

12-31-2025

## The Association Between E-Cigarette Use and Community Mattering Among Adolescents in Maine

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# Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral study by

April Hughes

has been found to be complete and satisfactory in all respects,  
and that any and all revisions required by  
the review committee have been made.

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Walden University

2025

Abstract

The Association Between E-Cigarette Use and Community Mattering Among  
Adolescents in Maine

by

April Hughes

MPH, Purdue University Global, 2018

BS, Kaplan University, 2017

Doctoral Study Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Doctor of Public Health

Walden University

February 2026

## Abstract

E-cigarette use among U.S. high school students is a significant public health issue. Factors such as mattering, sexual orientation, and gender identity (SOGI) influence e-cigarette use among adolescents, yet few studies have explored the relationship between mattering and e-cigarette use when considering SOGI. This quantitative study explored the association between past 30-day e-cigarette use and mattering among Maine high schoolers while controlling for SOGI and grade level. This correlational cross-sectional study used the 2023 Maine Integrated Youth Health Survey data, and the socioecological model served as the theoretical foundation. A multivariate binary logistic regression analysis indicated a significant association between mattering and past 30-day e-cigarette use, with youth who reported feeling that they mattered to people in their community having higher odds of use (OR = 1.84, 95% CI [1.70, 1.98]). Compared to heterosexual students, adolescents who identified as gay/lesbian had 1.45 times higher odds, and those who identified as bisexual had 1.70 times higher odds of using an e-cigarette in the past 30 days. Across all grade levels, community mattering significantly predicted past 30-day e-cigarette use ( $p < .001$ ), with higher odds among students in grades 9 (95% CI [1.85, 2.57]) and 10 (95% CI [1.80, 2.39]) compared with grades 11 (95% CI [1.47, 1.94]) and 12 (95% CI [1.51, 2.03]). The results of this study can provide insight into the connection between community, interpersonal level risk factors, and adolescent e-cigarette use. The implications of this research may assist public health practitioners and stakeholders with selecting appropriate health interventions to enhance community-level protective factors, while ensuring they are tailored to youth with the greatest disparities in use.

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## Dedication

This study is dedicated to my Papa, who I know would be proud to see what I have accomplished these last several years.

## Acknowledgments

This research would not have been completed without the unwavering support and guidance of several individuals. First, I would like to extend my sincere gratitude to my committee chair, Dr. Patrick Dunn, and my second committee member, Dr. Zin Htway, for their knowledge, guidance, and expertise throughout each phase of this academic journey. Finally, I would be remiss if I did not acknowledge that the support and encouragement provided by my family and Catherine throughout this process were invaluable and critical to its completion.

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## Section 1: Foundation of the Study and Literature Review

### **Introduction**

E-cigarette use among adolescents is a significant public health issue, as the use of these products during a critical time of development can lead to adverse health and social outcomes. Individuals who feel they matter to individuals within their community are less likely to engage in risky health behaviors, such as vaping (Flett, 2024). Conversely, individuals who feel they do not matter are more likely to engage in risky health behaviors (Flett, 2024). As such, this study examined the association between e-cigarette use and community mattering among adolescents in Maine.

This section includes a background of e-cigarette use among youth, including identifying the gap in the literature and why this study was conducted, the problem statement, the purpose of the study, research questions and hypotheses, and the theoretical or conceptual framework grounding the study.

### **Background**

E-cigarettes, also referred to as “vapes,” are the most commonly used tobacco products among youth in the United States (Steeger et al., 2025). According to the 2023 Maine Integrated Youth Health Survey (MIYHS), approximately 15.6% of high school students used an electronic vapor product (EVP) at least once in the past 30 days (Maine Department of Health and Human Services [MDHHS], 2023). The use of these tobacco products among adolescents is concerning, given that many of them include nicotine (Centers for Disease Control and Prevention [CDC], 2024). This highly addictive substance may negatively impact the portion of the brain that is in charge of mood

regulation, impulse control, and learning (CDC, 2024). Additionally, youth are more susceptible to nicotine addiction and may start showing signs of dependence before more frequent use of vape devices (CDC, 2024-b).

While e-cigarettes may be the most commonly used tobacco product among youth, the sociodemographic characteristics of the users vary greatly when considering sexual orientation, gender, race, and ethnicity. For example, McCauley et al. (2024) found that marginalized groups such as LGBTQ+ individuals had higher rates of past 30-day use. Similarly, Steeger et al. (2025) strengthened these findings by examining how psychosocial factors among sociodemographic characteristics generated disparities in vaping among early adolescents. For example, Steeger et al. (2025) stated that sexual orientation was strongly associated with higher nicotine vaping prevalence, with LGB+ youth using e-cigarettes more frequently than their heterosexual peers.

The driving factors for e-cigarette use among adolescents, particularly in marginalized communities, include minority stress, tobacco marketing targeted toward youth, social norms, and familial tobacco use (Steeger et al., 2025; Wang et al., 2022). Additional intrapersonal factors include mental health, perception of risk and harm associated with e-cigarette use, and other health-related behaviors (Han & Son, 2022). A literature review from Han and Son (2022) found that permissive attitudes towards e-cigarette use at school or within the home contributed significantly to their use from an organizational and community-level standpoint. Among these factors, mental health, interpersonal relationships, and experiences strongly predicted the likelihood of adolescent e-cigarette use.

The concept of mattering, which includes individuals' feelings of importance and significance to others (e.g., family, friends, community), was first introduced in 1981 by Rosenberg and McCullough (Watson et al., 2022). Mattering among adolescents and its connection to mental health issues, such as depression and anxiety, have been studied in the past, showing a strong connection (Watson et al., 2022). Watson et al. (2022) explored the connection between mattering, school connectedness, and media addiction and found a significant association between feelings of mattering and mental health symptoms. These findings determined that young people who feel like they matter to others at school are less likely to experience adverse mental health effects, such as depression and anxiety (Watson et al., 2022).

The significant connection between mattering and mental health is a key factor to consider when examining the influences on adolescent e-cigarette use. In particular, the lack of research focused on mattering within community-level contexts and adolescents requires further exploration, as the findings may contribute to culturally tailored and relevant public health interventions that prevent the initiation and use of e-cigarettes among youth.

### **Problem Statement**

E-cigarette use is a significant public health problem among adolescents in Maine. Approximately 15.6% of high school students have used an e-cigarette at least once in the past 30 days. Among the students who are currently using an e-cigarette, 19.4% identified as LGBTQ+. E-cigarettes are devices used to aerosolize nicotine or other substances, such as cannabis, to inhale it (Fiegel & Frank, 2023). The use of these products raises

concerns, given the numerous risks associated with their use (Fiegel & Frank, 2023).

Adolescence is an essential time for healthy brain development; however, using substances such as nicotine has the potential to impact its development, leading to problems with learning, memory, attention, mood, and impulsivity (Awad et al., 2024).

Additionally, the 2023 MIYHS showed that only half of high school students felt that they mattered to people in their community. The data revealed a significant disparity between youth who identify as LGBTQ+ and cisgender heterosexual youth when looking at the responses regarding community mattering (MDHHS, n.d.-a). Whereas 54.3% of heterosexual, cisgender students felt that they mattered to people in their community, only 35.7% of LGBTQ+ students said that they mattered (MDHHS, n.d.-a). With a strong association between mattering and mental health, as well as mental health and e-cigarette use, the information revealed in the 2023 MIYHS is important to consider (Awad et al., 2024; Flett et al., 2023).

### **Study Purpose**

The purpose of this quantitative study was to examine the association between past 30-day e-cigarette use and community mattering among Maine high school students while controlling for grade level (9–12), sexual orientation (heterosexual, lesbian, gay, bisexual, described sexuality some other way, questioning) and gender identity (cisgender, transgender, not sure of gender identity).

### **Research Questions and Hypotheses**

The research questions guiding this study include past-30-day e-cigarette use as the dependent variable, whether or not the individual feels like they matter to people in

their community, also referred to as “community mattering” as the independent variable, and sexual orientation, gender identity, and grade level as confounding variables.

RQ1: What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI)?

$H_01$ : There is no statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI).

