

## Article

# Association Between Vaping and Bullying Among High School Students in the United States

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## Abstract

**Background:** Bullying in schools has been a major issue among teens in the United States. The effects of bullying could be detrimental to both the mental and physical health of teens. Teens who are bullied may face higher odds of vaping or substance use. The specific aim of this study is to understand the relationship between vaping and being bullied. **Method:** The study used CDC 2023 YBRS data. The variables included in the study were being bullied, vaping status, grade level, sex, race, and sexual identity. Frequencies, percents, chi-square analysis, and multivariate binary logistic regression were used in the analysis. **Results:** After controlling for covariates (i.e., grade, sex, race, sexual identity), being bullied was associated with 2.2 times higher odds of vaping (OR, 2.2, 95% CI, 2.0–2.4,  $p$ -value  $\leq 0.001$ ) among high school students. **Conclusions:** Based on the findings, being bullied increased the odds of vaping. The higher odds suggest the need for more interventions to address bullying and bring awareness to the risk factors associated with bullying.

**Keywords:** bullying; vaping; mental health

## 1. Introduction

Vaping remains a significant and evolving public health concern among adolescents in the United States. Since the early 2010s, the rapid rise of electronic cigarette use has outpaced declines in traditional cigarette smoking, positioning vaping as a dominant form of nicotine consumption among the youth [1]. This trend is especially concerning given evidence that nicotine exposure during adolescence can adversely affect brain development, including impairments in attention, learning, and impulse control, and can increase long-term vulnerability to nicotine dependence. Adolescents who vape are also at an increased risk of respiratory symptoms, mental health challenges such as anxiety and depression, and progression to combustible cigarette and other substance use. These consequences underscore the importance of identifying modifiable risk factors associated with adolescent vaping and prioritizing prevention efforts aimed at reducing initiation and sustained use [1,2].

High school students, in particular, report disproportionately high rates of experimentation and regular vaping, influenced by factors such as appealing flavors, perceptions of reduced harm, peer influence, and social norms [2]. Although recent national estimates indicate declines in current e-cigarette use among high school students between 2022 and



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2023, electronic cigarettes remain the most commonly used tobacco product among the U.S. youth. Vaping during adolescence can establish patterns that persist into adulthood and compound existing health and social vulnerabilities, making it a critical public health concern. Given that adolescent vaping frequently involves flavored products and, for many users, near-daily use, continued surveillance of vaping behaviors and their associated risk factors remains a public health priority [1,3].

Bullying is another persistent public health issue affecting U.S. high school students. Despite national prevention efforts, many adolescents continue to experience bullying in physical, verbal, relational, and cyber forms. The 2023 Youth Risk Behavior Survey (YRBS) documents substantial burdens of bullying and related safety concerns among high school students, corroborated by the 2024 MMWR Supplement summarizing the 2023 cycle [4,5]. Broader national estimates from the National Health Interview Survey for Teens indicate that roughly one-third of U.S. adolescents ages 12–17 experienced bullying in the past year, with a disproportionately higher prevalence among girls, LGBTQ+ youth, and adolescents with disabilities [6].

A growing body of research has linked bullying victimization to an increased likelihood of substance use, including e-cigarettes. The youth who report being bullied are more likely to report vaping compared to their non-bullied peers, and this pattern has been observed across diverse populations. Some studies also suggest a dose–response relationship, with more frequent or severe bullying being associated with a higher likelihood of vaping [7]. Prior analyses using earlier cycles of the YRBS and other national datasets have shown that traditional bullying and cyberbullying are associated with higher odds of e-cigarette use, often mediated by psychological distress, sadness, hopelessness, and aggression [7,8]. Disparities have also been observed among the sexual minority youth, with bullying predicting patterns of combined cigarette and e-cigarette use more consistently than e-cigarette use alone [9]. International studies similarly demonstrate a relationship between bullying severity and vaping, supporting the robustness of this association across diverse populations [10].

