Association between Vaping and Mental Health: National Representative Study Controlling for Sex and Race among Youth Vapers

Caleb J. Choi

Received January 21, 2025
Accepted April 28, 2025
Electronic access May 15, 2025

Vaping among youth continues to be a public health problem with few effective cessation interventions. This study is aimed to determine associations between the use of vapor products and mental health indicators: poor mental health, feeling sad or hopeless and planning suicide. 2021 Youth Risk Behavior Survey (YRBS) data includes a representative sample of 9th through 12th graders. 18% of youth reported current use of vapor products. 29% of all youth reported mental health was most of the time or always not good. Current vapor product users were 3.6 times more likely to report feeling sad or hopeless compared to those who did not currently vape. Current vapers were 3.8 times more likely to report making a plan for suicide than youth who did not report current vape use. Finally, current vaping youth were 2.3 times more likely to report mental health was most of the time or always not good. The results demonstrate an association between vaping and mental health indicators such as poor mental health, feeling sad or hopeless and planning for suicide. Except for Native Hawaiian/other Pacific Islander youth, all races reported a statistically significant odds ratio and therefore higher association of using vapor products among youth who reported poor mental health. These findings point for the need for targeted and improved school–based services for mental health and the need for schools to provide vaping cessation services or referral systems to community resources.

Keywords: Vaping, Mental Health, Suicide

Introduction

Poor mental health can have serious negative impacts for the health and development of youth which may continue into adulthood. A significant percentage (29%) of youth reported poor mental health, 42% reported persistent feelings of sadness or hopelessness, 22% seriously considered attempting suicide, and 18% made a suicide plan, and 9% attempted suicide in 2021. There were increases in the percentage of students who experienced persistent feelings of sadness or hopelessness, seriously considered attempting suicide, made a suicide plan, and attempted suicide [1]. From 2011 through 2021, each indicator of poor mental health increased in percentage of youth reporting [2]. Vaping among youth is increasing; more than 5 million middle and high school students vape [3]. Significant increase in youth vaping stems from misinformation and misconceptions about safety of e-cigarettes, lower prices than traditional cigarettes and availability of variety of flavors [3]. Previous research of students suggests vapor users have a higher prevalence of depression and suicide ideation. Suicide attempts were significantly higher among e-cigarette users compared to non-users. It is critical to raise awareness about the association between electronic cigarettes and adolescent mental health [3].

Frequently cited reasons for uptake of vapor products by youth include: experimentation, taste, boredom, peer pressure, relaxation rather than to quit smoking. Youth with poor mental health may be more likely to be associated with vaping, due to a combination of emotional, social, and physical factors. Few youth have nicotine dependence diagnosed or received cessation treatment in youth treatment settings [4]. Vaping may offer a temporary coping mechanism for mental health struggles and may provide an outlet for stress relief. Vaping and other high-risk behaviors can also be influenced by peer pressure and environmental factors. Vapor products contain substances that are highly addictive and harmful. An alarming percentage of youth continue to use vapor products. Use of e-cigarettes may worsen depression symptoms and mental health. Youth who are depressed are more likely to uptake e-cigarette use [5,6]. This study aims to dive into these associations to see if any are statistically significant and may offer opportunities for interventions.

Results of community surveys in regions of the United States have shown one in every four children experience a mental disorder with few affected youth receiving adequate mental health care. However, there has been a lack of data on the prevalence and distribution of a wide range of mental disorders from a nationally representative sample of children or adolescents. This information is necessary to establish resource allocation priorities for prevention and treatment [7,8]. Interventions can be informed by research on associations between vaping and mental health indicators [9].

Methodology

The YRBS data for high school students were analyzed to explore association between vaping and mental health indicators, controlling for sex and race.1 Statistical analysis was performed on YRBS data were imported into Epi Info 7 using procedures that accommodate the weighted sampling design of YRBS. Epi Info 7 was used due to ease of importing data and compatibility with YRBS sampling design. YRBS is used to monitor priority health risk behaviors among youth in the United States. The national Youth Risk Behavior Survey (YRBS) uses a three-stage cluster sample design to produce a representative sample of 9th through 12th grade students. National data in YRBS High school student survey for 2021 were used to analyze the data.