$H_11$ : There is a statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI).

RQ2: What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

$H_02$ : There is no statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12).

$H_12$ : There is a statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12).

### **Theoretical Foundation**

The socioecological model (SEM) by Uri Bronfenbrenner (1979) provided the theoretical foundation of this study. Unlike other health behavior models, SEM offers more profound insight into the complex interplay of risk and protective factors on

different levels of influence that either increase or decrease the likelihood of engaging in health behaviors (Elliott et al., 2022; Thaivalappil et al., 2024). SEM includes intrapersonal, interpersonal, organizational, community, and environmental levels of influence, with various external-internal factors operating within them (Thaivalappil et al., 2024).

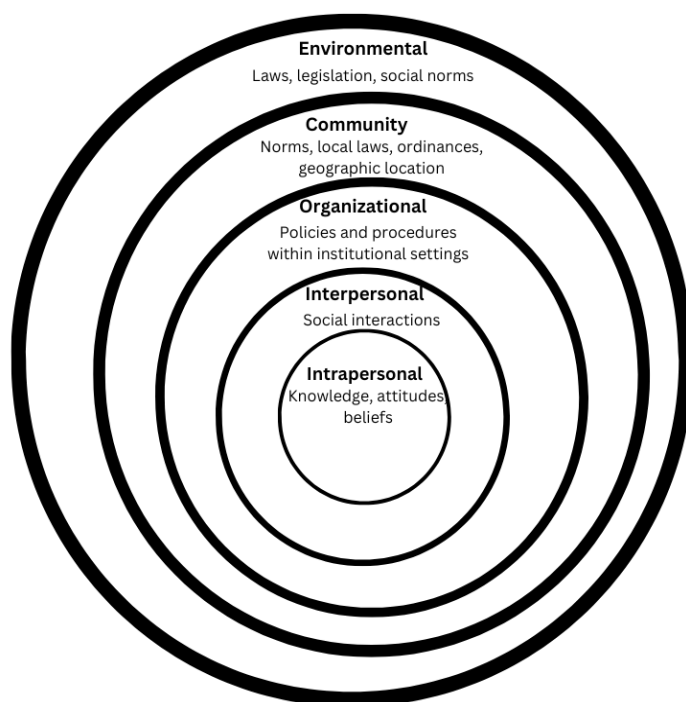
These constructs, listed below with examples of factors impacting health behaviors, have been used by public health practitioners and researchers to examine the psychosocial factors driving health behaviors and outcomes among adolescents. For example, Elliott et al. (2022) utilized the SEM to explore how psychosocial factors on different levels (e.g., individual, interpersonal, and community) impacted mental health well-being among LGBTQ+ adolescents living in rural locations. Based on the findings, Elliott et al. concluded that public health interventions that are rural-based and focused on increasing youth resiliency, as well as policies and practices that reduce adverse mental health outcomes among LGBTQ+ youth, are essential.

- Intrapersonal level: Include individual-level risk and protective factors such as beliefs, knowledge, and attitudes.
- Interpersonal level: The interactions and norms between an individual and others such as peers, family, friends, co-workers, and teachers.
- Institutional level: Policies, procedures, and systems within an organization that may directly or indirectly influence health behaviors. Examples of institutional settings include schools and workplaces.

- Community level: An individual's experiences and interactions with individuals within the community, businesses, organizations, and geographic area. This may include community norms, local laws, and ordinances (e.g., smoke-free parks).
- Environmental/Policy level: Factors on this level include laws and legislation that may impact health and health behavior.

**Figure 1**

*Socioecological Model*



Similarly to this study, some researchers have utilized SEM to examine connections between e-cigarette use and adolescents. For example, Han and Son (2022) conducted a systematic review using the SEM to examine the interplay of interpersonal and environmental factors on adolescent e-cigarette use. These findings were to inform

the development and selection of interventions to prevent adolescent e-cigarette use on the interpersonal and environmental levels. The authors found that on the interpersonal level, tobacco product use among an adolescent's peers and parents' favorable attitude toward e-cigarettes greatly predict whether an adolescent will use e-cigarettes. On the community level, seeing peers use e-cigarettes at school or attending a school without a smoking ban increased the risk of adolescent e-cigarette use.

As witnessed in studies examining risk and protective factors associated with adolescent e-cigarette use, the SEM was appropriate for this study, given the purpose of this study and the need to further explore community-level risk and protective factors while accounting for intrapersonal factors, such as sexual orientation, gender identity, and grade level.

### **Nature of the Study**

This study used a cross-sectional correlation design to determine the association between past 30-day e-cigarette use and community mattering among high school students in Maine. A secondary data analysis utilizing data from the 2023 MIYHS was used to address the research questions, with the following variables utilized:

1. Dependent variable: Past 30-day e-cigarette use
2. Independent variable: Community mattering
3. Control variables: Sexual orientation, gender identity, grade level

### **Literature Search Strategy**

The Walden University Library was used to search the following databases for peer-reviewed scholarly articles between 2020 and 2025: ScienceDirect, PubMed, SAGE

Journals, ProQuest, and MEDLINE. Additionally, Google Scholar was also explored. Keywords used in the search included *e-cigarettes*, *electronic cigarettes*, *vapes*, *youth*, *adolescents*, *teens*, *risk and protective factors*, *community connectedness*, *community*, *socioecological factors*, *mattering*, *mental health*, and *substance use*. Work specific to the SEM, particularly the model's initial use by Bronfenbrenner (1979), was included in the search.

### **Literature Review Related to Key Variables and/or Concepts**

#### **Adolescent E-Cigarette Use: Definitions and Risk Factors for Use**

##### ***Definitions***

E-cigarettes, also referred to as vapes or electronic nicotine delivery systems (ENDS), are devices used to aerosolize substances such as nicotine and cannabis, which can then be inhaled by the user (CDC, 2024-c; Sapru et al., 2020). The action of using these devices is often referred to as “vaping,” with many of these products coming in various shapes, sizes, and colors that may appeal to younger users (CDC, 2024-c). Depending on the product type, vape devices may have different mechanisms and ways to utilize them. For example, disposable vape products come prefilled and cannot be reused once the substance contained within the device is used (CDC, 2024-c; Sapru et al., 2020). Refillable e-cigarettes, which are rechargeable, contain a chamber that can be refilled with e-liquid (Sapru et al., 2020). Depending on the device and brand, they can also be modified to produce various amounts of aerosol and e-liquid strength (CDC, 2024-c). Finally, pod-based e-cigarettes are rechargeable and contain pre-filled cartridges or pods (CDC, 2024-c; Sapru et al., 2020).

The many types of e-cigarette devices available today are a product of this device's evolution since they were first produced in China in 2003 (Holt et al., 2023). A review published in the *Journal of Safety Research* by Holt et al. (2023) noted that since e-cigarettes entered the U.S. market in late 2006, the device has seen approximately four generations of product types. The first generation is more commonly referred to as “cig-a-likes” and is disposable; the second generation included refillable cartridges that could be reused, the third generation was the larger tank systems, and the fourth generation included rechargeable “pod mods” (Holt et al., 2023).

The e-liquid used in e-cigarette devices contains various ingredients, including nicotine, propylene glycol, vegetable glycerin (VG), chemical flavorings, solvents, and preservatives (Holt et al., 2023). Both propylene glycol and VG are considered safe by the U.S. Federal Food and Drug Administration for consumption (Holt et al., 2023). However, for use in e-cigarettes, these chemicals are deemed “Generally Regarded as Safe” (Holt et al., 2023). Conversely, e-juice used in vape devices intended for cannabis aerosolization includes the psychoactive ingredient tetrahydrocannabinol (THC) along with medium-chain triglycerides (Holt et al., 2023).

***Risk Factors: Interpersonal***

Factors contributing to e-cigarette initiation vary among adolescents. However, many studies have associated interpersonal factors, such as familial and peer influences, as being one of the most significant predictors of substance use initiation among youth (Han & Son, 2022; Hesse & Fite, 2024). For example, a study by Hesse and Fite (2024) employed multilevel survival analyses to investigate how various forms of socialization

(e.g., parental approval of e-cigarette use, sibling substance use, and peer risky behaviors) may increase the risk of e-cigarette use among rural early adolescents. The findings from this study confirmed a strong association between e-cigarette use among youth and parental approval and peer delinquency (Hesse & Fite, 2024). Similarly, a literature review by Villanueva-Blasco et al. (2025) found a strong association between adolescent e-cigarette initiation and peer influence, including perceived social norms through peer approval and behaviors.

