tailor suicide prevention training and case management programming for the needs of the youth [32, 33], though many argue that more such efforts are needed [34].

Suicide Risk Among Youth with Disabilities

One population at risk for suicide that has been relatively neglected as a focus of suicide research involves youth with disabilities (**YWD**) [7]. The conceptual definition of disability typically refers to physical or mental impairments that limit the person's functioning or ability to perform age-appropriate tasks and engage in some life activities. According to the 2010 U.S. census, among individuals age 15–24 years, 10.2% have some kind of a disability in the communicative, mental/emotional, or physical domain; of these, half (5.3%) were classified with a 'severe' disability (e.g., unable to perform one/more functional physical activities, find a job or remain employed, or develop and maintain positive interpersonal relationships [35]. In operational terms, we see variation across studies in how questions are phrased, whether the level of functional impairment is embedded in the definition, and the inclusion of different conditions.

Although some YWD report an intact sense of wellbeing and self-esteem, and evidence no notable negative psychosocial outcomes [36], available studies indicate that, for the most part, youth included in broad groups of disabling conditions or more specific disability groups are more inclined to report suicidal behavior relative to non-disabled peers [29, 37]. For example, Chavira et al. [29] found that youth receiving special education were significantly more likely to report SA in the past year relative to peers in child welfare, juvenile justice, alcohol/drug services, and county MH services—all populations at relatively high risk for suicide.

The suicide risk for some disability groups (Attention Deficit Hyperactivity Disorder or **ADHD**, psychiatric disorders, learning disabilities) has received a fair amount of attention, while other groups have received little to no attention (hearing and vision impairments, autism spectrum disorders, chronic health conditions, physical mobility). Questions that have yet to be more fully addressed, explored in this study, include the relative risk for suicidal behavior among youth with specific disabilities, and the extent to which a disability status confers additional risk above and beyond significant risk factors for suicide. The next section briefly reviews research on SA within more narrowly defined groups of YWD.

Suicide Attempts in Specific Disability Populations

Not surprisingly, youth diagnosed with mood, anxiety, and disruptive behavior disorders are more prone to suicidal behavior [12, 38]. Blum et al. [45] found that adolescents with emotional disabilities were more than 6 times as likely to report suicide attempts in the past 12 months relative to the nondisabled peers (11.6 vs. 1.9%). These conditions are often used as moderators or mediators explaining suicidal behavior in youth with other disabilities as well.

Adolescents with neuro-developmental disabilities involving ADHD and specific learning disorders are found to be at higher risk for suicide [39, 40]. This association is often explained by a high rate of co-occurrence of depression, anxiety, and externalizing symptoms, but these conditions are not always included as covariates [41]. Correlational and prospective studies of youth diagnosed with ADHD, find consistent links between ADHD and suicide ideation, attempts and completion [42–44]. Youth with specific learning disabilities (e.g., reading, math reasoning) have been found to demonstrate poorer coping (e.g. problem avoidance) [45], and to be and 2–3 times more likely than non-learning disabled youth to attempt suicide [39, 46–48].

The propensity for suicide among youth with autism spectrum disorder (**ASD**) has been under-researched, and the existing research indicates a more ambiguous association [49]. However a couple of recent studies found that parents of children and adolescents identified with ASD reported suicidal ideation or attempts as a significant problem far more frequently relative to parents of neuro-typical children [50, 51].

The research on suicidality among youth identified with hearing, visual and language/speech disabilities is quite sparse. Hearing loss/deafness has been identified as a risk factor for MH challenges [52], though studies of suicide among hearing impaired youth are few and outdated. A review of this literature found that 12-month rates of attempted suicide among hearing impaired youth ranged between 1.7–18%, with lifetime rates as high as 30% [53]. Suicide risk among adolescents with *vision impairments* has not been evaluated to the best of the author's knowledge. Several small studies on the psychological adjustment of vision-impaired adolescents have yielded inconsistent findings about depression and anxiety rates as well as externalizing symptoms. Some have found higher depression rates [54] and several have found slight or no differences in mental health between vision impaired and sighted peers [36, 55, 56].

Likewise, we have little information about suicide behavior among youth with a broad range of language impairments (e.g. phonological skills, verbal reasoning). Available research suggests that these youth are to some extent more likely to have emotional and behavioral disorders [57, 58]. However, the language impaired population is very heterogeneous [59], and some suggest that the risk may not directly result from communication issues, but rather that risk is more proximally related to relational and environmental stressors [60, 61].

Finally, the few studies assessing the risk of suicide among youth with physical or mobility impairments, and chronic medical conditions or chronic pain offer some evidence that these conditions increase the risk of suicidal behavior [62–64]. Most studies of suicide that include a measure for physical health find that, by and large, reports of poor health are related to suicidal ideation and attempts [16]. Two studies, the first of mobility impaired youth (N = 167) from the Ad Health study [46], and the second from the 2005 YRBS study reporting 'fair/poor health' or having a 'disability/health problem' [7], found these individuals were about three times more likely to report suicide attempts in the past 12 months relative to healthy peers. However, in both cases comorbid mental health conditions were unaccounted for. Some have found that the associations between chronic pain and SA or suicide ideation attenuate or disappear when controlling for depression or other MH conditions [65, 66]. Assessments of emotional and behavioral vulnerabilities among youth with specific physical mobility conditions such as spina bifida and multiple sclerosis, yield mixed results. Some studies report a higher rate of depression and other MH conditions [67, 68], but others have found a lower risk for MH problems and high-risk behavior often associated with suicide [67]. The mixed findings may relate to research limitations including small samples that lack analytic power as well as inconsistency in disability inclusion criteria and hence, composition of samples.