Given that nicotine exposure during adolescence can adversely affect neurocognitive development and that many adolescents who try e-cigarettes continue using them, clarifying the relationship between bullying victimization and vaping remains a pressing concern for school-based prevention [11]. While prior studies have documented this association, patterns of youth vaping, bullying, and mental health risk have shifted in recent years. The post-pandemic period has been characterized by changes in school environments, increased mental burden, evolving peer dynamics, and continued disparities in both bullying and vaping behaviors [12]. Updating this evidence base is essential to ensure that prevention strategies remain responsive to current adolescent risk.

Therefore, the purpose of the present study is to examine the association between bullying victimization and current vaping among U.S. high school students using data from the 2023 YRBS [12]. Rather than advancing new theoretical models, this study provides an updated, descriptive, and confirmatory assessment of the bullying–vaping relationship using contemporary national data. By situating this analysis within the evolving adolescent risk environment, the study extends prior research and provides updated, policy-relevant evidence to inform targeted school-based bullying prevention and tobacco control efforts [4,5,13].

## 2. Materials and Methods

The 2023 CDC YRBS data was analyzed in this study. Analysis included only the 9th–12th grades. The survey is a national survey conducted by the CDC. The survey is administered to middle school and high school students at private and public schools

within the United States [14]. High school students were only included in the study because vaping is more prominent within this age group, which would allow a clearer depiction of the association between bullying and vaping. The study also included both public and private schools, because the dataset does not include a variable to control for school type. The survey is administered by the department of health and education at the state, tribal, territory, or local level of each private and public school [14]. Detailed information about YRBS is available online at <https://www.cdc.gov/yrbs/index.html> (accessed on 12 February 2026).

### 2.1. Vaping

Vaping was defined based on the following questions: “During the past 30 days, on how many days did you use an electronic vapor product?” Respondents, who answered “0 days” were considered to be “not vaping.” Respondents, who answered “1 or 2 days,” “3 to 5 days,” “6 to 9 days,” “10 to 19 days,” “20 to 29 days,” or “all 30 days” were considered “to use vaping products”. Vaping was dichotomized to clearly distinguish between high school students who used vaping products compared to high school who did not use vaping products to examine the relationship between bullying and vaping.

### 2.2. Bullying

Bullying was defined based on the following question: “During the past 12 months, have you ever been bullied on school property?” Respondents, who answered “no” were considered “to not have experienced bullying” and respondents, who answered “yes” were considered “to have experienced bullying.” Bullying status was dichotomized based on the limitations of the YRBS instrument. However, the findings are still reliable and valid to examine the association between bullying and vaping.

### 2.3. Statistical Analysis

Frequencies and percents were calculated for each variable within the study. Chi-square analysis was performed between vaping status and bullying status and each covariate within the study (sex/sexual identity/grade/race). Logistic regression was conducted to assess the relationship between vaping status and bullying status after controlling for sex, grade, and race. IBM SPSS Statistics for Macintosh, Version 31.0. (Armonk, NY, USA), was used to perform the analyses. The significance level was based on a *p*-value of 0.05. The data was weighted to prevent bias and to ensure that the findings were generalizable.

## 3. Results

The analyses were based on 19,939 high school students. A total of 26.5% of participants were in the 9th grade; 51.9% of participants were males; 60% of participants were white; 73.3% were heterosexual (Table 1).

**Table 1.** Demographic Characteristics of High School Students, Youth Risk Behavior Survey, 2023.

| Characteristic | N      | %    |
|----------------|--------|------|
| Grade          |        |      |
| 9th            | 5266   | 26.5 |
| 10th           | 5129   | 25.8 |
| 11th           | 4827   | 24.3 |
| 12th           | 4650   | 23.4 |
| Sex            |        |      |
| Female         | 9592   | 48.1 |
| Male           | 10,347 | 51.9 |

Table 1. Cont.