In the YRBS survey, electronic vapor products include multiple products: e-cigarettes, vapes, vape pens, e-cigars, e-hookahs, hookah pens, and mods, such as JUUL, SMOK, Suorin, Vuse, and blu. Recent entrance into the marketplace of electronic vapor products has increased the availability of vapor products to youth. The YRBS survey asked high school students about risk behaviors of which three were used in this study: if their mental health was most of the time or always not good, whether they felt sad or hopeless, and whether you made a plan about how you would attempt suicide. In the YRBS, poor mental health includes stress, anxiety, and depression. Table 1 outlines the specific YRBS measures used in this study, including the questions asked and the response criteria for classifying vaping behavior and mental health indicators.

Race and sex differences were examined in the study and odds ratios with 95% confidence intervals were calculated for subgroups. Odds ratios were calculated for subgroups by sex and race. The odds ratio is a measure of association which measures the odds of an event happening in one group compared to the odds of the same event happening in another group.

The national YRBS questionnaire is a reliable instrument. The 2021 YRBS survey is moderate to substantially reliable and the mean Cohen's kappa was 0.68. Findings give support to relying on youth self-reported data when monitoring health behaviors using the YRBS [10].

Youth Mental Health

The analysis includes a representative sample of 17,232 high school students from the YRBS. Poor mental health includes stress, anxiety, and depression, during the 30 days before the survey. As depicted in Tables 2, 29% of high school youth reported poor mental health. 41% of female youth and 18% of male youth reported mental health was most of the time or always not good during the 30 days before the survey. 41%of female students reported poor mental health compared to only 18% of male students. 42% of high school youth reported feeling sad or hopeless.

Youth Vaping Usage

18% of youth reported current use of electronic vapor products as shown in Table 3. 21% of females reported current vapor product use compared to only 15% of males. Native Hawaiian/other Pacific Islander reported highest percentage (24.7%) of current electronic vapor use followed by American Indian/Alaska Native (23%) youth.

Youth Felt Sad or Hopeless and Vaping Usage

Youth who reported current vaping were 3.6 times more likely to report feeling sad or hopeless compared to youth who did not report current vaping. American Indian/Alaska Native youth reported highest odds ratio of 8.2 times more likely to feel sad or hopeless among current vapor users followed by Native Hawaiian/other Pacific Islander youth with odds ratio of 4.4 as shown in Table 4.

Poor Mental health and Vaping Usage

Figure 1 depicts that all youth who are current vapers are more likely to report mental health issues. The odds were higher for female youth for feeling sad or hopeless (odd ratio = 4.2). This means that for female youth who were current vapers were more than four times likely to report feeling sad or helpless than females who did not currently vape.

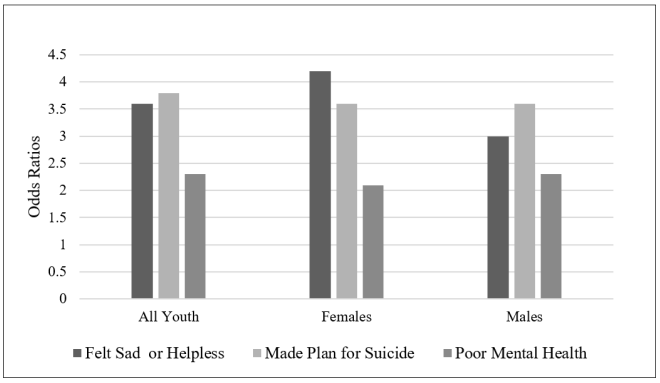

Fig. 1 Odds Ratios by Sex for Mental Health Indicators among Current Vapers.

High school youth who currently vape were 3.8 times more likely to make a plan about how they would attempt suicide (Table 5). American Indian/Alaska Native (AI/AN) high school youth reported highest odds ratio 6.4 among the youth. Current vaping AI/AN youth were more than six times likely to report suicide ideation than AI/AN youth who did not report current vaping. Odds ratios for Native Hawaiian/other Pacific Islander youth were not statistically significant.

YRBS Measure	Question	Response Choices	Inclusion Criteria
Current Vaping Use	During the past 30 days, on how many days did you use an electronic vapor product?	A. 0 days B. 1 or 2 days C. 3 to 5 days D. 6 to 9 days E. 10 to 19 days F. 20 to 29 days G. All 30 days	N/A
Ever Vaping Use	Have you ever used an electronic vapor product?	A. Yes B. No	N/A
Mental Health Indicator 1	During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?	A. Yes B. No	Youth who answered "Yes" are considered as having felt sad or hopeless.
Mental Health Indicator 2	During the past 30 days, how often was your mental health not good? (Poor mental health includes stress, anxiety, and depression.)	A. Never B. Rarely C. Sometimes D. Most of the time E. Always	Youth who answered "Sometimes," "Most of the time," or "Always" are considered as having poor mental health.
Mental Health Indicator 3	During the past 12 months, did you make a plan about how you would attempt suicide?	A. Yes B. No	Youth who answered "Yes" are considered as having made a plan for suicide.

