

SUICIDAL IDEATION IN AMERICAN INDIAN/ALASKA NATIVE AND WHITE ADOLESCENTS: THE ROLE OF SOCIAL ISOLATION, EXPOSURE TO SUICIDE, AND OVERWEIGHT

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Abstract: Social isolation, exposure to suicide, and overweight increase suicidal ideation in adolescents, but no study to date has examined their relative significance in American Indian and Alaska Native (AI/AN) youth. Generalized estimating equations and path analyses were used to measure the significance and mediation of these variables in the suicidal ideation of 721 AI/ANs and 12,107 White adolescents. Social isolation, exposure to suicide, and overweight were risk factors for suicidal ideation in both races, and the associations among the variables of interest and suicidal ideation varied by race. Interventionists need to consider race in the prevention of suicidal ideation in AI/AN and White youth.

INTRODUCTION

The U.S. Surgeon General’s 2012 National Strategy for Suicide Prevention called for “effective programs and practices that increase protection from suicide risk” (Story et al., 2012). In the United States, suicide costs \$34.6 billion annually (Corso, Mercy, Simon, Finkelstein, & Miller, 2007), and many suicide risk factors disproportionately affect AI/ANs (Gracey & King, 2009; King, Smith, & Gracey, 2009). The largest disparities in suicide attempts and mortality between AI/ANs and Whites are observed in adolescence (Centers for Disease Control and Prevention [CDC] & National Center for Injury Prevention and Control, 2012). Fifteen percent of American Indian and Alaska Native (AI/AN) adolescents have attempted suicide, compared to 6% of non-Hispanic Whites (hereafter Whites; CDC, 2012). Even more worrisome, deaths by suicide are twice as prevalent in AI/AN adolescents (20.7 per 100,000 people) than in Whites (8.9; CDC & National Center for Injury Prevention and Control, 2012). Suicide rates in AI/ANs vary significantly by tribal

community (Herne, Bartholomew, & Weahkee, 2014), but racial disparities in attempted suicide, as well as death by suicide, have remained stable for the last three decades (Gone & Trimble, 2012). Consequently, the Indian Health Service (2011) has made adolescent suicide a high priority for research, intervention, and prevention.

Recent reviews of the literature have identified risk factors for adolescent suicide at the individual, family, community, and societal levels (Asarnow & Miranda, 2014; Brent, 1995; Gould, Greenberg, Velting, & Shaffer, 2003; Joiner, Brown, & Wingate, 2005; Katz et al., 2013). Research in AI/ANs has long recognized the significance of social connectedness, or social isolation, as well as individual exposure to suicide (Borowsky, Resnick, Ireland, & Blum, 1999; Chino & Fullerton-Gleason, 2006; Grossman, Milligan, & Deyo, 1991; Hill, 2009; Lester, 1995; Manson, Beals, Dick, & Duclos, 1989; O'Keefe & Wingate, 2013; Pharris, Resnick, & Blum, 1997; Tingey et al., 2014). Previous studies have approached social isolation from the perspectives of alienation, hopelessness, and lacking a sense of belonging (Chino & Fullerton-Gleason, 2006; Grossman et al., 1991; Hill, 2009; Lester, 1995; O'Keefe & Wingate, 2013; Pharris et al., 1997), but the core argument is the same: Social isolation drives suicide. A second group of studies has regarded adolescent suicide as a product of exposure to suicidal behavior in others, especially relatives and friends (Borowsky et al., 1999; Grossman et al., 1991; Manson et al., 1989; Tingey et al., 2014). While previous studies have shown the relevance of social isolation and exposure to suicide as causative factors in regional samples of AI/ANs (Borowsky et al., 1999; Chino & Fullerton-Gleason, 2006; Grossman et al., 1991; Hill, 2009; Lester, 1995; Manson et al., 1989; O'Keefe & Wingate, 2013; Pharris et al., 1997; Tingey et al., 2014), no population-based study has examined risk factors for suicidal ideation in AI/AN and White adolescents.