Disability: Fundamental Cause for Suicidal Behavior?

Available studies indicate that YWD are disproportionately exposed to the risk factors known to relate to psychological distress and suicidal behavior [46, 69]. YWD are 3–4 times more likely to be victims of physical and sexual violence, including dating violence [70, 71]. Various specific populations of YWD report higher rates of depression and other MH and behavioral disorders [52, 54, 72], alcohol and substance use [46, 73], social rejection, loneliness, stigmatization, and peer aggression [52, 71, 74], and lower academic self-perception and achievement [75]. If youth with various disabilities are at greater risk of experiencing many of the risk factors known to relate to suicidal behavior, these intervening variables may explain the relationship between disability and SA.

Yet, there are reasons to suspect that, for adolescents, having a disability is a *fundamental cause* of negative outcomes such as suicidal behavior, meaning that "no fixed set of intervening risk and protective factors can account for the connection" [76]. Circumstances regarded as a fundamental cause of health disparities are those that are linked to disparities over time, regardless of interventions, largely because of pervasive, unavoidable, and often incalculable disadvantages in access to opportunities and resources critical for biopsychosocial wellbeing [77]. As such, when one intervening mechanism is addressed with intervention (e.g., disability rights laws, vocational rehabilitation to secure employment), other mechanisms of influence remain or develop over time to maintain the disparity in wellbeing, for instance pervasive stigma or inadequate opportunities for meaningful social and romantic connections.

Why would disability be a fundamental cause of suicidal behavior? First, having disability can be a chronic source of pain or stress that interferes with the youth's fulfillment of daily, age-appropriate academic, social, and instrumental tasks. During adolescence, when youth strive to develop a positive sense of identity and desire more privacy and autonomy, disability-related constraints might be feel particularly oppressive. YWD may feel the need to actively manage self- and public-stigma and to negotiate a positive identity [78,

79]. Second, drawing on Joiner's interpersonal-psychological theory of suicidal behavior [80], we expect disability status to involve intrinsic risk for suicide. This theory posits that people develop a desire to die when they (a) perceive themselves as a burden to others, and (b) when their need for social acceptance, belonging, and sense of community is not met. Depending on type and severity, disability often sets the person apart from others in a way that feels lonely and alienating [81, 82] and necessitates ongoing attention and help from others. When YWD experience shame, guilt and alienation on account of their condition, suicidal behavior may arise.

In this study, we focus on three research questions. First: *what is the relative risk for SA reported by youth identifying with different disabilities?* The hypothesis is that disabilities most often associated in the literature with depression and other mental health concerns, namely youth reporting disability pertaining to emotional problems, AD/HD and learning disabilities, will report a higher rate of SA relative to other subgroups of YWD. Second, *to what extent are YWD disproportionately subject to known risk factors for suicidal behavior?* Though there is a body of literature on the biopsychosocial risk factors faced by YWD and YSA respectively, the risk profile for these two adolescent groups has not been explicitly contrasted. Based on previous research, it is hypothesized that the risk profile for both groups of youth will be similar. Third, *does disability status add to the risk for SA above known risk factors for suicide?* The supposition that disability status is a fundamental cause of suicidal behavior, lead to the hypothesis that disability status will predict SA even when prominent psychosocial risk factors are accounted for. To explore these hypotheses, this study utilizes data from the 2012 Dane County Youth Assessment (DCYA), which surveyed middle- and high-school students from fifteen of sixteen public school districts in Wisconsin.

Methods

The focus of the DCYA survey, implemented every three years since 1980, is to gauge students' opinions, concerns, behaviors, attitudes and experiences on a range of topics pertaining to health and wellbeing. The DCYA includes items from the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Survey and other national surveys and incorporates questions on emerging youth issues. Survey items are carefully selected by a committee of educators, public health professionals, project funders, and parent representatives.

Participation in this on-line survey is voluntary and anonymous; parents can also opt to exclude their child from participation. School districts attempt to survey all 7th-12th graders, with most districts capturing over 90%; one particularly large school district (Madison Metropolitan School District) uses stratified random sampling methods to survey approximately 50% of 7th-12th graders in this district (their data is weighted to ensure representation of the entire.

MMSD student body of 7th-12th graders). Students with disabilities or reading/writing challenges can opt to receive assistance to complete the survey.

For this study, we utilized survey data from high school students (9-12th grades). The sample of 14,158 Students was whittled down to eliminate students likely to have given false information. A scale of six characteristics and circumstances considered rare was developed: family member in gang, transgender, pregnant 2 or more times, have 2 or more children, have had an abortion, use inhalants. Students endorsing all 6 indicators (N = 166) were flagged and dropped. In addition, students who reported having all 10 disabilities included in the study (N = 67) were also dropped, bringing the sample to 13,925. Of this sample, 563 (~4%) had missing data on suicide attempts and other self-harm variables more generally. Listwise deletion generated a sample that includes only cases with complete disability and SA data, (N = 13,362).