Table 1 YRBS Measures and Criteria

	Mental Health was Most of the Time or Always Not Good		Felt Sad or Hopeless	
	Percentage [Count]	95% Confidence Interval	Percentage [Count]	95% Confidence Interval
All Youth	29.3 [12795]	27.8–30.8	42.3 [16691]	41.0–43.7
Sex				
Females	41.0 [6099]	38.6–43.0	56.6 [8044]	54.6–58.5
Males	18.1 [6515]	17.0–19.2	28.6 [,670]	27.1–30.0
Race				
White	30.2 [6150]	27.8–32.7	41.1 [9054]	39.0–43.3
AI/AN*	31.1 [12795]	27.8–30.8	40.5 [143]	31.5–50.2
Asian	22.8 [609]	18.3–28.2	35.1 [833]	30.4–40.2
Black	26.5 [2084]	24.0–29.1	39.3 [2268]	36.3–42.5
Hispanic	29.7 [2703]	27.7–31.9	46.4 [3187]	43.9–49.0
NH/OPI**	20.1 [50]	7.8–42.8	39.2 [85]	29.1–50.3

* American Indian/Alaska Native

** Native Hawaiian/Other Pacific Islander

Table 2 Percentage of youth reporting poor mental health.

Youth Made Plan for Suicide and Vaping Usage

Youth who currently vape were 3.8 times more likely to report making a plan for suicide than youth who did not currently vape. American Indian/Alaska Native Youth reported the highest odds ratio of 6.4 more likely to currently vape if they reported making a plan for suicide. Note that the odds ratio was not statistically

	Currently Used Electronic Vapor Products		Ever Used Electronic Vapor Products	
	Percentage [Count]	95% Confidence Interval	Percentage [Count]	95% Confidence Interval
All Youth	18.0 [16077]	16.3–19.8	36.2 [16806]	33.7–38.8
Sex				
Females	21.4 [,559]	19.2–23.8	40.9 [7968]	37.6–44.2
Males	14.9 [8282]	13.3–16.7	32.1 [8593]	29.7–34.5
Race				
AI/AN*	23.2 [135]	16.5–31.7	33.5 [139]	23.8–44.8
Asian	5.5 [812]	4.2–7.2	19.5 [835]	14.1–26.5
Black	14.0 [2089]	12.3–16.0	33.6 [2252]	30.4–37.0
Hispanic	17.8 [2939]	15.3–20.5	40.4 [3150]	36.7–44.2
NH/OPI**	24.7 [78]	17.2–34.3	36.1 [83]	29.2–43.7
White	20.3 [8693]	18.4–22.2	36.7 [8968]	34.2–39.3
Multiple Race	17.1 [976]	13.4–21.5	36.8 [976]	30.9–43.2

* American Indian/Alaska Native
** Native Hawaiian/Other Pacific Islander

Table 3 Currently and Ever Used Electronic Vapor Products.

	Odds Ratios	95% Confidence Interval	p value
All Youth	3.6	3.35–3.97	< 0.0001
Sex			
Females	4.2	3.68–4.75	< 0.0001
Males	3.0	2.66–3.42	< 0.0001
Race			
AI/AN*	8.2	3.28–20.5	< 0.0001
Asian	4.1	2.30–7.42	< 0.0001
Black	3.3	2.54–4.18	< 0.0001
Hispanic	3.1	2.52–3.72	< 0.0001
White	3.9	3.47–4.33	< 0.0001
NH/OPI**	4.4	1.41–14.10	0.0110
Multiple Race	4.1	2.85–5.81	< 0.0001

* American Indian/Alaska Native
** Native Hawaiian/Other Pacific Islander

Table 4 Felt Sad or Hopeless and Currently Used Electronic Vapor Products among High School Youth.

significant for Native Hawaiian/other Pacific Islander youth.

For youth who ever used vapor products and reported poor mental health, Asian youth had the highest odds ratio of 3.61 followed by American Indian/Alaska Native and Hispanic youth with 2.51 and 2.19 odds ratios respectfully (Table 6). Multiple race youth who ever reported vaping were 1.7 times more likely to report poor mental health than multiple race youth who did not ever use vapor products. For youth who currently used vapor products and reported poor mental health, again similar results emerged. Asian youth had the highest odds ratio of 3.94 followed by American Indian/Alaska Native and Hispanic youth with odds ratio 2.69 and 2.34 respectively. The results for Native Hawaiian/other Pacific Islander were not statistically significant.