An emerging line of inquiry suggests that overweight might be another risk factor for adolescent suicide (Eaton, Lowry, Brener, Galuska, & Crosby, 2005; Swahn et al., 2009; Zeller, Reiter-Purtill, Jenkins, & Ratcliff, 2013). This hypothesis is especially relevant for AI/ANs, because they have a high prevalence of overweight and obesity (Anderson & Whitaker, 2009; Lau, Lin, & Flores, 2012). To date, no study has examined the relative significance of social isolation, exposure to suicide, and overweight in the suicidal ideation of AI/AN and White adolescents. The present study addresses these gaps by estimating the relative contribution of these three risk factors with data from a population-based sample. Our goals were to: 1) compare the magnitude and statistical significance of the coefficients for social isolation, exposure, and overweight in AI/ANs and Whites;

2) examine mediating factors in the associations among these three variables and suicidal ideation; and 3) assess the extent to which the associations among these variables and suicidal ideation vary by race.

METHODS

Study Sample

We conducted a retrospective cohort study with data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative survey of adolescents and young adults in the U.S. conducted by the University of North Carolina-Chapel Hill. Add Health respondents were recruited from schools and followed for four waves: 1994, 1996, 2002, and 2008. Schools were eligible to participate if they had an 11th grade class and a minimum of 30 students enrolled. Additionally, Add Health conducted in-home questionnaires with all respondents from the school sample, as well as selected oversampled communities. Full details on Add Health survey and sampling methods have been published previously (Harris & Udry, 2014). For this study, we used data from Wave 1 (1994), when all respondents were 11-20 years old. We limited our analyses to respondents who self-identified as AI/AN or White, and self-reported height and weight for calculation of body mass index (BMI). The resulting sample included 721 AI/ANs and 12,107 Whites. Our study was exempt from ethical review because it used only deidentified data.

Measures

Outcome

Suicidal ideation was measured with the question: “During the past 12 months, did you ever seriously think about committing suicide?” We used the original response categories (yes, no).

Variables of interest

Social isolation was measured by the degree of agreement or disagreement with the statements: “I feel socially accepted” and “I feel like I am part of this school.” Possible responses were *Strongly agree*, *Agree*, *Neither agree nor disagree*, *Disagree*, and *Strongly disagree*. We coded responses dichotomously, assigning 1 to “Disagree” or “Strongly disagree” and 0 to all other options.

Exposure to suicide through friends and family was measured with the following dichotomous questions: “Have any of your friends tried to kill themselves during the past 12 months?” and “Have any of your family tried to kill themselves during the past 12 months?” We used the original response categories (yes, no).

Overweight was calculated by using self-reported height and weight. Respondents with BMI above the 85th percentile (CDC, 2000) were categorized as overweight (yes, no).

Covariates

We adjusted all models for age, sex, and race. Age was coded as a continuous variable, while sex (male, female) and race (White, AI/AN) were coded categorically.

Statistical Analyses

Social isolation, exposure to suicide, and overweight were our variables of interest. Generalized estimating equations were fitted to model the associations among these variables and suicidal ideation, adjusting for age, sex, and race. Model 1 estimated the effects of age, sex, and AI/AN race on suicidal ideation. Model 2 assessed the association between overweight and suicidal ideation, controlling for age, sex, and AI/AN race. Model 3 included two variables to measure the role of previous exposure to suicide through friends and family, and Model 4 included two additional variables to estimate the relative significance of social isolation, exposure to suicide, and overweight in suicidal ideation. Regression models were conducted with R (R Development Core Team, 2010).