| Characteristic             | N      | %    |
|----------------------------|--------|------|
| Race                       |        |      |
| Asian                      | 846    | 5.3  |
| Am. Indian/Alaska Native   | 68     | 0.4  |
| Black or African American  | 2623   | 16.6 |
| Native Hawaiian/Other PI   | 73     | 0.5  |
| White                      | 9484   | 60   |
| Hispanic/Latino            | 1509   | 9.5  |
| Multiple Non-Hispanic      | 1207   | 7.6  |
| Sexual Identity            |        |      |
| Heterosexual (straight)    | 13,825 | 73.3 |
| Gay or lesbian             | 763    | 4.0  |
| Bisexual                   | 2147   | 11.4 |
| Other                      | 815    | 4.3  |
| Not sure                   | 834    | 4.4  |
| Don't know what this means | 474    | 2.5  |

Note: Table 1 variables will not have consistent totals because of missing data.

The prevalence of vaping differed for several demographic and substance use factors: 12th grade high school students ( $n = 949$ , 30%,  $p\text{-value} \leq 0.001$ ) had a higher prevalence than 9th ( $n = 616$ , 19.5%,  $p\text{-value} \leq 0.01$ ), 10th ( $n = 736$ , 23.3%,  $p\text{-value} \leq 0.001$ ), and 11th ( $n = 859$ , 27.2%,  $p\text{-value} \leq 0.001$ ) grade high school students; females ( $n = 1768$ , 55.6%,  $p\text{-value} \leq 0.001$ ) had a higher prevalence than males ( $n = 1414$ , 44.4%,  $p\text{-value} \leq 0.001$ ); White individuals ( $n = 1699$ , 67.6%,  $p\text{-value} \leq 0.001$ ) had a higher prevalence than Asian ( $n = 50$ , 2.0%,  $p\text{-value} \leq 0.001$ ), American Indian/Alaska Native ( $n = 17$  0.7%,  $p\text{-value} \leq 0.001$ ), Black or African American ( $n = 367$ , 14.6%,  $p\text{-value} \leq 0.001$ ), Native Hawaiian/Other Pacific Islander ( $n = 10$ , 0.4%,  $p\text{-value} \leq 0.001$ ), Hispanic/Latino ( $n = 167$ , 6.6%,  $p\text{-value} \leq 0.001$ ), and Multiple Non-Hispanic individuals ( $n = 202$ , 8.0%,  $p\text{-value} \leq 0.001$ ); those who identified as heterosexual ( $n = 1980$ , 64.6%,  $p\text{-value} \leq 0.001$ ) had a higher prevalence than those who identified as gay or lesbian ( $n = 149$ , 4.9%,  $p\text{-value} \leq 0.001$ ), bisexual ( $n = 548$ , 17.9%,  $p\text{-value} \leq 0.001$ ) or other ( $n = 164$ , 5.4%,  $p\text{-value} \leq 0.001$ ) (Table 2).

**Table 2.** Bullying among High School Students by Demographic and Substance Use Status, Youth Risk Behavior Survey, 2023.

| Characteristics           | Vaping |      |         |
|---------------------------|--------|------|---------|
|                           |        | n %  | p-Value |
| Grade                     |        |      |         |
| 9th                       | 616    | 19.5 | <0.001  |
| 10th                      | 736    | 23.3 |         |
| 11th                      | 859    | 27.2 |         |
| 12th                      | 949    | 30   |         |
| Sex                       |        |      |         |
| Female                    | 1768   | 55.6 | <0.001  |
| Male                      | 1414   | 44.4 |         |
| Race                      |        |      |         |
| Asian                     | 50     | 2.0  | <0.001  |
| Am. Indian/Alaska Native  | 17     | 0.7  |         |
| Black or African American | 367    | 14.6 |         |
| Native Hawaiian/Other PI  | 10     | 0.4  |         |

Table 2. Cont.

| Characteristics            | Vaping |         |
|----------------------------|--------|---------|
|                            | n %    | p-Value |
| White                      | 1699   | 67.6    |
| Hispanic/Latino            | 167    | 6.6     |
| Multiple Non-Hispanic      | 202    | 8.0     |
| Sexual Identity            |        |         |
| Heterosexual (straight)    | 1980   | 64.6    |
| Gay or lesbian             | 149    | 4.9     |
| Bisexual                   | 548    | 17.9    |
| Other                      | 164    | 5.4     |
| Not sure                   | 154    | 5.0     |
| Don't know what this means | 69     | 2.3     |
| Bullying                   |        |         |
| No                         | 2193   | 69.6    |
| Yes                        | 959    | 30.4    |

Note: Table 2 is from a chi-square analysis. Due to the nature of the analysis, only participants that vaped and belong to the characteristic category will be listed in the table.