Figure 2 depicts odds ratios by race and clearly Asian youth had the highest reports of odds ratios 8.2 for felt sad or helpless and odds ratio of 6.4 for made plans for suicide. This can be interpreted as follows. Asian youth who were current vapers were more than eight times more likely to report feeling sad or helpless than Asian youth who did not currently vape. In addition, Asian youth who currently vape are six times more likely to have made a plan for suicide than Asian youth who did not currently vape.

The strongest association between poor mental health and current use of vapor products were found among Asian and

	Odds Ratios	95% Confidence Interval	p value
All Youth	3.8	3.42–4.13	< 0.0001
Sex			
Females	3.6	3.19–4.07	< 0.0001
Males	3.6	3.06–4.21	< 0.0001
Race			
AI/AN*	6.4	2.52–16.38	0.0001
Asian	4.9	2.72–8.82	< 0.0001
Black	3.9	3.00–5.18	< 0.0001
Hispanic	3.5	2.80–4.33	< 0.0001
White	3.9	3.44–4.43	< 0.0001
NH/OPI**	2.8	0.88–9.2	0.0807
Multiple Race	3.3	2.30–4.72	< 0.0001

* American Indian/Alaska Native
** Native Hawaiian/Other Pacific Islander

Table 5 Made A Plan About How They Would Attempt Suicide by Currently Used Electronic Vapor Products.

	Ever Used Electronic Vapor Products			Currently Used Electronic Vapor Products		
	Odds Ratios	95% Confidence Interval	p value	Odds Ratios	95% Confidence Interval	p value
All Youth	2.05	1.90–2.22	<0.0001	2.31	2.10–2.54	<0.0001
Sex						
Females	1.84	1.65–2.04	<0.0001	2.07	1.83–2.34	<0.0001
Males	2.14	1.88–2.44	<0.0001	2.30	1.97–2.68	<0.0001
Race						
AI/AN*	2.51	1.11–5.66	0.0270	2.69	1.08–6.69	0.0329
Asian	3.61	2.38–5.48	<0.0001	3.94	2.12–7.32	<0.0001
Black	1.93	1.57–2.37	<0.0001	2.33	1.79–3.04	<0.0001
Hispanic	2.19	1.84–2.60	<0.0001	2.34	1.89–2.89	<0.0001
White	1.96	1.75–2.19	<0.0001	2.24	1.98–2.54	<0.0001
NH/OPI**	1.67	0.48–5.83	0.4209	1.25	0.30–5.16	0.7609
Multiple Race	1.72	1.26–2.33	0.0006	1.94	1.35–2.79	0.0003

* American Indian/Alaska Native
** Native Hawaiian/Other Pacific Islander

Table 6 Reported mental health was most of the time or always not good among youth who ever and currently used electronic vapor products.

American Indian/Alaska Native youth. These findings point to an increased odds of current use and ever use of vapor products among the youth who reported poor mental health. In line with previous research studies, poor mental health is associated with use of vapor products [11].

Discussion

This study analyzed recent 2021 YRBS survey data. In this large national representative survey of high school students, the prevalence of poor mental health was 29% among all youth. Overall, 41% of female youth and 31% of American Indian/Alaska native youth reported highest percentage for poor mental health. This is consistent with findings from previous research [8]. Female youth report highest prevalence of depressions and suicide ideation [3]. American Indian/Alaska Native (41.5%) and multiple race (41.3%) youth reported highest percentages of poor mental health.

Eighteen percent of youth reported current use of electronic vapor products. Native Hawaiian/other Pacific Islander and American Indian/Alaska Native youth reported highest current

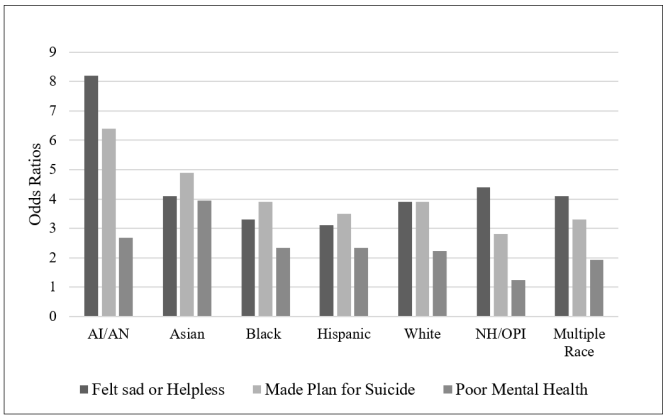

Fig. 2 Odds Ratios by Race for Mental Health Issues among Current Vapers

electronic vapor use percentage 25% and 23% respectively. Only 5.5% of Asian youth reported current use of vapor products; however, Asian youth reported the highest odds ratio of 3.9. This can be interpreted as Asian youth who currently vape were 3.9 times more likely to report mental health was most of the time or always not good.