Structural equation modeling was used to determine whether social isolation mediated the relationship of exposure and overweight with suicidal ideation. For the path analyses, items were combined for exposure (*friend and/or family member attempted suicide*) and social isolation (*socially unaccepted and/or not part of school*) resulting in dichotomous manifest predictor and mediating variables. The path model was stratified by race, and we controlled for age and sex by including them as covariates in the analyses. Mplus Version 7.11 (Muthén & Muthén, 1998-2010) was used for path analyses. Due to the binary nature of the data, model fit is demonstrated with the sample-size adjusted Bayesian Information Criteria (BIC) for each model (Muthén & Muthén, 1998-2010). BIC is a predictive fit index that takes into account sample size and model complexity (Kline, 2005). Robust maximum likelihood estimation was utilized for the pathanalyses and, therefore, logistic regressions were estimated (Muthén & Muthén, 1998-2010), resulting in odds ratios (OR). All results are reported in OR, 95% confidence intervals (CI), and *p* values (*p*), with *p* < 0.05 considered statistically significant.

RESULTS

Descriptive Statistics

We used proportions, means, and standard deviations to describe the characteristics of the study sample (Table 1). We followed the recommendations of a recent publication (Cummings & Rivara, 2003), and decided not to include *p* values in Table 1. AI/ANs and Whites had an average age of 15 years, and females comprised approximately 50% of the sample. The average BMI for AI/ANs was 23.4 (*SD* = 5.2), and 36% were overweight or obese. The average BMI for Whites was 22.3 (*SD* = 4.3), and 27% were overweight or obese. The prevalence of social isolation was similar in both groups, but AI/ANs reported more exposure to suicide than Whites through relatives (7% vs. 5%) and friends (26% vs. 19%). AI/ANs also reported a higher prevalence of suicidal ideation than Whites (17% vs. 14%).

Table 1
Characteristics of Study Participants Stratified by Race^a

	AI/ANs (<i>N</i> = 721)	Whites (<i>N</i> = 12,107)
	<i>SD</i>	<i>SD</i>
Age in years; mean	15.0 (1.7)	15.1 (1.7)
BMI; mean	23.4 (5.2)	22.3 (4.3)
	<i>n</i> (%)	<i>n</i> (%)
Female	377 (52.3)	6,026 (49.8)
Overweight (BMI ≥ 85th percentile)	257 (35.6)	3,322 (27.4)
Feels not socially accepted	54 (7.5)	874 (7.2)
Feels not part of the school	83 (11.5)	1,487 (12.3)
Friend attempted suicide	187 (25.9)	2,258 (18.7)
Relative attempted suicide	48 (6.7)	540 (4.5)
Suicidal ideation	124 (17.2)	1,652 (13.6)

^a Source: National Longitudinal Study of Adolescent to Adult Health, Wave 1.

Three Explanations for Suicidal Ideation

AI/AN race was associated with an increased risk of suicidal ideation by 31% (OR = 1.31; CI = 1.08, 1.60; *p* < 0.01), controlling for age and sex (Table 2). Overweight adolescents were 19% more likely to think about suicide than those with a normal BMI (OR = 1.19; CI = 1.07, 1.33; *p* < 0.01; Table 2, Model 2). Previous exposure to suicide through relatives and friends multiplied the odds of suicidal ideation by factors of two (OR = 2.23; CI = 1.84, 2.72; *p* < 0.01) and three (OR =

3.01; CI = 2.69, 3.37; $p < 0.01$), respectively (Table 2, Model 3). After adjusting for exposure to suicide, overweight maintained a statistically significant association with suicidal ideation (OR = 1.14; CI = 1.01, 1.28; $p = 0.028$), but AI/AN race did not (Table 2, Model 3).

Table 2
Role of Overweight, Exposure to Suicide, and Social Isolation
in the Suicidal Ideation of AI/AN and White Adolescents^a