Measures

Dependent Variable

Suicide Attempts (SA)

1 item: "During the past 12 months, have you attempted to kill yourself?" (response choices: No; Yes, 1 time; Yes, more than 1 time). For multivariate analyses, the responses were dichotomized (yes/no).

Independent variables

Disability Status

2 items, "Do you have a disability that limits you from doing certain activities?" (yes/no) "If yes, which disabilities do you have?" 9 types of disability and 'other' (yes/no; see Table 1).

Socio-Demographic Characteristics

This domain includes *age, gender, race or ethnicity* and free/reduced lunch eligibility (as a proxy for poverty). *Age* was operationalized as follows: 1 = 12 yo, 2 = 13 yo, 3 = 14 yo, 4 = 15 yo, 5 = 16 yo, 6 = 17 yo, and 7 = 18 yo or older. *Gender* and *eligibility for free and reduced lunch* were each surveyed with 1 item. *Race or culture* included 8 categories and students checked all that apply. Given some very small subsamples in the some of the minority categories (e.g. Asian,

Table 1 Frequencies and disability by attempted suicide within the past 12 months (N = 13,362)

	N	%	One attempted suicide	Multiple suicide attempts	Any attempted suicide (Total) in past 12 months	Odds ratio of reported suicide attempt
Disability status						
No disability	10,330	77.3	1.5% (153)	0.6% (58)	2.0% (211)	–
One type of disability	2,129	15.9	5.1% (109)	1.8% (38)	6.9% (147)	3.6
Two/more disabilities	903	6.8	10.1% (91)	5.9% (53)	15.9% (144)	9.1
Total	13,362	100	2.6% (353)	1.1% (149)	3.8% (502)	–
Disability (ordered by % total SA)[a]						
Emotional/mental health problems	713	5.1	12.5% (89)	8.3% (59)	20.8% (148)	9.1
Autism spectrum	159	1.1	7.5% (12)	10.7% (17)	18.2% (29)	6.0
Hearing impairment	134	0.96	9.0% (12)	6.0% (8)	14.9% (20)	4.6
Vision impairment	376	2.7	9.3% (35)	4.5% (17)	13.8% (52)	4.5
Other disability	384	2.8	6.3% (24)	6.0% (23)	12.2% (47)	3.8
Physical/mobility	231	1.7	6.1% (14)	5.2% (12)	11.3% (26)	3.4
Learning disability	463	3.3	7.6% (35)	3.7%(17)	11.2% (52)	3.5
Speech/language problem	207	1.5	5.8% (12)	5.3% (11)	11.1% (23)	3.3
Health problem	537	3.9	6.0% (32)	4.7% (25)	10.6% (57)	3.3
ADHD/ADD	1298	9.3	6.8% (88)	2.9%(37)	9.6% (125)	3.3

[a]All comparisons in suicide attempt rates by disability types were significant at $p < .001$

Native American, Latinx), this variable was dichotomized by students endorsing one/more of the non-white categories (minority) vs. exclusively white. *Homelessness* was defined as having been homeless in the past 12 months or over 12 months .

Mental Health Status

This domain includes available measures for depressed mood, long-term MH problem, and perceived social stigma related to having a MH problem. *Depressed mood episode* was measured with 1 item: "During the past 12 months, did you ever feel so sad or hopeless almost every day for at least two weeks in a row that you stopped doing some usual activities?" (yes/no). *Long-term mental health problem* was measured with one item: "Do you have any of the following long-term emotional or mental health problems? (6 months or more)" Endorsement of any of the following indicated a 'yes': depression, anxiety, an eating disorder, or other emotional or MH problem). *Perceived stigma related to MH services* was measured with one item, "Most youth would look down on someone who is getting professional help for a mental health problem" (4-point agreement scale).

Family Stability and Maltreatment

This domain captures family engagement and stress (running away, eating dinner with family), parents' communication and supervision, and the extent of exposure to various family adversities. *Run away from home* and *foster care* were measured with one item each, dichotomized by "never" vs. 'in the last 12 months' or 'over 12 months ago'. *Eating dinner with family* was measured with 1 item (response scale: 1–7 days). *Parent communication and supervision* was measured with an average of 7 items (e.g. "Parents know where I am when I out", "Parents talk with me about things that bother me" (4-point frequency response scale, $\alpha = .82$ in this sample). *Family risk scale* was comprised of a sum of 6 items asking about high-risk or disruptive behavior on the part of parents: prison, physically abusive, drunk or drug-abusing once per week or more; physical fights among parents and a family member in a gang (each item dichotomized "no" vs. "yes" or "don't know").

Social Relationships

This domain includes indicators for positive social supports and negative social interactions. '*Have at least one good friend (I can) trust'* was rated on a 4-point agreement scale. The measure for '*adults to rely on'* involved this question: "Not counting your parents, how many adults can you rely on if you have a problem and need help? (5-point response scale: no other adults are available' to 'four or more adults'). '*Peer victimization scale'* ($\alpha = 0.85$), and '*Aggression toward peers scale'* ($\alpha = 0.83$) are comprised of four and seven items respectively, each rated on 4-point frequency scale. Peer victimization refers to being picked on, insulted and hit/pushed; aggression toward peers pertains to social

aggression (spreading rumors, starting conflicts, excluding peers), verbal aggression, and physical fighting.