McCausland et al. (2024) employed the SEM to investigate the factors that likely contribute to e-cigarette initiation among youth in Western Australia, as perceived by school personnel, parents, caregivers, and youth aged 13–17. Similar to other studies, McCausland et al. (2024) found that the perceived normalization of e-cigarette use among their peers facilitated the use of e-cigarettes among young people. Additionally, the findings determined that social networks and interactions played a significant role in e-cigarette use. Youth study participants noted e-cigarette use while in social settings with their friends and peers, such as in school bathrooms, friends' homes, or during parties and gatherings (McCausland et al., 2024).

Finally, a qualitative study conducted by Guerra Castillo et al. (2025) sought to understand the socio-contextual factors that premeditated adolescents' (ages 13–17) first use of e-cigarettes. Similar to prior studies, Guerra Castillo et al. (2025) found that primary drivers for adolescent e-cigarette initiation included a combination of perceived social norms, such as the belief that many of their peers used these devices and approved of their use and opportunity (e.g., social situation with peers who are vaping).

***Risk Factors: Intrapersonal***

On the intrapersonal level, Fortier et al. (2022) and Villanueva-Blasco et al. (2025) conducted studies to determine which factors increased adolescents' likelihood of using e-cigarettes. For example, Fortier et al. used a longitudinal design to explore how adverse childhood experiences (ACES) impacted adolescent and young adult vaping and patterns of use over two periods of time. This study found that ACES, such as emotional or physical abuse, parental substance use, and household mental illness, were associated with any adolescent and young adult vaping. Villanueva-Blasco et al. (2025) conducted a systematic literature review to investigate other intrapersonal factors and found that sensation-seeking and impulsivity significantly increased the risk of adolescent e-cigarette use.

Guerra Castillo et al. (2025) conducted a qualitative study of adolescents in California to determine the factors associated with e-cigarette initiation among this population. After completing semi-structured interviews with youth between the ages of 13 and 17, Guerra Castillo et al. (2025) found that on the intrapersonal level, a common theme emerged around the use of e-cigarettes to help cope with stress and anxiety. This study indicated that mental health may play a role in adolescent e-cigarette use.

Using the Population Assessment of Tobacco and Health (PATH) Study, Kwon et al. (2018) used logistic regression to examine multilevel factors that may increase e-cigarette use susceptibility among youth. The findings from their analysis determined that demographics, ever-use of substances (e.g., alcohol, marijuana, etc.), psychological factors (e.g., moderate risk-taking behaviors), and environmental factors, such as

exposure to secondhand smoke at home or e-cigarette advertisements, increased youth susceptibility to e-cigarette use (Kwon et al., 2018).

***Risk Factors: Community and Environmental***

Community and environmental risk factors, as identified in a study by Vázquez et al. (2024), include community norms that are favorable towards substance use, e-cigarette marketing and promotion, and ease of access to these products. In particular, the availability of these products was strongly associated with early adolescent e-cigarette use. Similarly, McCausland et al. (2024) found that e-cigarette marketing, including design, colors, scent, and aesthetics, generated interest and intention to use these products among adolescents. Additionally, while product-specific, the lower, more affordable cost of disposable and pod-based e-cigarette devices made these products more appealing to youth who use them.

Abadi et al. (2022) conducted a study using an ecological momentary assessment (EMA) to examine community-level and socio-contextual factors contributing to adolescent e-cigarette use and dual use (e.g., the use of e-cigarettes and combustible cigarettes). The study by Abadi et al. used variables focused on socio-temporal contexts, such as peer networks and environmental locations at the moment of vape use, intrapersonal factors, such as motivation to use, and community-level factors such as e-cigarette advertisements and exposure to e-cigarette use among peers and adults.

Similar to other studies, Abadi et al. (2022) found a strong association between adolescent exposure to adult and peer use of e-cigarettes and adolescent e-cigarette use, indicating that social norms may play a role in vaping among youth. Additionally, this

study confirmed prior findings that demonstrated that adolescent exposure to e-cigarette promotions and marketing increases the likelihood of youth e-cigarette use. For example, participants in the EMA study indicated that shortly after exposure to e-cigarette product marketing, they used a tobacco product, often on the same day of exposure (Abadi et al., 2022).

### ***Adolescent E-Cigarette Use: Prevalence and Use Trends***

In the United States, e-cigarettes are the most preferred tobacco product among adolescents aged 13 to 18, with approximately 7.8% of high school students currently using these products (CDC, 2024; Fortier et al., 2022). While combustible cigarette use has steadily been declining among youth, the introduction of electronic nicotine devices in the U.S. market in the late 2000s essentially eradicated decades of progress made at reducing tobacco use among this population (Fortier et al., 2022; Sapru et al., 2020).

The National Youth Tobacco Survey (NYTS) results revealed that among youth who have used an e-cigarette device in the past 30 days, approximately 87.6% cited using a flavored e-cigarette, 38.4% stated that they used an e-cigarette 20 or more days, and nearly 1 and 4 were daily users (CDC, 2024). When considering the device type among adolescent e-cigarette users, more than half (55.6%) stated that they use disposable e-cigarettes, 15.6% used pod and cartridge-based devices, and 7.0% used refillable mods or tanks (CDC, 2024).

According to the CDC (2024), females were more likely than males to report using an e-cigarette device based on the results of the 2024 NYTS. However, Villanueva-Blasco et al. (2025) and McCauley et al. (2024) noted that being male was a risk factor

for e-cigarette use. McCauley et al. (2024) provided additional insight into the nuances of e-cigarette use according to sex by assessing birth year and device type. For example, when examining past 30-day e-cigarette use, McCauley et al. found that males born before 2000 had higher rates of e-cigarette use than females. However, females born between 2001 and 2008 used disposable and cartridge-based vape devices at higher rates than males.

Additionally, e-cigarette use differs according to other demographics, including race, ethnicity, sexual orientation, and gender identity. For example, non-Hispanic American Indian and Alaska Native students showed higher use rates (11.5%) in comparison to non-Hispanic White (5.9%) and non-Hispanic Asian students (2.3%) in the NYTS (CDC, 2024). McCauley et al. (2024) also noted that in comparison to Black and Non-Hispanic White participants, individuals who identified as Hispanic or Latino were more likely to report past 30-day e-cigarette use across all age groups included in the study.

Disparities in tobacco product use are also evident in sexual orientation and gender diverse youth. For example, a study by McCauley et al. (2024) found that ever- and past 30-day e-cigarette use was higher among youth who identified as LGBTQ+. Using a cross-sectional study design and a descriptive approach, McCauley et al. (2024) developed summary tables to capture participants' responses to e-cigarette device type used and sociodemographic variables. The study's purpose was to assess key sociodemographic variables associated with e-cigarette use, particularly sex, sexual

orientation, gender identity, and race/ethnicity, to detect disparities in use and to inform public health policies and practices (McCauley et al., 2024).

Expanding on the literature, Juhan et al (2025) used a Weighted Poisson Regression model utilizing the 2023 NYTS to understand the connection between tobacco product use and sexual minority youth. The findings from this study confirmed results from previous studies that highlighted greater tobacco product prevalence among sexual minority adolescents, including youth who identify as asexual (Juhan et al., 2025).

Azagba et al. (2025) explored the nuances of sexual and gender minority groups and substance use (e.g., e-cigarettes, tobacco, cannabis, and other substances) by including the subgroup identities captured in the 2023 NYTS, such as asexual, pansexual, queer, and questioning. Using multivariate logistic regression, Azagba et al. found that youth who identified as a sexual or gender minority young person, particularly lesbian/gay, bisexual, asexual, pansexual, queer, or questioning, used e-cigarettes, other tobacco products, or cannabis vapes at higher rates than peers who identified as heterosexual. Additionally, gender minority youth, such as those who identify as transgender, genderqueer, or genderfluid reported e-cigarette and cannabis vaping at higher rates than their cisgender peers.