The regression model showed the association between vaping status and bullying status after controlling for grade, sex, sexual identity, and race. High school students who are bullied had 117% higher odds of vaping (aOR, 2.17, 95% CI, 1.95–2.41,  $p$ -value  $\leq 0.001$ ) than high school students who did not vape after controlling for grade, sex, sexual identity, and race (Table 3). The model also showed that 10th graders had 32% higher odds of vaping (aOR, 1.32, 95% CI, 1.15–1.52,  $p$ -value  $\leq 0.001$ ) compared to 9th graders. The 11th graders had 87% higher odds of vaping compared to 9th graders (aOR, 1.87, 95% CI, 2.07–2.14,  $p$ -value  $\leq 0.001$ ). The 12th graders had 137% higher odds of vaping compared to 9th graders (aOR, 2.37, 95% CI, 1.12–2.71,  $p$ -value  $\leq 0.001$ ). Males had 23% higher odds of vaping compared to females (aOR, 1.23, 95% CI, 1.12–1.36,  $p$ -value  $\leq 0.001$ ). American Indian/Alaska Natives had 459% higher odds of vaping compared to Asians (aOR, 5.59, 95% CI, 2.91–10.7,  $p$ -value  $\leq 0.001$ ), Black or African American individuals had a 156% higher odds of vaping compared to Asian individuals (aOR, 2.56, 95% CI, 1.86–3.53,  $p$ -value  $\leq 0.001$ ); Native Hawaiian/Other PI individuals had 143% higher odds of vaping compared to Asian individuals (aOR, 2.43, 95% CI, 1.14–5.21,  $p$ -value = 0.022); White individuals had 207% higher odds of vaping compared to Asian individuals (aOR, 3.07, 95% CI, 2.27–4.17,  $p$ -value  $\leq 0.001$ ); Hispanic/Latino students had 102% higher odds of vaping compared to Asian students (aOR, 2.02, 95% CI, 1.43–2.85,  $p$ -value  $\leq 0.001$ ); multiple-Non-Hispanic individuals had 209% higher odds of vaping compared to Asian individuals (aOR, 3.09, 95% CI, 2.20–4.34,  $p$ -value  $\leq 0.001$ ). Bisexual students had 86% higher odds of vaping compared to heterosexual students (aOR, 1.86, 95% CI, 1.63–2.12,  $p$ -value  $\leq 0.001$ ). There was no significant relationship between vaping and students who identified as gay or lesbian.

Table 3. Association between Vaping and Bullying among High School Students, Youth Risk Behavior Survey, 2023.

| Characteristic  | aOR  | 95% CI    | p-Value |
|-----------------|------|-----------|---------|
| Bullying Status |      |           |         |
| No              | 1.00 | Referent  |         |
| Yes             | 2.17 | 1.95–2.41 | <0.001  |