Health and Activity

Assessment of this domain involves indicators for health, weight, sedentary behavior, physical activity, and sleep hygiene. Each of the measures in this category involve 1 item. *Overweight or obesity* was calculated based on data on height and weight and using CDC Body Mass Index cut-offs, and dichotomized by healthy weight or underweight (0) vs. overweight or obese (1). For *days physically active* (60/+ min. in past week), students were reported average number of days that they engage in physical activity that elevates heart rate (response scale 1–8 associated with 0–7 days). *Hours spent watching TV/using computer* was measured with: "On an average school day/night, how many total hours do you sit and watch TV, play video or computer games, use Facebook or the internet, or spend time using hand held computer devices? (excluding time spent on school work.)" (response scale 1–7 associated with none (1) to 5 + hours per day (7)). The response scale for (average) *number of school nights awake past 11 pm* was (1–6) '0 nights' to 'every school night'. Students were also asked about having *asthma* in the past 12 months (yes/no).

Sexual & Gender Identification, Behavior & Victimization

This domain includes measures of risk related to sexual preference, gender identification, less discriminating sexual behavior and sexual coercion. To identify students who have same sex-preferences, participant were asked *how they self-identify* (responses dichotomized by : straight/heterosexual (0) vs. gay or lesbian, bi-sexual or questioning or (*GLBQ*)). Students were also asked if they *identify as transgender* (yes/no). The *number of sexual partners* was measured with "How many people have you had voluntary sexual contact with during your life?". We also included the question: *number of unfamiliar sex partners*: "How many people have you had sex with that you just met or didn't know very well?" (response scale for the last two questions: 1 person (2) to six or more people (7)). Finally, youth were asked if they *posted sexually explicit pictures*: "Have you ever sent or posted naked or sexually explicit pictures of yourself?" (yes/no).

Substance Use and Other High Risk Behavior

This domain includes indicators for use of alcohol, marijuana (pot), cigarettes, and other drugs; problem pattern of use; and involvement in the juvenile justice system. The use of *cigarettes, alcohol*, and *marijuana* was determined with the following questions: "how old were you when you: 'smoked a whole cigarette for the first time?", "had your first drink of alcohol other than a few sips?", and "first tried pot?" (responses were dichotomized: 'never…' (0) vs. ages 8–17+ (1)). *Consumption of other drugs* indicates that youth reported using any of the following drugs once per month or more: prescription drugs (nor prescribed for student), cocaine or crack, inhalants, speed, heroin, ecstasy, bath salts, synthetic marijuana or steroids. An additional question asked of youth to gage seriousness of use: *"Have you ever been asked to stop/cut down on substance use by family or friends?"* (response: yes/no). Finally, involvement in the *juvenile justice/corrections system* was operationalized as having "…been in juvenile corrections/prison for more than 30 days" (3 point scale dichotomized by never vs. prior to or during the last 12 months).

School Functioning and Integration

This domain consists of one-item indicators for school achievement, attachment and problematic behavior (suspensions and cutting classes). *Grades* was based on a question: "What grades do you usually get on your report card?" (response scale 1–8 from 'mostly below D's' (1), mostly D's… to 'mostly A's' (8)). *Suspensions from school* was dichotomized by never (0) vs. one-three or more times in the past year (1). *Skipping/cutting classes* in the past 30 days was also dichotomized by: 0–1 time per month (1) vs. more than 1 or 2 times per month (1). The *school attachment* scale included five items averaged (e.g., "I feel like I belong at this school", 4-point agreement response scale, α=.80).

Assets and Resources

As true for *all* adolescents, certain protective factors such as social support can mitigate risk for mental health co-morbidities and suicide for YWD [83]. This last category comprises factors expected to protect against suicidal behavior: spirituality, positive coping, and a sense of neighborhood connectedness. *Positive coping scale* was comprised of three items relating to active problem-solving, positive reframing of a situation, and ability to calm oneself (response scale: 1 = not at all to 4 = always, α=.74). *Neighborhood Connectedness* was calculated using 5 items pertaining to perceived safety and comfort in neighborhood (e.g." I can ask my neighbors for help", 4-point agreement response scale, α=.83). Finally, the question pertaining to *religiousness or spirituality* was: "How spiritual or religious would you say you are?" (4-point frequency response scale).