There appears to be a twofold increased odds for ever having used vapor products among youth who reported poor mental health (odds ratio= 2.0). There also is an increased odds among current vapers among youth who reported poor mental health (odds ratio= 2.3). Addressing mental health problems could be a promising target for preventing initiation of vapor product use by youth[11]. This is consistent with prior research which reported that depression and suicide ideation was associated with e-cigarette use[3]. For all youth there was a 3.6 times more likely increased odds for current use of vapor products for those who felt sad or helpless. The strongest association between feeling sad or hopeless and current use of vapor products were found among American Indian/Alaska Native (odd ratio = 8.2) and Native Hawaiian/other Pacific Islander (odd ratio = 4.4). followed by Asian and multiple race youth where both groups reported third highest odds (odd ratio = 4.1).

The odds ratio for all youth (except Native Hawaiian/other Pacific Islander who were not statistically significant) indicated increased odds for current use of vapor products for those who reported making a plan about how they would attempt suicide. The strongest association between planning suicide and current use of vapor products were found among American Indian/Alaska Native (odd ratio = 6.4) and Asian youth (odd ratio = 4.9). followed by black and white youth where both groups reported third highest odds (odd ratio = 3.9).

Prior research suggests that the association between vaping and mental health outcomes is stronger in females than in males[12]. The association between e-cigarette use and mental health was found to be modified by smoking status and sex in most of the logistic models. E-cigarettes had less than multiplicative effects among smokers. Female e-cigarette users tended to have higher odds of adverse mental health than male users[13]. Research indicates that females may be more vulnerable to substance use, including vaping, compared to males, particularly during periods of stress or social challenges due to estrogen levels[14]. In addition, females may be more responsive to social influence surrounding e-cigarette use[15]. Given the potential sex differences in vaping and mental health, vaping control interventions may need to be tailored to address the unique needs of both males and females.

Research indicates that racial and ethnic minorities are more likely to use tobacco products, including e-cigarettes, to cope with distress, anxiety, and stress. Mental health problems following social media use served as a risk factor for e-cigarette use among youth. Interventions aiming to improve youth's mental health could in turn temper e-cigarette use among youth social media users, and implementing tailored interventions in response to racial differences is warranted. Relative to Whites, Black and Asian populations may be more likely to trust e-cigarette[16] companies with information about the health effects of e-smoking compared to White communities[17]. The perception of vaping as a "cool" or "normal" activity among racial minorities can strongly influence initiation and continued use. Vaping can be used by some youth as a way to express their identity or fit in with a particular group. In some Native American communities, vaping decision-making is influenced by colonialism and the historical impact of the tobacco industry. Social media platforms can contribute to the normalization and glamorization of vaping, potentially influencing youth perceptions and behaviors.

There are significant public health implications by sex and race since female youth and Asian youth and American Indian/Alaska Native youth appear to be at higher odds. Intervention programs should target these youth with culturally appropriate vaping prevention and depression prevention efforts. More research is needed and targeted interventions needed for high-risk youth populations for vapor product use especially among female and Asian youth. The findings in this study are consistent with previous research. "Mental health problems are associated with increased odds for initiating e-cigarette, combustible cigarette, and dual-product use in adolescence. Addressing mental health could be a promising target for preventing initiation of nicotine- and/or tobacco-product use by adolescents[11]." Minority-tailored interventions may be warranted to prevent tobacco product initiation. These findings point for the need for improved school-based services in the area of mental health and vaping cessation with a priority need for focus on minority youth. The findings highlight the need for race-based tailored approaches to promote mental health, especially for those who vape or enter cessation programs.

There is also a need for evidence-based approach to interven-

tion programs. School-based interventions to prevent and reduce adolescent e-cigarette use should be developed, implemented, and evaluated. School-based tobacco prevention programs have mixed results in tackling normative beliefs and actual behaviors. However, there are components of school-based tobacco prevention programs that have been effective such as interactive curricula, refusal skills activities, and content addressing health effects and industry marketing[9].