Table 3. *Cont.*

| Characteristic             | aOR  | 95% CI    | p-Value |
|----------------------------|------|-----------|---------|
| Grade                      |      |           |         |
| 9th                        | 1.00 | Referent  |         |
| 10th                       | 1.32 | 1.15–1.52 | <0.001  |
| 11th                       | 1.87 | 2.07–2.14 | <0.001  |
| 12th                       | 2.37 | 1.12–2.71 | <0.001  |
| Sex                        |      |           |         |
| Female                     | 1.00 | Referent  |         |
| Male                       | 1.23 | 1.12–1.36 | <0.001  |
| Race/Ethnicity             |      |           |         |
| Asian                      | 1.00 | Referent  |         |
| Am. Indian/Alaska Native   | 5.59 | 2.91–10.7 | <0.001  |
| Black or African American  | 2.56 | 1.86–3.53 | <0.001  |
| Native Hawaiian/Other PI   | 2.43 | 1.14–5.21 | 0.022   |
| White                      | 3.07 | 2.27–4.17 | <0.001  |
| Hispanic/Latino            | 2.02 | 1.43–2.85 | <0.001  |
| Multiple Non-Hispanic      | 3.09 | 2.20–4.34 | <0.001  |
| Sexual Identity            |      |           |         |
| Heterosexual (straight)    | 1.00 | Referent  |         |
| Gay or lesbian             | 1.20 | 0.97–1.50 | 0.099   |
| Bisexual                   | 1.86 | 1.63–2.12 | <0.001  |
| Other                      | 1.18 | 0.96–1.46 | 0.123   |
| Not sure                   | 1.19 | 0.95–1.48 | 0.126   |
| Don't know what this means | 1.11 | 0.80–1.55 | 0.532   |

aOR = adjusted odds ratio; CI = confidence intervals; p-value = 0.05.

#### 4. Discussion

This study examined the association between bullying victimization and vaping among a nationally representative sample of U.S. high school students. The findings demonstrate a significant association between bullying victimization and vaping, with those with experiences of bullying victimization having 2.17 times higher odds of vaping compared to their non-bullied peers after controlling for grade level, sex, race/ethnicity, and sexual identity. These results contribute to the growing body of evidence showing the association between peer victimization to substance use behaviors among teens and have important implications for school-based prevention efforts.

The observed association between bullying victimization and vaping in the current study is consistent with the results of prior research examining this relationship. Ihongbe et al. [15] reported that Texas high school students who experienced school-based and cyber bullying had a greater likelihood of vaping. Using data from the 2017 YRBS, Ragavan et al. [16] also found a significant association between vaping and bullying victimization (aOR = 1.5), in addition to other forms of violence (i.e., relationship abuse (aOR = 3.0), youth violence (aOR = 3.0). Similarly, Azagba et al. [8] found that bullying victimization was significantly associated with greater odds of e-cigarette use (i.e., vaping) among a national sample of middle and high school students in Canada. Another recent Canadian study utilizing the COMPASS survey found that any bullying victimization was associated with double the odds of nicotine vaping (aOR = 2.25) [17]. International research corroborates these findings; Peng et al. [10] found a dose–response relationship among Chinese adolescents, where students with mild (OR = 1.38), moderate (OR = 2.20), and severe (OR = 3.98) bullying experiences demonstrated increasingly elevated odds of vaping. The consistency of these findings across geographic regions and study populations strengthens the evidence for a robust association between bullying victimization and vaping behaviors among teens.

Although the cross-sectional design precludes testing mechanisms or directionality, several theoretical frameworks present plausible hypotheses about why bullying victimization and vaping may co-occur, which future longitudinal and mediation-capable designs should assess. The self-medication hypothesis poses that individuals use substances to cope with psychological distress and emotional states associated with painful experiences [18]. Bullying victimization is understood as a significant stressor associated with depression, anxiety, and other internalizing symptoms [19], while teens experiencing these conditions and emotional states may turn to nicotine use (vaping) for its anxiolytic and regulating effects [20]. Ma et al. [20] similarly found that sexual- and gender-minority adolescents identified stress relief and anxiety reduction as primary motivations for vaping. Further, the stress-coping model suggests that individuals adopt coping mechanisms in response to stressful experiences—like bullying—including maladaptive coping strategies such as substance use [21]. For example, Gaete et al. [22] found in a multi-level analysis of Chilean teens that victims may use substances as a coping mechanism to deal with anxiety brought on by social rejection and isolation, and peer attacks. Although not inferences directly from the present data, self-medication and stress-coping frameworks offer testable hypotheses about why bullying victimization and vaping may be linked.