	Model 1			Model 2			Model 3			Model 4		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>	OR	95% CI	<i>P</i>	OR	95% CI	<i>p</i>
Age	1.06	1.03 1.09	<0.001	1.06	1.03 1.09	<0.001	1.07	1.04 1.10	<0.001	1.06	1.03 1.10	<0.001
Female	1.67	1.50 1.85	<0.001	1.69	1.52 1.88	<0.001	1.47	1.32 1.63	<0.001	1.45	1.30 1.62	<0.001
AI/AN	1.31	1.08 1.60	0.007	1.29	1.06 1.57	0.010	1.17	0.96 1.44	0.122	1.18	0.97 1.45	0.105
Overweight				1.19	1.07 1.33	0.002	1.14	1.01 1.28	0.028	1.12	1.00 1.26	0.050
Friend attempted suicide							3.01	2.69 3.37	<0.001	2.92	2.60 3.20	<0.001
Relative attempted suicide							2.23	1.84 2.72	<0.001	2.24	1.84 2.72	<0.001
Feels not socially accepted										2.03	1.68 2.45	<0.001
Feels not part of the school										1.33	1.14 1.57	<0.001

^a Source: National Longitudinal Study of Adolescent to Adult Health, Wave 1. Generalized Estimating Equations were used to estimate the associations between the variables of interest and suicidal ideation.

When we estimated the relative significance of the three risk factors for suicidal ideation, we observed that previous exposure to suicide through friends had the largest effect (Table 2, Model 4). Adolescents with a friend who had attempted suicide were almost three times more likely to think about suicide than those without such exposure (OR = 2.92; CI = 2.60, 3.20; $p < 0.01$). Similarly, exposure to suicide through relatives doubled the odds of suicidal ideation (OR = 2.24; CI = 1.84, 2.72; $p < 0.01$), as did social isolation (Table 2, Model 4). Respondents who did not