Data Analysis

Descriptive statistics provided a profile of SA prevalence across the various disability groups while logistic regression was used to establish the relative risk of single/multiple SA

reports. A large set of risk and resource predictors, chosen based on the risk and resilience literature relevant for disability and suicide were included in bivariate data analyses (t-test or chi square) with disability status and SA respectively to ascertain the extent to which youth identified in these groups share similar risk factors. Subsequently, to prepare for the final multivariate binary logistic model testing the significance of disability status as a predictor of SA above and beyond other risk and protective factors, a series of logistic regression models was implemented in three steps. First, SA was regressed on each block of variables shown in Table 2 separately, identifying predictors significant at $p < .01$ to address concerns about Type II errors. Variables were excluded if they were not significantly associated with SA as a bivariate (race, physical activity), or if inclusion of the variable excluded a large segment of the sample (e.g. the number of voluntary sex partners was omitted because this excluded students who have never engaged in sex). Second, predictors identified in step 1 were included in a multivariate binary logistic model using the forward selection procedure to reduce the set of predictors to those accounting for the maximal variance of SA. The third and final regression model (Table 3) entered all variables identified as uniquely predictive of SA in the step 2 regression equation, adding disability status in a second block to examine its utility in explaining SA above and beyond the impact of other risk and protective factors. Testing for multicollinearity, there were no concerns as tolerance values were all well above 0.1 (range 0.56-.96), and VIF values were all far below 10 (range 1.0-1.4), indicating that the parameters of the regression model were not prone to undue biases according to conventional standards.

Results

In this sample, 22.7% of respondents reported one or more disabilities, a much higher figure relative to rates reported from various large scale surveys with explicit criteria for disability (e.g., 8% for all children under age 18 in the 2009 Health Interview Survey) [84]. This higher proportion likely relates to the fact that the DCYA elicits self-report data rather than reports from schools or households attached to explicit definitions of disability. In terms of suicidal behavior 3.8% (502) youth reported making one or more suicide attempts (henceforth, these youth will be referred to as **YSA**). Our rates of SA are lower in comparison to the 7.8% SA rate reported in the 2011 national YRBS survey [3], and also lower relative to the 6% SA rate in the WI statewide YRBS survey [85].

Data presented in Table 1 shows that YWD are 3.6 times more likely to report a SA in the past year than peers, and having more than one disability almost triples the risk of SA within the last 12 months (OR = 9.1). Not surprisingly, youth reporting an emotional/MH disability topped the list for SA in the past year (20.8%), followed by youth reporting ASD (18.2%). Curiously, youth with ASD reported being most likely, proportionately, to make multiple SA. It was also unexpected that youth reporting with sensory impairments (hearing and vision) were more likely to report suicide attempts than youth with learning disabilities, ADHD and health-related issues. This is striking as the former disability groups are less frequently studied as risk conditions for suicide, and/or previous results have been ambiguous.

Next, we turned to the examination of risk factors for SA and for YWD. As shown in Table 2, youth with disabilities were disproportionately more likely to report poor mental health, as hypothesized. In fact, YWD were significantly vulnerable to *all* of the risk factors, in every domain examined, that were tied to greater risk of SA in this sample, with the exception of age and gender (no significant age or gender differences for YWD, while YSA were older and disproportionately female). YSA *and* YWD were more likely to: report higher stress and poor mental health; come from a poor socio-economic household (free/reduced lunch and homelessness); have negative family experiences (maltreatment, parental risk behavior, lack of parental supervision and communication); report less social supports and more victimization by peers, indicate poorer health and lower physical activity levels (more over-weight, asthma); report minority sexual preference and transgender identifications and more high-risk sexual experiences and behavior (more indiscriminate sexual activity, posting nude pictures, coerced sex experiences); claim more alcohol and other substance use and greater juvenile justice system involvement; report poorer school engagement and performance; and rate lower on positive coping skills and on sense of neighborhood connectedness and safety.

The question about the extent to which having a disability is linked to suicidal behavior above and beyond prominent risk factors was addressed using the logistic regression analytic steps described above to identify the most statistically salient set of predictors for SA. Step one (not shown) eliminated only two variables (beyond those denoted with a [a] or [b] in Table 2): foster care and the aggression toward peers scale. Step two identified the factors most statistically linked to SA using regression analysis with forward selection to identify the correlates of SA that account for maximal variance (shown in Table 3). Adding disability status in a second block to examine its utility in explaining SA above the most statistically salient risk and protective predictors, we found that a reported disability increased the odds of suicide attempt(s) by 54% ($p = .002$)--above and beyond the variation explained by 14 predictors of SA: older age and sexual minority identification; negative family circumstances and

Table 2 Risk and protective correlates of disability status and of suicide attempts in past year (N = 13,362)