The finding—that older teens (11th and 12th graders) had significantly greater odds of vaping compared to younger teens (9th graders)—is consistent with established observed patterns of adolescent substance use. National surveillance data consistently demonstrate that e-cigarette use increases with age during high school years, with 12th graders exhibiting the highest prevalence [23]. This age-related pattern may reflect an increased access to vaping products, greater peer influence, and progressive development of risk-taking behaviors during adolescence. Importantly, early initiation of e-cigarette use has been associated with more frequent use and a greater risk of nicotine dependence [24], underscoring the importance of implementing prevention efforts early in high school before vaping behaviors become more established.

Before interpreting the subgroup patterns discussed below, an analytic caveat warrants emphasis. Because the present study relied on bivariate tests and a multivariable model without interaction terms, the adjusted odds ratios for sex, sexual identity, and race/ethnicity describe group-specific associations with vaping following covariate adjustment rather than showing evidence that the bullying vaping association differs across these groups. Claims about formal moderated or intersectional disparities would require formal tests of interaction that were not captured in the present study. Thus, the following interpretations should be read under this constraint.

The significant association found between bisexual identity and vaping ( $OR = 1.86$ ) reflects documented disparities in nicotine product use among the sexual-minority youth. Research has consistently demonstrated that sexual- and gender-minority (SGM) adolescents use vaping products at higher rates than their heterosexual and cisgender peers [25]. Multiple studies have found that the bisexual youth and young adults demonstrate the highest prevalence of tobacco-product use among sexual minority groups [25,26]. These disparities may be attributable to minority stress, including experiences of discrimination, stigma, and victimization related to sexual orientation [27], as explained by Meyer's minority stress model [28]. Culturally tailored bullying prevention and mental health interventions addressing both minority stress and substance use represent a reasonable direction for future intervention research in this population.

The observed racial and ethnic differences in vaping odds also warrant careful consideration. American Indian/Alaskan Native students demonstrated the highest odds of vaping ( $OR = 5.59$ ), followed by White ( $OR = 3.01$ ) and multiple-non-Hispanic ( $OR = 3.09$ ) students, compared to Asian students (reference), aligning with national surveillance data

indicating increased e-cigarette use among Native groups and White adolescents relative to other racial/ethnic groups [23]. Factors contributing to these disparities may include differential exposure to e-cigarette marketing and community-level risk factors. Differences may also be attributed to intersecting social, structural, and contextual factors rather than inherent group characteristics. Variations in neighborhood conditions, school resources, and exposure to discrimination may influence both victimization risk and substance use behaviors. Peer network dynamics and social norms around vaping may also differ across groups, shaping both exposure and uptake. Cultural and family factors, such as parental monitoring and attitudes toward substance use, may also play a role. Experiences of racism or identity-based bullying may contribute to stress. Additionally, differences in school climate, policy enforcement, and disciplinary practices can affect observed patterns. Measurement issues, including self-reporting bias and limited survey instruments, may further contribute to disparities. Notably, Asian adolescents have consistently demonstrated lower rates of tobacco and nicotine product use, which may reflect cultural protective factors [23] that should be explored to inform prevention strategies. Future research should examine the interplay between racial/ethnic identity, bullying experiences, and vaping to inform culturally responsive prevention strategies.

The findings from this study have important implications for school-based prevention and intervention efforts targeting high-school-aged students. Although not directly supported by the current study's findings, the association between bullying victimization and vaping could suggest that comprehensive approaches addressing both peer victimization and substance use may be effective. Evidence-based anti-bullying programs have demonstrated effectiveness in reducing bullying behaviors and improving the school climate [29]. Integrating substance use prevention components into these programs may provide synergistic benefits. School personnel should also be made more aware that students who have experienced bullying may be at an elevated risk for vaping and should be prepared to provide appropriate support and referrals. Prevention efforts could also target hypothesized psychological pathways that future research will need to confirm, including teaching adaptive coping skills and stress management strategies. Programs that enhance social-emotional competencies could also be explored to help bullied students develop healthier responses to victimization or be more prone to seeking support prior to initiation.