feel socially accepted were twice as likely to report suicidal ideation as those who felt socially accepted (OR = 2.03; CI = 1.68, 2.45; $p < 0.01$), and respondents who did not feel part of their schools were 33% more likely to report suicidal ideation than their counterparts (OR = 1.33; CI = 1.14, 1.57; $p < 0.01$; Table 2, Model 4). Overweight increased the odds of suicidal ideation by 12% (OR = 1.12; CI = 1.00, 1.26; $p = 0.050$), even after controlling for social isolation and exposure to suicide (Table 2, Model 4).

Path Analysis

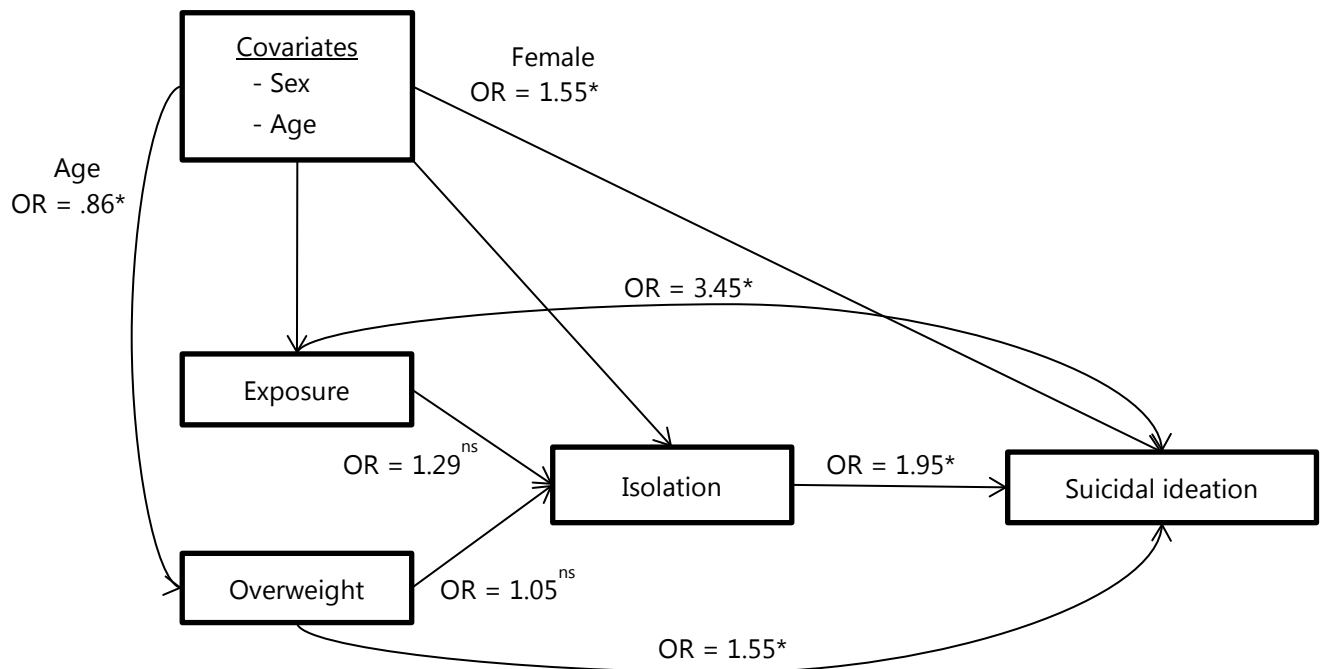
We stratified our models by race to determine whether the associations among the variables of interest were consistent in both samples. To measure the effects of exposure to suicide and social isolation, we selected the variables with the strongest effects in Table 2, Model 4; friend attempted suicide (exposure) and feels not socially accepted (isolation). Path analysis for AI/AN participants (BIC = 3,056.16) showed that exposure to suicide was not related to social isolation (OR = 1.29; CI = 0.83, 2.03; $p = 0.257$), nor was overweight (OR = 1.05; CI = 0.69, 1.60; $p = 0.829$). However, social isolation (OR = 1.95; CI = 1.18, 3.24; $p < 0.01$), exposure to suicide (OR = 3.45; CI = 2.30, 5.19; $p < 0.01$), and overweight (OR = 1.55; CI = 1.02, 2.35; $p = 0.039$) were all related to suicidal ideation, without mediation. For AI/ANs, the three variables of interest were associated with suicidal ideation, but they were not related to one another (Figure 1).