The disparities that exist between substance use and marginalized populations could be explained by the minority stress theory. Azagba et al. (2025) noted that this theory posits that health-related disparities exist among these populations due to the unique stressors experienced due to their identities, such as internalized and external stigmatization and biases, discrimination, and victimization. As a result, individuals from

these marginalized communities may turn to risky health behaviors such as substance use to cope with these stressors, leading to poorer health outcomes (Azagba et al., 2025).

### ***Adolescent E-Cigarette Use: Health-Related Outcomes***

The health risks associated with e-cigarettes make the use of these products among youth concerning. Adolescence is an important time for brain development. However, the consumption of nicotine during that time increases the risk for impaired development, leading to issues with mood regulation, impulse control, memory, and learning (CDC, 2024; Vázquez et al., 2024). Additionally, nicotine use may increase the risk for dependence and subsequent use of other substances, such as combustible tobacco products or cannabis (Vázquez et al., 2024).

Other potential risks associated with e-cigarettes include the devices themselves and the e-liquid that is vaporized via these devices. For example, chemicals and agents that may adversely impact cardiovascular health are found within the flavors used in e-liquid, as well as in the aerosol, also known as “vapor,” that is produced by the heating mechanisms within the e-cigarette (Vázquez et al., 2024). These agents include heavy metals like nickel and lead (Vázquez et al., 2024). The presence of these agents and their prolonged use may potentially lead to cardiovascular health issues.

Exploring more immediate effects of e-cigarette use and secondhand aerosol exposure, a study by McClelland et al. (2021) found notable physiological effects from the act of vaping among study participants. For example, immediately after inhaling aerosolized e-juice containing 5% nicotine, the users’ heart rate increased rapidly. It is not known what effect prolonged periods of tachycardic episodes may have among

frequent users of highly concentrated amounts of nicotine, which are often found in e-cigarette devices (McClelland et al., 2021). In addition to increased heart rates, the study also found an increase in blood pressure following e-cigarette use, even in moments of rest or inactivity (McClelland et al., 2021). Finally, a significant finding in the study noted a concerning decrease in the amount of oxygen in the bloodstream post-vaping, which can have serious cardiac and respiratory implications for individuals with cardiovascular health issues or asthma (McClelland et al., 2021).

### **The Theory of Mattering: Definition**

Rosenberg and McCullough first introduced the construct of mattering in 1981 (Flett, 2024). They determined that mattering includes an individual's feelings of being valued and cared for by others, an essential construct for young people (Flett, 2024). Rosenberg and McCullough (1981, as cited in Flett, 2024), established that mattering includes the following elements:

1. Importance: When youth feel they are significant to others.
2. Attention: When youth feel others notice them.
3. Dependence: The feeling that others rely on them and/or they can rely on others.

In more recent years, this construct has expanded to include the feeling of bringing value to others' lives and one's own (Dyrendahl et al., 2025). The combination of these components has the potential to increase the resiliency of individuals, operating as a protective factor at the interpersonal level against risky health behaviors and poor mental health (Dyrendahl et al., 2025; Flett, 2024). With components of mattering

encompassing feelings of being valued and cared for by those in close social networks (e.g., family, friends, and peers), schools, and communities, the sense of belonging is oftentimes mistakenly included as a construct of mattering (Flett, 2024). However, despite the close relationship between belonging and mattering, Flett (2024) distinguishes belonging as a unique, separate construct, as individuals who feel they belong to groups do not always feel valued by others.

Conversely, anti-mattering includes feeling undervalued and overlooked by others (Flett, 2024). The hopelessness derived from feelings of not mattering to others and the community is often connected to increased suicidality among youth when coupled with other risk factors (Flett, 2024). A review of the literature by Flett (2024) found that high school students who felt as though they did not matter to others experienced increased feelings of loneliness.

To build upon the literature of mattering, Paradisi et al. (2024) conducted a meta-analysis using the PRISMA framework to examine the connection or overlap between mattering and the concept of well-being. Well-being includes three constructs: hedonic, satisfaction with life, eudaimonic, understanding one's true self, and holistic, meaning an individual is experiencing satisfaction with different areas of their life (Paradisi et al., 2024). Similar to the idea posed by Flett (2024) regarding the distinguishable features between belonging and mattering, Paradisi et al. also noted from their literature review that individuals who have decent self-esteem but do not feel valued may not experience overall well-being. Paradisi et al. determined a significant connection between mattering and well-being.

With the literature expanding on mattering and how it impacts various components of overall health and well-being, it is being heralded more as a protective factor concerning psychosocial outcomes (Paradisi et al., 2024). For example, adolescents who feel they matter at school or in the broader community are less likely to experience risky health behaviors or adverse social outcomes (Paradisi et al., 2024). This next section delves deeper into this concept and its impact on different areas of health and well-being.

### **The Theory of Mattering: Impact on Mental Health and Adolescents**

Depending on the context, feelings of mattering can be a protective or risk factor regarding adolescent mental and behavioral health. For example, youth who do not feel they matter to others are more at risk for suicidality and attempts than those who feel like they matter to others (Flett, 2024; Flett et al., 2022). A study by Flett et al. (2022) utilized an anti-mattering scale to examine the association between varying levels of anti-mattering and psychosocial issues among adolescents and emerging adults. The results of this study indicated that youth and young adults who experienced higher rates of not mattering to others were more likely to experience adverse mental health effects, such as depression and social anxiety. Conversely, a literature review by Flett (2024) determined that community mattering, or feeling valued and appreciated by others, played a significant role in decreased thoughts of suicide among adolescents.

Semprevivo (2023) explored the connection between LGBTQ+ status, mattering, and mental health. Semprevivo noted that LGBTQ+ youth often face a multitude of risk factors for poor mental health, such as bullying, victimization, and discriminatory

practices and policies. Victimization, in particular, is significantly linked to adverse mental health outcomes, including suicide (Semprevivo, 2023). To explore this subject further, Semprevivo conducted a study to determine how protective factors on the individual, institutional, and community levels may impact mental health among LGBTQ+ students. After completing a binary logistic regression of the 2019 Youth Risk Behavior Surveillance System (YRBSS), Semprevivo determined that youth who identify as LGBTQ+ were more likely to report feeling depressed and suicidal when they stated that they did not feel safe at school or matter to people in the community.

### **The Theory of Mattering: Impact on Health Behavior and Adolescents**

Although there have been ample studies assessing the connection between the concept of mattering and its impact on mental health, a few studies have examined its association with other health behaviors. For example, a literature review by Flett (2024) found that risky health behaviors, such as underage alcohol use, were associated with decreased feelings of mattering among adolescents. Similarly, Semprevivo (2023) noted in their study that some at-risk populations of youth, such as lesbian, gay, bisexual, transgender, and queer/questioning (LGBTQ+), are more likely to engage in risky health behaviors, such as substance use, due to victimization.

Building upon this literature, Dyrendahl et al. (2025) conducted a study utilizing qualitative and quantitative methods to examine the connection between substance use and mattering among a population of adolescent girls in Norway. The findings determined that the concept of mattering significantly impacted substance use perceptions, use, and behaviors among adolescent girls. For example, girls who felt

valued by their peers and family members and had an increased sense of significance to others were less likely to use substances. Conversely, a lack of mattering or a decreased sense of value to others operated as a risk factor for substance use (Dyrendahl et al., 2025).

### **Assumptions**

This study utilized data from the 2023 MIYHS to examine associations between the feeling of community mattering among adolescent high school students and e-cigarette use. The MIYHS is a biennial survey that is distributed to Maine middle and high school students to determine health behaviors and beliefs among this population, such as substance use, tobacco use, mental health, nutrition, physical activity, and other positive and risky health behaviors and experiences (MDHHS, n.d.-a). Depending on school participation rates, data are available at the state, public health district, county, and school levels. Additionally, the MIYHS is weighted to ensure representativeness, adjusting for non-participating schools and students who opted out of the survey (MDHHS, n.d.-b).