Interventions targeting children and youth have been implemented at three levels: directed at the individual (e.g., interactive video games), delivered to students at school (e.g., campus bans), and launched in the community (e.g., mass media campaigns). Some individual- and school-based interventions showed promise for preventing e-cigarette initiation among children and youth. While most community interventions increased vaping risk knowledge and harm perceptions, there is lack of evidence they prevent vaping uptake. Educational vaping prevention programs and vape-free policies have had mixed results in preventing uptake of vaping[18]. "...health services should be accessible to adolescents to address their needs and help to prevent any adverse mental health outcomes[19]."

Conclusion

Vapor products such as e-cigarettes are now the most used tobacco product among US youth. Over 1.2 million high students reported vaping and was the most commonly used tobacco product among high school students[1]. Factors that lead to the popularity of vaping among youth include: marketing, attractive packaging, enticing flavors, perception that vaping is safer than cigarettes, and many of their peers are using them.

Minorities have been found to use e-cigarettes at higher rates than whites, but little is known about reasons for this disparity. Studies have linked e-cigarette use to long-term health risks; moreover, there is a need to understand disparities in e-cigarette use[20]. "Regardless of the tobacco product used, findings reveal high co-occurrence of substance use and mental health problems among youth tobacco users, especially poly-tobacco users. These findings suggest the need to address comorbidities among high-risk youth in prevention and treatment settings[21]." Research showed that e-cigarette use is more prevalent among minority youth populations. Findings revealed that minority youth have a higher prevalence of e-cigarette use than white youth. These findings are in line with previous studies showing that disparities persist in substance use in general among minority youth[22].

The self-medication hypothesis, proposes that individuals, including youth, may turn to substances like vaping to alleviate negative emotions or psychological states. The self-medication hypothesis posits that among those experiencing depressive symptoms, substance use, including vaping use, may be motivated by specific outcome expectancies related to the substance use, such as negative mood management or stress reduction[23]. Youth with poor mental health may vape more than peers because they believe vaping use will decrease stress, increase relaxation and concentration[23]. Researchers hypothesize that adolescents who experienced depression and/or suicidal behaviors may use vapor products to self-sooth[12]. Stress-coping models suggest that youth vape to manage stress, anxiety, and depression.

Research has shown significant association between psychosocial stressors and adolescent e-cigarette use, highlighting the potential importance of interventions, such as targeted school-based programs that address stressors and promote stress management, as possible means of reducing adolescent e-cigarette use[24]. Youth who vape may seek out and form friendships with other vapers, creating a self-reinforcing cycle of vaping behavior. Peer influence, especially the perception of peer approval and use of e-cigarettes, significantly impacts youth vaping initiation and frequency, as adolescents often emulate behaviors and adopt attitudes based on what they perceive as social norm. Yout who had used and who had never used e-cigarettes acknowledge their popularity and acceptance among their peers. The literature on teen vaping identifies peer influence (having peers who use tobacco) as one of the most common drivers of teen e-cigarette use, with demographics (male gender identity, older age, higher amount of pocket money) and other tobacco use behavior (such as regular and heavier use) also associated with use[25].

Evidence based recommendation include use of schools. Instead of relying on zero tolerance policies only, school-wide positive behavior interventions have shown effectiveness in vaping prevention. Schools are ideal setting for vaping prevention programs since large amount of youths social lives occur and revolve around schools. To implement school-wide positive behavior interventions for youth vaping, schools should focus on education, policy, and community support, including increase of refusal skills, addressing misconceptions about vaping, and offering resources for quitting, while also implementing clear policies and enforcing them consistently. To implement school-wide positive behavior interventions for vaping, focus must be on comprehensive prevention programs, including education about the risks, peer-led initiatives, and alternatives to suspension, while also addressing the underlying factors that contribute to vaping, such as stress and peer pressure.

Examples of key strategies for school-wide interventions include: curriculum integration, peer education and parent involvement. Curriculum Integration can be accomplished by incorporating vaping prevention education into various subjects, emphasizing the health risks, marketing tactics, and the dangers of nicotine addiction. Peer Education includes training of student leaders to deliver messages about vaping prevention, promoting a positive and supportive school environment. Parent Involvement can be accomplished with engagement of parents in tobacco-related education by encouraging open communication

and setting clear expectations. In addition, interventions can focus on positive reinforcement by promoting healthy alternatives: Encourage students to engage in extracurricular activities, sports, and other positive behaviors; Stress Management: Provide access to counseling services and stress management techniques to address the underlying factors that contribute to vaping; and Cessation Programs: Offer access to smoking/vaping cessation programs and resources.