This study has several limitations to consider when interpreting the findings. First, the cross-sectional study design precludes establishing temporal or causal relationships between bullying victimization and vaping. The observed association is compatible with multiple causal orders that the present data cannot distinguish: bullying experiences may precede vaping, vaping may precede or elevate the risk of victimization, or unmeasured common causes (e.g., peer networks, mental health status) may drive both outcomes. Longitudinal research is needed to clarify the direction of association and potentially identify critical intervention periods. Second, all variables in the study, including bullying victimization and vaping use, were assessed via self-reporting, which may be subject to recall and social-desirability bias. Third, the YRBS assesses bullying as a single dichotomous item, which fails to capture the frequency, severity, or type of bullying experienced; different forms of bullying (e.g., physical, verbal, relational) may have differential associations with vaping. Further, the reliance on a single yes/no item limits the ability to distinguish between students who experienced isolated incidents and those subjected to chronic or severe victimization, which may differ in their associations with substance use outcomes. Similarly, vaping was measured as a dichotomous variable (any use vs. no use in the past 30 days), which does not account for variation in the frequency or intensity of use. This binary classification treats occasional use and daily use equally, potentially masking important distinctions in the strength and nature of the bullying-vaping association. These

measurement constraints reflect the limitations of surveillance data such as the YRBS, which prioritizes breadth of coverage over the depth of individual constructs. Fourth, while the study controlled for grade level, sex, sexual identity, and race/ethnicity, other potential confounders such as mental health status, academic performance, family factors, stress, social support perceptions, and peer substance use were not included in the analysis. Fifth, chi-square tests of difference are not robust to unequal sample sizes unless each cell has thousands of cases. In the case of this data, 60% of the sample were white and 73.3% of the sample were heterosexual, which means interpretations based off of them should be interpreted cautiously. Sixth, there are analytical limitations, such as using bivariate chi-square tests and a single multivariate logistic regression model, and no interactions are examined between study variables.

Studies investigating specific types of bullying, including cyberbullying, and their differential relationships with vaping would provide greater nuance in the understanding of these associations. Research examining potential mediators, such as mental health issues or conditions and coping strategies, would help elucidate the mechanisms underlying the bullying–vaping relationship and inform targeted interventions for those who are at greatest risk. Additionally, intervention research evaluating the effectiveness of integrated anti-bullying and substance use prevention and/or school-wide social–emotional learning programs is needed to translate these findings into practice.

## 5. Conclusions

This study investigated the association between bullying victimization and vaping among U.S. high school students using nationally representative data from the 2023 YRBS. Vaping remains the most used tobacco product among adolescents, raising major public health concerns due to nicotine’s adverse effects on adolescent brain development and its role in establishing long-term nicotine dependence [23]. Bullying is also a prevalent psychosocial stressor during adolescence, making the examination of their intersection particularly important for prevention efforts [2].

Using data from 19,939 students in grades 9–12, the study found a strong and statistically significant association between bullying victimization and vaping. After adjusting for grade level, sex, race/ethnicity, and sexual identity, students who reported being bullied on school property had more than twice the odds of vaping compared to students who did not experience bullying (adjusted odds ratio = 2.17). Higher odds of vaping were also observed among older students, females, bisexual youth, and certain racial and ethnic groups, highlighting disparities that may reflect differences in exposure to stress, discrimination, and access to prevention resources. These findings are consistent with prior evidence linking bullying victimization to increased e-cigarette use among adolescents [30]. The public health significance of this research lies in highlighting bullying victimization as a potentially modifiable factor associated with adolescent substance use. Bullying-related stress may increase vulnerability to vaping through maladaptive coping or self-medication pathways, potentially compounding health risks for already vulnerable populations. The findings suggest the potential value of integrated school-based approaches that address bullying, mental health, and substance use simultaneously. Future research should employ longitudinal designs to clarify directional pathways, examine the role of bullying type and severity, and explore mediating mechanisms such as mental health and coping strategies to inform targeted and equitable prevention interventions. Therefore, these strategies will improve outcomes and build resiliency in adolescents.

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