### **Scope and Delimitations**

This methodology, when utilized with the MIYHS, provides insight into the scope and delimitations of this study. For example, this study will examine the association between e-cigarette use and community mattering among Maine high school students using a secondary data analysis of the 2023 MIYHS. As noted above, Tilton et al. (2023) confirmed in their study that the MIYHS is a cross-sectional survey distributed to public and quasi-public middle and high schools (Grades 5–12). Each participating school is

randomly assigned to one of four survey versions (A, B, C, and D). Each version includes a set of core measures (e.g., smoking). While e-cigarettes were not included as a core measure when Tilton et al. (2023) conducted their study, they were included as a core variable in the 2023 MIYHS.

Another notable difference between the last three MIYHS surveys was the method of survey completion. For example, the 2019 MIYHS had youth participants complete a paper-based version of the survey, whereas the 2023 MIYHS included both a paper and web-based version. The surveys contain 99–110 questions, depending on the version used. Survey administrators provide the students with a web or paper-based survey and administer it over a class period (i.e., approximately 30–45 minutes; MDHHS, n.d.-a). Responses were anonymous to ensure confidentiality and increase credibility (MDHHS, n.d.-b; Tilton et al., 2023).

The variables used in this correlation cross-sectional study include past 30-day e-cigarette use, whether or not youth feel like they matter to people in their community, sexual orientation (gay, bisexual, heterosexual), gender identity (transgender-yes, transgender-no), and grade level (9–12). I explored associations between these variables through this secondary data analysis of the 2023 MIYHS.

### **Limitations**

Several limitations must be considered after reviewing the study's findings. For example, while the 2023 MIYHS is representative of Maine's youth population, it was only conducted in public and quasi-public schools. This means that students attending private and semi-private schools, as well as those who are homeschooled, were not

included in this study. Additionally, the only youth population included in the study was in high school, and only among those whose parents/guardians did not opt them out of taking the survey, which means the findings would not be generalizable to all youth populations (e.g., middle school-aged youth; Ramirez et al., 2024; Tilton et al., 2023). Secondly, as Tilton et al. (2023) noted in their study, the possibility of recall and social desirability bias must be considered due to the self-report nature of the MIYHS. Thirdly, the MIYHS, a cross-sectional survey, does not allow for causality between variables (Tilton et al., 2023). Additionally, the cross-sectional design only accounts for a snapshot in time and cannot account for longitudinal variances in adolescent experiences and behaviors.

Finally, the study did not include all possible responses to each question from the 2023 MIYHS. For example, the question focused on sexual orientation included the responses, “I am not sure about my sexual identity (questioning)” and “I do not know what this question is asking.” The question focused on gender identity, such as “some people describe themselves as transgender when their sex at birth does not match the way they think or feel about their gender. Are you transgender?” does not include the following responses, “I am not sure if I am transgender” and “I do not know what this question is asking.” The youth who selected these responses were not included in the survey, as it was unclear if a lack of understanding of the question or other unknown variables prevented a “yes” or “no” response.

### **Significance**

This study is significant in that the findings may provide insight into the connection between adolescent e-cigarette use and community mattering, a community-level protective factor. Similar to the study by Tilton et al. (2023), the findings may also reveal potential disparities among different adolescent populations, such as LGBTQ+ youth, to assist in developing socially equitable and culturally tailored public health interventions. The results of this study may be of significant interest to public health practitioners, community-based organizations, and policymakers in implementing appropriate health interventions to enhance protective factors.

The implications of this research may present a foundation for future research into the specific experiences and qualities of the community environment (e.g., availability of resources, opportunities for youth, community support or volunteerism) that may contribute to adolescents' feelings of being valued, appreciated, and important to people in their communities (Flett, 2024).

Additionally, these findings have the potential to generate positive social change by shedding light on the potential disparities between adolescent e-cigarette use and mattering. The information discovered in this study can help inform the development and implementation of public health interventions on each level of the SEM. Interventions that increase the sense of mattering among youth on the individual and interpersonal (e.g., peers and community members) levels may potentially enhance this protective factor against adolescent e-cigarette use. Additionally, policymakers and decision-makers can use this knowledge to inform community and societal-level policies that directly

impact mattering, increasing adolescents' feelings of belonging and acceptance within their social networks and communities.

### **Summary and Conclusions**

E-cigarette use among adolescents is a significant concern in Maine, nationwide, and globally, especially given that they are the most commonly used tobacco product among this population (Steeger et al., 2025). The use of the products during a critical period of brain development for adolescents can impede its development, leading to issues with mood regulation, impulse control, and learning, making the individual vulnerable to addiction (CDC, 2024; Vázquez et al., 2024). This leads to increased risk for other substance use and risky health behaviors. Beyond the behavioral and developmental concerns associated with e-cigarette use, the potential threat to cardiovascular and respiratory health is also present due to the heating mechanisms and the chemicals used to make the flavored e-juice used in these products (CDC, 2024; Vázquez et al., 2024).

There are many risk factors associated with e-cigarette use, with many of them experienced on the intra- and interpersonal levels. The concept of mattering, or the feeling of being valued by and known by your social networks and community, can operate as either a risk or protective factor depending on how young people experience this concept (Flett, 2024). For example, youth who experience low feelings of mattering are more likely to experience poor mental health effects and are at increased risk for substance use and other risky health behaviors (Flett, 2024). Conversely, youth who feel as though they matter to others are less likely to experience poor mental health and

substance use (Flett, 2024). Additionally, some populations of youth, such as those who identify as LGBTQ+, are more likely to experience higher rates of mental health issues, substance use, and a decreased sense of mattering (McCauley et al., 2024; Semprevivo et al., 2023; Steeger et al., 2025).

With risk and protective factors being essential SEM constructs, this conceptual framework is appropriate for grounding this study. SEM includes multiple levels of influence on health behavior: intrapersonal, interpersonal, institutional, community, and environmental (Elliott et al., 2022; Thaivalappil et al., 2024). This study further explored the connection between the interpersonal and community-level concept of mattering and how this may increase or decrease e-cigarette use among adolescents in Maine. SEM, combined with the identified gaps in the relevant literature, are appropriately aligned to answer the following research questions:

1. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation (heterosexual, gay/lesbian, bisexual, described sexuality some other way, questioning) and gender identity (SOGI) (transgender- yes, transgender- no)?
2. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

This study accounts for additional influencing variables that may impact the relationship between e-cigarette use and whether or not a young person feels as though they matter to people in their community. For example, sexual orientation and gender identity (SOGI) was included as confounding variables to determine the strength of

association between mattering and past 30-day e-cigarette use. Similarly, grade levels 9 through 12 were also included.

Despite the limitations of conducting a cross-sectional correlational study, such as the lack of longitudinal data and causality, the study has the potential to generate positive social change in Maine's adolescent communities (Tilton et al., 2023). The findings will provide deeper insight into the connection between e-cigarette use and mattering on the community level while accounting for grade level and SOGI. The findings will provide policymakers and public health professionals with the information to develop, tailor, and implement culturally relevant and appropriate public health interventions to reach the adolescent population, impacting e-cigarette initiation and use (Tilton et al., 2023).

## Section 2: Research Design and Data Collection

### **Introduction**

E-cigarette use among adolescents in the United States poses a significant public health issue. In Maine, approximately 15.6% of high school students have used an EVP at least once in the past 30 days, and at least 30.4% of students have used an EVP at least once (MDHHS, 2023). Any use of these products during adolescence is a concern, given the mental and physical risks associated with their use. This section introduces the study's research design and methodology, including the population of focus, sampling procedures, data collection, dissemination, and validity, an overview of the variables, data analysis plan, and ethical implications for this research.

### **Research Design and Rationale**

The MIYHS is a biennial survey that collects information regarding health behaviors and beliefs among students in grades 5 through 12 (MDHHS, n.d.-a). Health behaviors, beliefs, and protective factors focus on a myriad of topics in the survey, including substance use (e.g., cannabis, alcohol, etc.), tobacco use, including EVPs, community mattering, school connectedness, and other risky health behaviors and experiences (e.g., exposure to secondhand smoke; MDHHS, n.d.-a). The MDHHS (n.d.-a) noted that the MIYHS has been distributed to participating public and quasi-public schools in Maine since 2009. Over the years, the MIYHS has been modified to include variables and trends most relevant to youth and current health behaviors.