Addressing Vaping Behaviors include implementing clear policies and installing vape detectors. Establish and enforce a comprehensive policy that prohibits vaping on school grounds and at school-related events. Schools can consider using vape detectors in high-risk areas to deter vaping behavior. Also, alternatives to suspension should be considered. Implement alternative-to-suspension programs that focus on education, counseling, and support, rather than punitive measures. Resource and Support for mental health should be another key component. Schools should ensure students have access to mental health services and resources to address underlying issues that may contribute to vaping.

Youth psychiatry treatment programs may be an ideal setting for prevention efforts and treatment, which should focus on both nicotine dependence and psychiatric disorders[4]. The results from this study can be used to tailor public health interventions that are focused on youth at high odds of vaping and poor mental health. These findings point for the need for improved school-based services in the area of mental health and vaping cessation. The findings indicate a need to target or adapt direct services and programming for females and Asians and American Indian/Alaska Native youth. Therefore, there is a need for schools to assess youth for mental health and provide mental health services or referral systems to community resources. "Child and adolescent psychiatry treatment programs may be a good setting for prevention efforts and treatment, which should focus on both nicotine dependence and psychiatric disorders[26]."

From a public health policy perspective, much more needs to be done besides education and awareness campaigns, increase mental health support (better access to mental health services, school-based support systems, stress management programs), parental & family involvement, community involvement, these data call for stronger regulation to reduce/eliminate access to vapor products by youth (restrict access, increase cost of vapor products, ban flavored vaping products, reduce marketing to youth, reduce selling of unauthorized vapor products by retailers).

Although there are limited evidence-based treatment options for vaping cessation, some previous studies show promise in vaping cessation for youth that relies on behavioral interventions, telehealth interventions, mobile apps[27]. "Adapting well-established smoking cessation and other substance use treatment approaches to address vaping is a worthwhile extension to facilitate evidence-based treatment development and dissemination[27]."

Limitations of this study include the use of self-reported measures, resulting in social desirability bias from study participants (e.g., sexual identity status). Furthermore, the data come from a school-based survey that may be susceptible to recall bias and self-reporting bias and may not be generalizable to youth not attending schools. Another limitation to the study is that it relies on cross-sectional data and therefore limits causal interpretations. A weakness of the study is that data excludes information from youth who are marginalized or not in school.

Acknowledgment

I would like to give thanks to my parents for their continuous support and encouragement when undertaking my research on the important topic of vaping and mental health.

References

1 1., *Centers for Disease Control and Prevention*, www.cdc.gov/yrbs, Available at:.

2 C. Disease Control and Prevention, *Smoking and Tobacco Use*, https://www.cdc.gov/tobacco/e-cigarettes/youth.html, Available at.

3 S. Javed, S. Usmani, Z. Sarfraz, A. Sarfraz, A. Hanif, A. Firoz, R. Baig, M. Sharath, N. Walia, I. Chérrez-Ojeda and S. Ahmed, *A Scoping Review of Vaping, E-Cigarettes and Mental Health Impact: Depression and Suicidality*.

4 H. Upadhyaya, D. Deas, K. Brady and M. Kruesi, *Cigarette smoking and psychiatric comorbidity in children and adolescents*.

5 W. Lechner, T. Janssen, C. Kahler, J. Audrain-McGovern and A. Leventhal, *Bi-directional associations of electronic and combustible cigarette use onset patterns with depressive symptoms in adolescents*.

6 N. Chadi, G. Li, N. Cerda and E. Weitzman, *Depressive symptoms and suicidality in adolescents using e-cigarettes and marijuana: a secondary data analysis from the Youth Risk Behavior Survey*.

7 P. Cohen, J. Cohen, S. Kasen, C. Velez, C. Hartmark, J. Johnson, M. Rojas, J. Brook and E. Streuning, *An epidemiological study of disorders in late childhood and adolescence—I: Age- and gender-specific prevalence*.

8 H. Reinherz, E. Lefkowitz, B. Pakiz and A. Frost, *Prevalence of psychiatric disorders in a community population of older adolescents*.

9 J. Liu, H.-F. S.M. and B., *School-based programs to prevent adolescent e-cigarette use: A report card*.

10 S. Jones, N. Brener, B. Queen, H.-A. M, H. WA, M. JJ and U. JM, *Reliability of the 2021 National Youth Risk Behavior Survey Questionnaire*.