	Disabled (N = 3032, 22.7%)		Non-disabled (N = 10,330, 77.3%)		Suicide 1/+ times in last 12 months (N = 502, 3.8%)		No Suicide in last 12 months (N = 12,860, 96.2%)	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Socio-demographic characteristics								
Gender: females	1503	50.6[n.s]	5247	50.9	303	60.5	6,447	50.2
Race/culture: non-white or mixed race[a]	803	26.5[n.s]	2674	25.9	140	27.9[n.s]	3337	25.9
Age	15.9	1.2[n.s]	15.9	1.2	15.7	1.2	15.9	1.2
Free/reduced lunch	679	23.3	1555	15.4	153	32.8	2081	16.6
Homeless	138	4.6	162	1.6	58	11.9	242	1.9
Mental health and stress								
Perceived stigma related to MH services	2.6	0.84	2.5	0.77	2.8	0.91	2.5	0.78
Depressed mood episode in past year	1130	37.4	1440	14.0	380	76.2	2182	17.1
Long-term mental health problem	1526	49.4	2034	18.8	369	73.5	2660	20.7
Stress	2.4	0.92	1.9	0.76	2.9	0.90	2.0	0.80
Family stability and maltreatment								
Nights/week eat dinner with family	3.8	2.5	4.2	2.2	1.9	2.5	3.1	2.3
Parent communication and supervision	3.2	0.65	3.3	0.57	2.9	0.77	3.3	0.58
Family risk scale	0.93	1.4	0.43	0.92	1.8	1.9	0.49	1.0
Run away from home	512	17.0	668	6.5	202	40.6	978	7.6
Foster care	102	3.4	116	1.1	29	6.0	189	1.5
Social relationships, behavior & victimization								
Have at least one friend one trusts	3.5	0.70	3.6	0.61	3.4	0.84	3.6	0.62
Adults to rely on	2.4	1.4	2.7	1.3	1.9	1.4	2.6	1.3
Peer victimization scale	1.5	0.72	1.3	0.49	1.8	0.87	1.3	0.54
Aggression toward peers scale	1.3	0.44	1.2	0.33	1.4	0.56	1.2	0.34
Health, sleep & physical activity								
Overweight or obese	811	26.7	2073	20.1	155	30.9	2729	21.2
Days phys. active (60/+ min. in past week)[a]	3.2	2.3	3.3	2.2	3.3	2.3[n.s]	3.2	2.2
Hours spent watching TV/using computer	4.4	1.6	3.9	1.4	4.5	1.8	4.0	1.5
School nights awake past 11 pm	2.8	1.8	2.6	1.8	3.2	1.8	2.6	1.8
Asthma (take medication for) (yes)	747	24.7	1435	13.9	118	23.6	2064	16.1
Sexual identification, behavior & victimization								
Identified as GLBQ	393	13.1	421	4.1	136	27.3	678	5.3
Identified as Transgender	72	2.4	100	1.0	30	6.1	142	1.1
Ever had sex	1245	41.1	3585	34.7	312	62.2	4518	35.1
Posted a nude/sexually explicit picture of self	413	14.7	825	8.4	141	31.5	1097	9.0
Number of voluntary sex partners[b]	3.9	1.8	3.4	1.6	4.1	1.9	3.5	1.7
Sexual partners that were unfamiliar[b]	1.8	1.5	1.5	1.2	2.2	1.8	1.6	1.2
Ever coerced (verbally or physically) into sex	348	11.6	516	5.0	141	28.9	714	5.6
Substance use and high risk behavior								
Smoked a whole cigarette	822	27.5	1604	15.7	243	50.0	2183	17.1
Drank alcohol (ever)—more than a few sips	1780	58.7	5336	51.7	393	78.3	6723	52.3
Marijuana consumption (ever)	1149	37.9	3015	29.2	304	60.6	3860	30.0
Consumption of other drugs: 1 × month/ more	319	10.5	450	4.4	99	19.7	670	5.2
Asked to stop/cut down on substance use[b]	3294	22.2	636	14.4	97	28.2	863	15.6
Juvenile Justice/Corrections	92	3.1	84	0.8	47	9.6	129	1.0
School functioning & integration								
Grades usually get	6.0	1.7	6.7	1.4	5.6	1.8	6.6	1.5
Skipped/cut classes : More than 2 × per month	231	8.0	424	4.2	76	16.4	579	4.6
Suspensions (1 × or more in past year)	225	7.8	310	3.1	73	15.8	462	3.7

Table 2 (continued)

	Disabled (N = 3032, 22.7%)		Non-disabled (N = 10,330, 77.3%)		Suicide 1/+ times in last 12 months (N = 502, 3.8%)		No Suicide in last 12 months (N = 12,860, 96.2%)	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
School attachment	2.9	0.62	3.1	0.54	2.8	0.68	3.1	0.55
Strengths and resources								
Positive coping	2.4	0.80	2.9	0.72	2.4	0.81	2.9	0.72
Neighborhood connectedness/safety	2.9	0.67	3.1	0.60	2.7	0.74	3.1	0.61
Religiousness or spirituality	2.2	1.0	2.3	1.1	2.2	1.0[a]	2.3	1.1

All comparisons in disability by correlates and suicide attempt rates by correlates were significant at $p < .001$ unless noted

n.s not statistically significant

[a]Not included in multivariate analysis (Table 3) because of non-significant association with suicide attempt or because $p > .01$ (relig/spiritual)

[b]Not included in multivariate analysis (Table 3) because of high drop-off in sample participation

Table 3 Pared-down logistic regression model—regressing significant correlates on suicide attempt

	Exp(B)	95% C.I.for EXP(B)		Sig.
		Lower	Upper	
Socio-demographics, sexual identity and family issues				
Age	1.275	1.157	1.405	0.000
Family risk scale	1.183	1.099	1.274	0.000
Run away from home	2.174	1.680	2.813	0.000
GLBQ	1.827	1.376	2.426	0.000
Mental health & coping				
Perceived stigma related to MH services	1.234	1.079	1.412	0.002
Depressed mood episode in past year	4.761	3.603	6.292	0.000
Long-term mental health problem	2.570	1.954	3.381	0.000
Positive coping	0.824	0.706	0.963	0.015
School achievement, risk behavior and victimization				
Grades usually achieve	1.078	1.009	1.150	0.025
Posted a nude/sex. explicit picture online	1.584	1.206	2.082	0.001
Drank alcohol (ever)	1.436	1.093	1.887	0.009
Peer victimization scale	1.182	1.018	1.373	0.028
Coerced into sex	1.476	1.108	1.966	0.008
Disability status	1.544	1.134	1.838	0.002