The variables and data extrapolated from the 2023 MIYHS to conduct this study include the dependent variable current (past 30-day) EVP use, the dependent variable

whether or not a youth feels as though they matter to people in the community (yes/no), and the confounding variables sexual orientation (heterosexual, gay/lesbian, bisexual, described sexuality some other way, questioning), gender identity (transgender-yes, transgender-no), and grade level (9–12). The population of focus for this study includes high school students in grades 9–12 who participated in the 2023 MIYHS.

The research questions guiding this study that include the selected variables were as follows:

1. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation (heterosexual, gay/lesbian, bisexual, described sexuality some other way, questioning) and gender identity (SOGI) (transgender- yes, transgender- no)?
2. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

This study included a cross-sectional correlation study design to address the research questions. Associations between the past 30-day EVP use among Maine high school students and community mattering were examined.

The use of a cross-sectional design was appropriate for this study as this type of design is ideal for studies utilizing data gathered during a single point in time among a selected population (Wang & Cheng, 2020). Cross-sectional studies are used to monitor health behaviors, trends, and prevalence, as well as to assess the features and determinants of health among various populations (Wang & Cheng, 2020). Cross-sectional studies are observational and cannot be used longitudinally, which limits their

ability to determine changes in health behaviors and trends over time (Wang & Cheng, 2020). Despite this limitation, cross-sectional studies are effective in determining correlations between variables, are cost-effective, and do not require an excessive amount of time to conduct (Wang & Cheng, 2020).

## **Methodology**

### **Population**

The MIYHS collects data on a broad range of health-related behaviors and beliefs and risk and protective factors among Maine youth in grades 5-12 (MDHHS, 2023). The 2023 MIYHS collected responses from approximately 55,352 Maine high school students attending either a public or quasi-public high school. Additionally, the survey collected demographic information such as sex, gender identity, sexual orientation, age, race and ethnicity, and primary language (MDHHS, 2023). The survey responses were weighted to adjust for missing values (e.g., non-responses and non-participating schools) and ensure the population's representativeness (MDHHS, 2023).

### **Sampling Procedure**

The sampling frame used in the MIYHS included all Maine public and quasi-public (60% of the students are publicly funded) schools in the state (MDHHS, 2024). Schools with fewer than 10 students or that were considered alternative education schools were not included in the sampling frame. The Maine Department of Education supplied enrollment data for survey administrators to determine school eligibility (MDHHS, 2024). Once schools were determined eligible due to enrollment status, a pair of the four survey versions (AC or BD) was selected and disseminated to the participating schools.

This study included a power analysis to determine the minimum sample size needed to detect statistical significance and ensure population representativeness.

### **Data Collection**

The MIYHS includes questions from the Youth Risk Behavior Survey (YRBS), the National Youth Tobacco Survey (NYTS), the Maine Child Health Survey, and the Search Institutes Assets survey (MDHHS, n.d.-b). Additionally, questions from the Maine Youth Drug and Alcohol Use Survey were included. In 2009, to reduce the burden of survey administration among Maine schools, the state combined these surveys to develop the MIYHS (MDHHS, 2024).

The 2023 MIYHS included 184 questions covering various health-related topics, such as substance use, tobacco product use, mental health, and other risky health behaviors (MDHHS, n.d.-c). Four versions of the survey (A through D) contained 99–110 questions of the possible 184 (MDHHS, n.d.-c). Sixty core questions were available in the survey, with 62 questions included in only two versions of the survey, and 63 questions included in one version of the survey, which only provided state-level data (MDHHS, n.d.-a). Version C of the survey met the CDC’s requirement to be included in the YRBS (MDHHS, 2024).

All Maine public and quasi-public high schools were invited to participate in the 2023 MIYHS. After schools opted to participate, they were assigned a survey version pair (AC or BD), with an equal number of schools within each county receiving the same version pair (MDHHS, 2024). Parents and caregivers were notified of the survey prior to administration to allow the opportunity for parents to opt their child out of completing it.

Participation in the survey was voluntary and confidential, with survey completion occurring during a single class period either via a paper copy or online (MDHHS, 2024).

### **Data Availability**

MIYHS results are available to the public via generated reports on the state, county, and public health district level on the MIYHS website. As long as more than 20 students completed the survey, schools that participated could access their school-specific data through an online portal provided to the superintendent or principal (MDHHS, n.d.-b). Individuals outside of the school system, such as local public health or community-based organizations, may also obtain school-level data if given special permission from the school's superintendent.

### **Data Quality**

Most of the questions included in the survey were obtained from national, reputable surveys such as the YRBS and Monitoring the Future survey. Jones et al. (2024) conducted a more current reliability test of the YRBS using test–retest reliability. The study by Jones et al. used the same survey procedures conducted by the 2021 National YRBS to compare results over two periods. The findings from this study determined that the YRBS data are generally reliable, reinforcing previous studies that found the YRBS to be reliable and credible (Jones et al., 2024).

### **Variables**

The variables used in this study are present in the 2023 MIYHS. For example, the MIYHS includes demographic data, including biological sex (male, female), gender identity (transgender-no, transgender-yes, not sure if transgender, not sure what the

question is asking), sexual orientation (heterosexual, bisexual, gay/lesbian, describes sexuality some other way, questioning, and does not understand the question), and grade level (9–12). Other variables included in the MIYHS and needed for this study include past 30-day EVP use, which includes a scale of possible answers (e.g., 0 days, 1 or 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, and all 30 days) and whether youth agree or disagree that they matter to people in their communities. This last variable also includes multiple possible responses, such as strongly agree, agree, not sure, disagree, and strongly disagree.

### **Data Analysis Plan**

I downloaded the 2023 MIYHS data set from the MIYHS website and converted it from its original file to SPSS software. To ensure representativeness for the high school-aged population in Maine, the raw dataset is weighted, which accounts for non-responses (e.g., schools that did not participate, responses that were left blank, and students who did not participate; MDHHS, n.d.-b). Data analysis was conducted using IBM SPSS software version 29.0.2.0. (20).

### **Research Questions**

The research questions guiding the data analysis were as follows:

1. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation (heterosexual, gay/lesbian, bisexual, described sexuality some other way, questioning) and gender identity (SOGI) (transgender- yes, transgender- no)?

2. What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

### **Statistical Analyses**

To complete the analysis, an ordinal logistic regression model was used to determine correlational associations between the dependent variable, past 30-day e-cigarette use, and the independent variable, whether or not youth feel as though they matter to people in the community (community mattering variable). Confounding variables, such as sexual orientation, gender identity, and grade level, were also included to account for outside influences on the strength of association between the dependent and independent variables used in this study.

There are a few assumptions for ordinal logistic regression that I addressed prior to completing the data analysis. The first was that the dependent variable is categorical and ranked in a natural order (The University of St. Andrews, n.d.). The second was that the independent variable(s) are considered continuous, ordinal, or categorical and do not have any multicollinearity between them (The University of St. Andrews, n.d.). The final assumption states the construct of proportional odds or that each independent variable used in the study is linear to the dependent variable (The University of St. Andrews, n.d.).

The Hosmer-Lemeshow test was used to test these assumptions and ensure goodness of fit for this model. Hosmer-Lemeshow tests the null hypothesis that the model used in logistic regression is appropriate and valid (Surjanovic & Loughin, 2024). The pseudo-R-squares, such as the Nagelkerke and Cox and Snell, were used in this study also to determine the goodness of fit for the logistic regression model.

## **Power Analysis**

A power analysis using the formula developed by Mann-Whitney for ordinal logistic regression was conducted a priori to determine the necessary sample size for this study's significance level and population effect size to answer the research questions (Walters, 2004). This formula utilizes percentages from the control (students who feel close to people at school) and treatment (students who do not feel close to others at school) groups in relation to the dependent variable (past 30-day EVP use), along with the alpha and power levels (CDC, 2024-d; Walters, 2004).