11 K. Riehm, A. Young, K. Feder, N. Krawczyk, K. Tormohlen, L. Pacek, R. Mojtabai and R. Crum, *Mental Health Problems and Initiation of E-cigarette and Combustible Cigarette Use*.

12 P. Baiden, H. Szlyk, P. Cavazos-Rehg, H. Onyeaka, J. Peoples and E. Kasson, *Use of electronic vaping products and mental health among adolescent high school students in the United States: The moderating effect of sex*.

13 T. Pham, J. Williams, D. A. A., L. Isherwood and S. Patten, *Electronic cigarette use and mental health: A Canadian population-based study*, https://doi.org/10.1016/j.jad.2019.09.026.

14 J. Anker and M. Carroll, *Females are more vulnerable to drug abuse than males: evidence from preclinical studies and the role of ovarian hormones*.

15 B. Piñeiro, J. Correa, V. Simmons, P. Harrell, N. Menzie, M. Unrod, L. Meltzer and T. Brandon, *Gender differences in use and expectancies of e-cigarettes: Online survey results*.

16 X. Zheng, M. Yang, W. Li and H. Lin, *The mediating roles of mental health problems and racial differences in the linkage between social media use and E-cigarette use among American youth.*

17 L. Collins, A. Glasser, H. Abudayyeh, J. Pearson and A. Villanti, *E-Cigarette Marketing and Communication: How E-Cigarette Companies Market E-Cigarettes and the Public Engages with E-cigarette Information*.

18 G. Mylocopos, E. Wennberg, A. Reiter, A. Hebert-Losier, K. Filion, S. Windle, G. Gore, J. O'Loughlin, R. Grad and M. Eisenberg, *Interventions for Preventing E-Cigarette Use Among Children and Youth: A Systematic Review*.

19 R. Vanderkruik, L. Gonsalves, G. Kapustianyk, T. Allen and L. Say, *Mental health of adolescents associated with sexual and reproductive outcomes: a systematic review*.

20 B. Lahey, E. Flagg, H. Bird, M. Schwab-Stone, G. Canino, M. Dulcan, P. Leaf, M. Davies, D. Brogan, K. Bourdon, S. Horwitz, M. Rubio-Stipec, D. Freeman, J. Lichtman, D. Shaffer, S. Goodman, W. Narrow, M. Weissman, D. Kandel, P. Jensen, J. Richters and D. Regier, *The NIMH Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) Study: Background and methodology*.

21 K. Conway, V. Green, K. Kasza, M. Silveira, N. Borek, H. Kimmel, J. Sargent, C. Stanton, E. Lambert, N. Hilmi, C. Reissig, K. Jackson, S. Tanski, D. Maklan, A. Hyland and W. Compton, *Co-occurrence of tobacco product use, substance use, and mental health problems among youth: Findings from wave 1 (2013–2014) of the population assessment of tobacco and health (PATH) study*.

22 G. Tilton, S. Huston and P. Albert, *Risk and Protective Factors for Vaping and Smoking Among High School Students in Maine*, http://dx.doi.org/10.5888/pcd20.220307.

23 C. North and A., *Depressive symptoms and vaping: The mediating effect of outcome expectancies among young adults*, https://psycnet.apa.org/doi/10.1016/j.drugalcdep.2023.109870.

24 J. Erhabor, E. Boakye, N. Osuji, O. Obisesan, A. Osei, H. Mirbolouk, A. Stokes, O. Dzaye, O. Shahawy, C. Rodriguez, G. Hirsch, E. Benjamin, A. DeFilippis, R. Robertson, A. Bhatnagar and M. Blaha, *Psychosocial stressors and current e-cigarette use in the youth risk behavior survey*.

25 A. Groom, T. Vu, R. Landry, A. Kesh, J. Hart, K. Walker, L. Wood, R. Robertson and T. Payne, *The Influence of Friends on Teen Vaping: A Mixed-Methods Approach*.

26 C. Struble, S. Bauer, L. Lundahl, S. Ghosh and D. Ledgerwood, *Electronic cigarette use among sexual minority and heterosexual young adults in a U.S. national sample: Exploring the modifying effects of advertisement exposure*.

27 A. Palmer, R. Tomko, L. Squeglia, K. Gray, M. Carpenter, T. Smith, J. Dahne, B. Toll and E. McClure, *A pilot feasibility study of a behavioral intervention for nicotine vaping cessation among young adults delivered via telehealth*.