Model $\chi^2_{(df=14)} = 1132.8$, $p < .001$; Nagelkerke R^2 Square = 0.357, Cases correctly predicted = 96.7%

relationships; poor MH, coping, and perceived stigmatization related to mental health issues; high risk-behavior and experiences related to running away, sex, and alcohol use; victimization by peers and experiences with coerced sex; and poorer school achievement. Disability status added 0.9% to variance explained by the model (Nagelkerke R^2 Δ 0.348–.357).

Discussion

This study builds on previous research indicating that YWD are disproportionately subject to risk factors that dispose them toward greater risk for SA and are indeed more likely to report suicidal behavior [46, 65, 69]. We addressed questions about the relative SA risk across various disability groups, some of which have not been well researched; the extent to which YWD are subject to known psychosocial risk factors for suicidal behavior; and whether a disability status contributes risk for SA above and beyond these risk factors, including indicators of poor mental health. Based on data from a large survey of high school students from a large school district in the Midwest, our findings confirm the pervasive vulnerability of YWD in many quality of life domains and suggest that disability adds unique risk for SA.

We found that youth self-identified with any of the specific disabilities reported between 3 and 9 times higher rates of SA relative to youth who did not identify having any disability. As hypothesized, YWD associated with emotional or mental health concerns reported the highest rate of SA. At the same time, youth with disabilities that are relatively less prevalent and less well studied in terms of suicidal behavior– ASD, sensory impairments, physical mobility disabilities, speech/language disabilities and chronic health conditions– reported surprisingly high rates of SA relative to peers reporting disabilities/conditions with a known risk of suicidal behavior (AD/HD, and learning disabilities) [43, 44, 47]. These findings, providing partial support for our first hypothesis regarding which group of YWD will report the highest rate of SA, support the need for further attention to the mental health needs and suicidal propensity of *all* youth with disabilities. Notably, youth who identified as having two or more disabilities were 3 times more likely to report SA relative to adolescents identifying one disability. The heightened risk of suicidality for individuals with comorbid

psychiatric conditions has been documented [41, 86], but the potential for added risk for SA associated with intersecting disabilities has received little attention.

It is particularly noteworthy that youth identifying ASD had second highest reported rate of one or more SA in the past 12 months (OR = 6.0) and the *highest* rate of multiple SA (18%). This is of particularly great concern as longitudinal research suggests that youth reporting multiple attempts are at far greater risk of successful suicide [6]. Researchers have found that multiple attempters are more likely to wish to die and regret their 'unsuccessful attempts' relative to single attempters, and that they have greater, more chronic vulnerability [6, 87]. The link between ASD and suicidal behavior has not been well researched, and there is little understanding of the processes that lead youth with ASD to attempt suicide [49]. One interesting but very small study (N < 10) found a strong negative correlation between severity of ASD symptoms and level of suicidal ideation, indicating that higher functioning youth with ASD are at particular risk, a finding that is worthy of further examination.

Trying to identify risk and protective factors that may explain higher suicidal behavior among YWD, we examined a broad range of personal, family and environmental risk factors, including some that have typically not been included in studies (e.g., juvenile justice involvement, overweight, sleep hygiene, posting nude pictures online, neighborhood connectedness and safety). YWD reported disproportionately higher rates of poor mental health and stress, as hypothesized, but they also evidenced higher risk and lower rates of protective factors in *every* other domain, similarly to YSA: lower income, family instability and maltreatment, poorer health (asthma) and less self-care (e.g., sleep, weight); less positive social relationships and more social and sexual victimization; higher rates of transgender identification, minority sexual preference; higher risk-sexual behavior and more use and higher-risk use of alcohol and other substances; juvenile corrections involvement, less positive school engagement and lower achievement; and lower resources and strengths including neighborhood connectedness, positive coping and spirituality.

Subsequently, we explored whether reporting a disability of any kind increases the risk of SA among adolescents above and beyond an inclusive set of biopsychosocial risk factors for suicidal behavior, hypothesizing that it would. We found that, indeed, it does. Disability status increased the explained variance of SA by a significant but small quotient (< 1%); but this is meaningful when considering the comprehensive array of risk factors included in the model including indicators of poor mental health. This finding supports the possibility that having a disability may be a fundamental cause of suicidal behavior.