RQ1: What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation (heterosexual, gay/lesbian, bisexual, described sexuality some other way, questioning) and gender identity (SOGI) (transgender- yes, transgender- no)?

For the power analysis, the frequency data were extracted from the 2023 YRBS using question number 36 (past 30-day EVP use), which originated as a 7-point Likert scale, which was converted to a 5-point Likert scale (CDC, 2024-d). The original 7-point scale included the following categories: 0 days, 1 or 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, and all 30 days (CDC, 2024-d). This scale was recoded into a new variable as a 5-point Likert scale, which included the following categories: 0 days, 1 to 5 days, 6 to 19 days, 20 to 29 days, and all 30 days. Then, question number 103 for the main predictor variable, whether or not high school students agreed or disagreed that they feel close to people at school, was converted on a 5-point Likert scale (strongly agree, agree, not sure, disagree, and strongly disagree) to be dichotomous. This new

dichotomous variable included strongly agree, agree, and not sure as the control group (Yes- Mattering) and disagree and strongly disagree as the treatment group (No- Not Mattering). The alpha was set at 0.05 and the power at 0.80.

After running frequencies, the following past 30-day EVP use parameters were established from the control group: 0 days (81%), 1-5 days (7%), 6-19 days (4%), 20-29 days (2%), and all 30 days (6%). The outcome variable parameters for the treatment group are represented as follows: 0 days (77%), 1-5 days (7%), 6-19 days (5%), 20-29 days (2%), and all 30 days (10%). Below are the results displayed for RQ1 after establishing the parameters for the past 30-day EVP use among the control (mattering) and treatment (non-mattering) groups:

Sample size: 1,449.1, Cumulative Odds Ratio- 1.29, 1.50, 1.62, 1.66, Control Mean- 0.45, Control SD- 1.08, Treatment Mean- 0.62, Treatment SD- 1.29, PBar- 79%, 7%, 4%, 2%, and 8%.

### **Threats to Validity**

Internal and external threats to validity were considered in this study. As a secondary data analysis using a cross-sectional correlation design with the 2023 MIYHS dataset, this study considered the development and selection of questions used in the survey. To reduce the burden of survey administration by schools and students, the MIYHS combined the following surveys into one comprehensive survey: The YRBS, the YTS, the Search Institute's Developmental Assets Profile Methodology, the Maine Child Health Survey, Monitoring the Future survey, and other statewide and national health surveys (MDHHS, 2024). Additionally, subject matter experts from various state

agencies and organizations provided input on selecting questions to include in the MIYHS (MDHHS, 2024).

The self-report nature of many youth-focused health surveys, such as the YRBS, poses potential validity threats. For example, a lack of understanding of the questions or terminology may lead youth to select an answer randomly or generate a nonresponse (Kooijmans et al., 2022). However, in 1999 and, more recently, in 2024, test–retest reliability studies were conducted on the YRBS to determine consistency in youth responses at two different periods (Jones et al., 2024). A test–retest study by Jones et al. (2024) found that the YRBS questions experienced between 74% and 96% reliability among the youth who participated.

### **Ethical Procedures**

The 2019 MIYHS process included obtaining passive consent by distributing survey information letters to parents via email and mail (MDHHS, 2024). This allowed parents and caregivers to learn about the survey and, if desired, opt their child out of participating. The informational letters were translated into several languages and made available to parents upon request.

Additionally, participation in the MIYHS is voluntary, and the responses are anonymous. To protect the anonymity of students, schools with fewer than 20 students could not obtain a report of their school’s specific data (MDHHS, 2024). To ensure that the survey is protective of participants, Institutional Review Board (IRB) approval was obtained from the University of Southern Maine (MDHHS, 2024).

Another consideration with youth-focused surveys is the collection of demographic data, particularly sexual orientation and gender identity. While progress has been made in including options extending beyond biological sex (i.e., male and female), some surveys do not include options for transgender, non-binary, or other terminology and gender expressions related to gender identity (Pike et al., 2023). Including these options would allow surveys to be more inclusive and provide relevant stakeholders with the information needed to address health-related issues impacting at-risk youth populations (Pike et al., 2023). The 2023 MIYHS addresses this need by including sexual orientation and gender identity questions.

### **Summary**

E-cigarette use among adolescents is a significant public health concern among this population. Intrapersonal factors, such as sexual orientation or gender identity, and interpersonal or community-level factors, such as feelings of mattering, may contribute to e-cigarette use as either protective or risk factors. This cross-sectional correlational study included a secondary data analysis utilizing the 2023 MIYHS. An ordinal logistic regression model was used to examine the association between current e-cigarette use and community mattering among high school students. To conduct this analysis, the following variables were extrapolated from the dataset, including the dependent variable (past 30-day e-cigarette use), the independent variable (community mattering), and the confounding variables (sexual orientation, gender identity, and grade level). The study design considers the validity of the dataset and potential ethical implications, such as protecting the identity of youth participants through the survey's anonymity and

exclusion of schools with fewer than 10 students. Additionally, the low cost and minor time constraints associated with this study design provided minimal impact on study completion. Section 3 includes the results and findings from this study design.

### Section 3: Presentation of the Results and Findings

#### **Introduction**

The purpose of this study was to examine the association between past 30-day e-cigarette use and community mattering among Maine high school students. This study controlled for variables such as age, gender identity, and sexual orientation to account for variables that may impact the strength of the association between the dependent variable (past 30-day e-cigarette use) and the independent variable (community mattering). The results and findings presented in this section offer a deeper insight into the association between these variables and how the findings may influence social change.

This section includes a review of the research questions and associated hypotheses, study purpose, and 2023 MIYHS data access. Additionally, results of the statistical analysis and study findings are shared.

#### **Deviation From the Plan**

The original research design included ordinal logistic regression for secondary data analysis. However, after receiving the dataset from the MDHHS and uploading the data into SPSS software, the dependent variable (past 30-day e-cigarette use) was dichotomized. The dataset provided did not meet the assumptions for ordinal logistic regression. The dependent variable, being dichotomized, met the assumption for binary logistic regression. As a result, a binary logistic regression was conducted to answer both research questions.

### **Research Questions and Hypotheses**

RQ1: What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI)?

$H_{01}$ : There is no statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI).

$H_{11}$ : There is a statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI).

RQ2: What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

$H_{02}$ : There is no statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12).

$H_{12}$ : There is a statistically significant association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12).

### **Secondary Data and Analysis**

A cross-sectional, correlational research design was used in this quantitative study to address the research questions. To assess the association between self-reported past 30-day e-cigarette use and community mattering status among Maine high school students, an analysis of secondary data from the 2023 MIYHS was conducted. The 2023 MIYHS

dataset, including the necessary variables for this study, was downloaded via a flash drive provided by the MDHHS for the purposes of this study and converted to an SPSS dataset.

This dataset contains the following variables needed for this study:

1. Dependent variable: Past 30-day e-cigarette use (students who self-reported using an EVP at least 1 day in the past 30 days)
2. Independent variable: Community mattering (students who answered that they “strongly agreed” or “agree” that they matter to people in their community)
3. Predictor variables: sex (male, female), sexual orientation (heterosexual, gay/lesbian, bisexual, questioning), gender identity (not transgender, transgender, not sure), and grade level (9 through 12)

### **Data Collection and Response Rates**

The MIYHS is a statewide survey that monitors health-related behaviors, perceptions, and beliefs of Maine middle and high school students (MDHHS, n.d.-a). The survey was distributed to participating public schools with Grades 5 through 12 from January to March of 2023 (MDHHS, n.d.-d). In total, 29,770 Maine high school students completed the 2023 MIYHS.

### **Dataset Variables and Analysis**

The 2023 MIYHS dataset provided by the MDHHS for this study was filtered and uploaded onto a flash drive to only include necessary variables, such as past 30-day e-cigarette use, whether or not youth felt as though they mattered to people in their community, also referred to in this study as the “community mattering” variable, sexual orientation, gender identity, and grade level (9–12). The dependent variable, past-30-day

e-cigarette use, was dichotomized and included respondents who answered “no” to using an e-cigarette in the past 30 days, and those who answered that they used an e-cigarette one or more times. For sexual orientation and gender identity, “do not understand question” responses were not included in the analysis.