Path analysis for White participants (BIC = 45,464.98) showed a distinctive pattern. Exposure to suicide was related to social isolation (OR = 1.63; CI = 1.46, 1.83; $p < 0.01$), as was overweight (OR = 1.14; CI = 1.02, 1.28; $p = 0.021$). In turn, social isolation was directly related to suicidal ideation (OR = 1.90; CI = 1.67, 2.17; $p < 0.01$). Exposure to suicide was also directly related to suicidal ideation (OR = 3.30; CI = 2.95, 3.69; $p < 0.01$), but overweight was not (OR = 1.11; CI = 0.98, 1.25; $p = 0.101$). For Whites, social isolation partially mediated the relationship between exposure and suicidal ideation, and fully mediated the relationship between overweight and suicidal ideation (Figure 2).

DISCUSSION

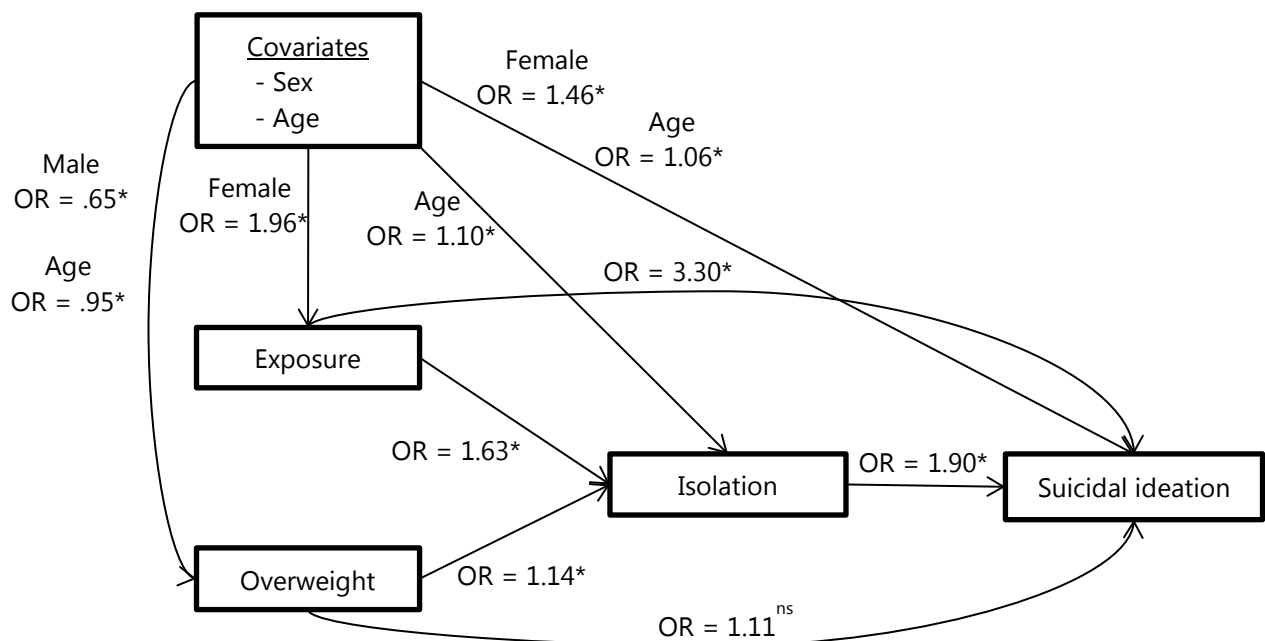
A retrospective cohort study with data from Add Health allowed us to estimate the relative significance of social isolation, exposure to suicide, and overweight in the suicidal ideation of AI/ANs and Whites ages 11-20 years. All three variables were associated with increasing suicidal ideation in both races, but the associations between these variables varied by race. Exposure to suicide through friends had the strongest effect on suicidal ideation, as respondents with friends who attempted suicide were three times more likely to exhibit suicidal ideation than those without such exposure. Path analyses showed that social isolation mediated the effects of exposure and overweight in Whites, but not in AI/ANs. In AI/ANs, we observed that all three variables maintained statistically significant associations with suicidal ideation, without mediation.

Figure 1
Path Model of Mediation by Social Isolation with Covariates for the AI/AN Sample (N = 721)^a



^a Source: National Longitudinal Study of Adolescent to Adult Health, Wave 1. Odds ratios (OR) are reported for each path. For presentation purposes, only statistically significant covariate paths are reported.
 * $p < 0.05$

Figure 2
Path Model of Mediation by Social Isolation with Covariates for the White Sample (N = 12,107)^a



^a Source: National Longitudinal Study of Adolescent to Adult Health, Wave 1. Odds ratios (OR) are reported for each path. For presentation purposes, only statistically significant covariate paths are reported.
 * $p < 0.05$

This is the first population-based study to estimate the relative significance of three risk factors for suicidal ideation in AI/ANs and Whites. Our results are consistent with previous studies reporting the significance of social isolation and exposure to suicide in the suicidal ideation of AI/AN youth (Borowsky et al., 1999; Chino & Fullerton-Gleason, 2006; Grossman et al., 1991; Hill, 2009; Lester, 1995; Manson et al., 1989; O’Keefe & Wingate, 2013; Pharris et al., 1997; Tingey et al., 2014). A study of 204 boarding school students from Southeastern AI/AN tribes found that exposure to suicide through friends and family, as well as depression, limited social support by family, and high levels of social support by peers, were all associated with increased suicidality (Manson et al., 1989). The White Mountain Apache Tribe developed the first suicide surveillance system in Indian country, in collaboration with the Johns Hopkins University, and showed promising results (Cwik et al., 2014). This system found that most Apache adolescents who attempted suicide visited the Emergency Department (ED) one year prior to their attempt (Ballard et al., 2014). Thus, EDs might be key units to screen for suicidal ideation and prevent suicide in adolescents. Further research is needed to clarify the effectiveness of prevention strategies over the life course, and across tribal communities.