As noted in the introduction, fundamental cause theory posits that certain social and environmental factors, and other circumstances are fundamental causes of health disparities when they meet certain criteria such as influencing negative health outcomes through multiple risk pathways across various contexts and persistently through time [77]. Such factors have an enduring relationship with health outcomes because they shape basic life opportunities in myriad ways. Specifically referring to disability and similar stigmatized statuses, Hatzenbuehler et al. [88] argue that stigma (i.e. devaluation and discrimination) associated with these is likely a fundamental cause for population health inequalities. Public and self-stigma disrupt many life domains (e.g., achievement, social integration, coping behaviors), adding burden that has a negative impact above and beyond disability-related impairments. For instance, Zhao et al. [89] demonstrated experimentally that when asked to complete a task, youth with learning disabilities are preoccupied with concerns about performance and keeping their challenges a secret, thoughts likely to undermine their confidence and performance. In terms of the stigmatizing effects of effects of labels, analysis from the Educational Longitudinal Study found that the learning disabilities label negative effects adolescents' educational outlook relative to youth who were not labeled but similar in academic and behavioral functioning [90]. Moreover this stigma effect was partially mediated by parents' and particularly teachers' lower expectations. Future research that finds ways to incorporate disability-related stigma as well as components of Joiner's interpersonal-psychological theory of suicidal behavior (perceived burden, alienation) [80] may illuminate important pathways explaining suicidal behavior among YWD.

Various limitations in this research warrant readers' consideration. The single-informant, self-report nature of the large scale survey raises questions about the quality of data. Participants demonstrating an apparent bias toward over-reporting problems were eliminated from the sample, but questions remain about data reliability especially when considering that many of the factors were measured with a single item (e.g., disability, depression). Though many such singular items have been used repeatedly in national youth risk surveillance studies, they do not lend themselves to testing of psychometric properties. We cannot be certain how youth interpreted the question, hence we cannot be sure whether the findings would hold up if using more robust and rigorous measures. Note for example that one study found that 40% of respondents reporting "yes" to a question about lifetime suicide in a survey, when probed, indicated that they did not intend to die with this 'attempt' [91]. Until other studies replicate the findings reported here, using more refined measures for risk and protective factors, we must regard the findings as purely suggestive, and exercise caution before concluding that disability is a 'fundamental cause' for SA among adolescents.

Other limitations tend to be endemic in disability studies. First, studies such as ours that rely on self-report regarding disability are useful for understanding dynamics related to *perceived* disability, but raise questions about the composition of disability samples. Individuals likely differ in how they draw the distinction between life problems or challenges and disability, thus some who may be judged by others as quite functionally impaired may not self-identify as disabled, while others who are highly functional despite a condition may self-identify as disabled. One way of addressing this is to triangulate with other sources; however this is no panacea either, as we often see poor agreement between youth, teachers, parents, and professionals on youth functioning [92, 93]. Also, similarly to many other disability surveys, we are not able to account for the tremendous intra-group variability within the population of YWD [94]. To understand the nature and severity of difficulties that promote risk for SA, it is essential to have some gage of ability in multiple functional domains. Unfortunately, surveillance studies that offer the benefit of large sample sizes typically do not have this level of detail.

In relation to survey design, due to the crossectional nature of this survey, it is not possible to untangle the direction of influence between risk and protection correlates and disability status in relation to suicidal behavior. Longitudinal research would be essential for understanding critical events or developments that predict or cause SA in adolescence and beyond. Finally, though Dane County represents a large and very diverse high school population (SES, rural/urban), and student representation in the survey across participating districts was excellent, suicide as well as disability rates tend to vary across states and locales and we would not presume to generalize findings beyond the study population.

Pathways to suicidal behavior tend to be complex. For example, longitudinal research indicates that among boys, bullying (but not victimization) is associated with suicidal behavior later in life, but that this is better accounted for by the existence of mental disorders such as conduct disorder and depression; while, for girls, victimization (but not bullying) is predictive of later SA even after considering the effects of depression and conduct disorder [95]. Should other studies replicate our findings regarding disability as a 'fundamental cause' of suicide, it would be important to develop theory grounded in observation about the nature and causes of suicidal behavior among youth with different conditions and circumstances. Some have posed important questions such as, to what extent do reported problems in psychosocial adjustment arise from late or inadequate identification of impairments, lack of appropriate community education, or limited opportunities for educational and social integration [72]? Research on such questions would provide meaningful directions for targeted interventions. Not least, there is much room for broadening the study of disability beyond the negative impacts of impairment to focus on wellness and resilience in YWD and the individual, family, and community/environmental resources that support positive outcomes [96].

Summary

The data presented confirm some previous findings regarding the risk for SA among YWD, but also highlight the vulnerability of youth reporting all types of disabilities, including some with scarce published data on suicidal behavior. More than one self-identified disability dramatically increases the odds of reporting a SA. This work also indicates that disability increases the odds of attempting suicide net of the effects of a broad range of other individual, family and environmental risk factors that also dispose YWD to SA, suggesting that disability may be a fundamental cause for SA among adolescents. A search for literature on suicide screening and prevention specifically adapted for YWD (excl. ADHD and psychiatric conditions) came up woefully short. This work and others point to a critical need for more fine grained research to uncover the mechanisms of suicide in specific populations of YWD that also considers specific types of impairments (e.g. verbal vs. non-verbal youth with ASD) and strengths (level of social skills or social integration), and environmental conditions (e.g., family and school climate, community resources). On a practical level, there is a need for suicide screening and prevention efforts tailored to address the needs of various sub-populations of YWD [86]. Much more widespread awareness of the suicide risk among YWD is the first step for promoting such important efforts.

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Compliance with Ethical Standards

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