Our results also are consistent with research reporting that excessive weight in adolescence is a risk factor for suicidal ideation. Previous research has found that adolescents who were overweight or obese, and perceived their weight accurately, were more likely to report suicidal ideation than were their normal-weight peers and their overweight peers who perceived their weight inaccurately (Eaton et al., 2005; Swahn et al., 2009; Zeller et al., 2013). Our dataset did not include weight perception variables, but our results provide evidence of the link between adolescent overweight and suicidal ideation. Overweight and obesity prevention programs are expected to help prevent suicide in adolescence.

Further research is needed to clarify the etiologies of suicidal ideation and its variability by race. The different prevalence of overweight and exposure to suicide in AI/ANs and Whites could be explaining the results of our path analyses. Because of the relatively high prevalence of overweight and suicide in tribal communities (Alcantara & Gone, 2007; Holm, Vogeltanz-Holm, Poltavski, & McDonald, 2010), overweight or exposure to suicide are not associated with social isolation in AI/ANs, but these variables are associated with social isolation in Whites. This hypothesis is consistent with a recent study finding that Whites experience stronger patterns of weight discrimination than do racial minorities (Dutton et al., 2014), even though AI/ANs were not represented in the study sample.

Further research is also needed to test alternative explanations for suicidal ideation, based on mental health conditions, substance use disorders, childhood abuse, and firearm ownership. Recent reviews of the literature have emphasized the importance of these factors (Asarnow & Miranda, 2014; Brent, 1995; Gould et al., 2003; Joiner et al., 2005; Katz et al., 2013), but Add Health did not include measures adequate for inclusion in our analysis. Anthropological research is needed to explain persistent differences in suicidality between AI/ANs and Whites. Perhaps Native cultures encompass distinctive understandings of suicide [and overweight] that influence suicidal ideation in ways that we could not capture with available survey data. Retrieving such cultural knowledge could inform the development and cultural tailoring of interventions to prevent suicide in tribal communities. Thus, we encourage researchers, clinicians, and interventionists to replace traditional linear approaches to suicide prevention with more textured models.

This study has four main limitations. First, variables estimating social isolation, exposure to suicide, overweight, and suicidal ideation were measured by self-report. Social desirability might have encouraged participants to underreport these factors (Larson, 2000; Miotto & Preti, 2008). Second, we did not distinguish between youth who were overweight and those who were obese, or between those who had thought about suicide and those who had made a suicide attempt. Although these distinctions might be informative, we chose not to include them because the number of respondents in each subgroup was extremely small. To offer a broad public health message, we decided to focus on conditions affecting a large percentage of the adolescent population. Third, our dataset was collected in 1994, and these are the most recent data to answer our research question. This limitation is important, because the obesity landscape and the nature of adolescent communication have changed since 1994. We are not aware of any other nationally representative dataset with adequate variables to examine the role of social isolation, exposure to suicide, and overweight in the suicidal ideation of AI/AN and White adolescents. Racial disparities in adolescent suicide have been stable for the last three decades (Gone & Trimble, 2012), and new datasets are needed to continue studying adolescent suicide across racial and ethnic groups. Fourth, Add Health did not oversample AI/ANs, so the AI/AN respondents do not comprise a truly nationally representative sample of tribal communities. Although Add Health provided nationally representative data of AI/ANs and Whites, it was not designed to capture the heterogeneity of each racial category (Israel, Schulz, Parker, & Becker, 1998). Larger datasets with systematic oversampling of AI/ANs are needed to capture the heterogeneity within each racial group.

CONCLUSION

This population-based study contributes to the literature on adolescent suicide by detailing the relationships among social isolation, exposure to suicide, overweight, and suicidal ideation in AI/ANs and Whites. Results show that all risk factors are related to suicidal ideation in both groups, but their interrelationships differ by race. Further research is needed to clarify etiologies of suicidal ideation in adolescence, as well as the long-term consequences of adolescent social isolation, exposure to suicide, and overweight in adulthood. Meanwhile, we encourage public health organizations, researchers, and community advocates interested in adolescent health, health disparities, and suicide to work together on intervention strategies that can successfully address suicide risk in AI/AN and White youth.

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