To conduct secondary data analysis, IBM SPSS Statistics 29.0 software was used, with frequency distributions and crosstabs completed to determine significant associations between study variables.

## **Results**

This quantitative, cross-sectional study utilized a secondary data analysis to examine the association between e-cigarette use and community mattering among Maine high school students, while controlling for sexual orientation, gender identity, and grade level.

### **Frequency Distributions**

Of the valid 28,002 respondents for grade level, 8,189 were in ninth grade (27.5%), 7,838 were in 10<sup>th</sup> grade (26.3%), 6,614 were in 11<sup>th</sup> grade (22.2%), and 5,361 were in 12<sup>th</sup> grade (18%). For sexual orientation, 20,314 (68.2%) respondents identified as heterosexual, 1,138 (3.8%) identified as gay/lesbian, 3,602 (12.1%) identified as bisexual, and 1,168 (3.9%) as questioning. For gender identity, 26,105 (87.7%) respondents identified as cisgender (not transgender), 1,296 (4.4%) transgender, and 769 (2.6%) respondents were not sure if they identified as transgender. There were 13,560 (45.5%) students who agreed or strongly agreed that they mattered to people in their community, and 14,201 (47.7%) students disagreed or strongly disagreed that they

mattered to people in their community. Of the valid 27,236 respondents, 23,057 (77.5%) did not use an e-cigarette in the past 30 days, and 4,179 (14%) used an e-cigarette one or more times in the past 30 days. Frequency distribution results are presented in Table 1.

**Table 1**

*Frequency Distribution—Study Variables*

Variables	Frequency	Percentage
Sexual orientation		
Heterosexual	20,314	77.5
Gay/Lesbian	1,138	4.3
Bisexual	3,602	13.7
Questioning	1,168	4.5
Gender identity		
Transgender	1,296	4.6
Cisgender	26,105	92.7
Not sure	769	2.7
Grade level		
9	8,189	29.2
10	7,838	28
11	6,614	23.6
12	5,361	19.1
Past 30-day e-cigarette use		
Yes	4,179	15.3
No	23,057	84.7
Community mattering		
Yes	13,560	48.8
No	14,201	51.2

**Multivariate Analysis: Research Questions 1–2**

To address each research question, a binary logistic regression was conducted to analyze the relationship between the dependent variable (past 30-day e-cigarette use) and

the independent variable (community mattering) when controlling for predictor variables, such as sexual orientation, gender identity, and grade level (9–12).

### ***Research Question 1***

What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI)?

### ***Relevant Findings***

A multivariate binary logistic regression analysis was conducted to examine the association between past 30-day e-cigarette use and community mattering among Maine high school students while controlling for sexual orientation (heterosexual, gay/lesbian, bisexual, describe other way, questioning) and gender identity (transgender, cisgender, not sure if transgender). Model fit was tested for all levels of each categorical variable.

The Omnibus Test of Model Coefficients,  $\chi^2(6) = 414.93, p < .001$ , indicated statistical significance for the overall model, confirming that the predictor variables reliably distinguished between past 30-day e-cigarette use among students and those who did not use. The Hosmer–Lemeshow Goodness-of-Fit Test was not significant,  $\chi^2(3) = 4.46, p = .216$ , indicating a good model fit. Nagelkerke  $R^2$  (.032), which represents an increase in variance from the null model, indicated that approximately 3.2% of the variance in past 30-day e-cigarette use was explained by the confounding variables community mattering, sexual orientation, and gender identity. Overall classification accuracy was 85.1% with the model predicting only non-use of e-cigarettes due to an imbalance in past 30-day e-cigarette use responses.

The independent variable, community mattering, was statistically significant in association with past 30-day e-cigarette use ( $p < .001$ ). Youth who reported feeling that they mattered to people in their community had 1.84 times higher odds, Exp(B) 1.836, of reporting past 30-day e-cigarette use compared to those who did not feel as though they mattered (95% CI [1.70, 1.98]).

Sexual orientation also strongly predicted past 30-day e-cigarette use. Compared to heterosexual students, adolescents who identified as gay/lesbian had 1.45 times higher odds (95% CI [1.22, 1.74],  $p < .001$ ), and adolescents who identified as bisexual had 1.70 times higher odds (95% CI [1.53, 1.88],  $p < .001$ ) of using an e-cigarette in the past 30 days. Adolescents who identified as questioning did not demonstrate statistical significance with a  $p$ -value of .233.

The analysis showed that gender identity also strongly predicted past 30-day use. Adolescents who stated that they were unsure if they identified as transgender reported 42% lower odds of using an e-cigarette in the past 30 days in comparison to youth who identified as transgender ( $OR = 0.58$ , 95% CI [0.41, 0.82],  $p = .002$ ). When compared to transgender youth (reference group), cisgender youth did not differ significantly in their odds of e-cigarette use,  $OR = 1.07$ , Exp(B), 95% CI [0.87, 1.31],  $p = .536$ . The results of this analysis are displayed in Table 2.

**Table 2**

*Logistic Regression Predicting the Likelihood of Past 30-Day E-Cigarette Use Based on Sexual Orientation and Gender Identity*

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup>								
Mattering	0.608	0.039	239.262	1	0.000	1.836	1.700	1.983
Heterosexual			118.126	3	0.000			
Gay/Lesbian	0.375	0.091	16.758	1	0.000	1.454	1.216	1.740
Bisexual	0.528	0.051	106.577	1	0.000	1.696	1.534	1.875
Questioning	-0.118	0.099	1.425	1	0.233	0.889	0.733	1.078
Transgender			16.835	2	0.000			
Cisgender	0.065	0.105	0.384	1	0.536	1.067	0.869	1.311
Not Sure	-0.545	0.173	9.872	1	0.002	0.580	0.413	0.815
Constant	-2.230	0.110	409.809	1	0.000	0.108		

a. Variable(s) entered on step 1: Community Mattering- Percentage of students who answered "Strongly agree" or "Agree", Sexual Orientation, Gender Identity.

### ***Research Question 2***

What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?

### ***Relevant Findings***

A multivariate binary logistic regression analysis was conducted to examine the association between past 30-day e-cigarette use and community mattering among Maine high school students while controlling for grade levels 9 through 12. Model fit was tested for all grade levels.

The Omnibus Tests of Model Coefficients demonstrated statistical significance, which indicates that the predictors were able to distinguish between youth who reported on past 30-day e-cigarette use. All grade levels displayed p-values as  $p < .001$ .

- Grade 9:  $\chi^2(1) = 93.41$
- Grade 10:  $\chi^2(1) = 105.81$
- Grade 11:  $\chi^2(1) = 56.52$
- Grade 12:  $\chi^2(1) = 56.16$

The Nagelkerke  $R^2$  values ranged from .016 to .042, which explains the level of variance between the predictors and past 30-day e-cigarette use, or the null model. The Hosmer–Lemeshow Goodness of Fit test did not display results, with Chi-squares computed as .000 and degrees of freedom as 0, which is likely due to the significant imbalance in responses to the dependent variable, with a majority of respondents answering “no” to past 30-day e-cigarette use. Classification percentage accuracy ranged from 77.3% to 89.9% among each grade level, with the model predicting non-use of e-cigarettes.

Across all grade levels, whether or not youth felt as though they mattered to people in the community was a significant predictor of past 30-day e-cigarette use for all grade levels displayed,  $p < .001$ , indicating that community mattering was statistically significant and associated with past 30-day e-cigarette use. Grade levels 9 ( $p < .001$ , 95% CI [1.85-2.57]) and 10 ( $p < .001$ , 95% CI [1.8-2.39]) had slightly higher odds of use when feeling as though they mattered to people in their community than grades 11 ( $p < .001$ , 95% CI [1.47-1.94]) and 12 ( $p < .001$ , 95% CI [1.51-2.03]). These findings are presented in Table 3.

**Table 3**

*Logistic Regression Predicting Likelihood of Past 30-Day E-Cigarette Use Based on Grade Levels 9–12 and Community Mattering—Students Who Answered “Strongly Agree” or “Agree”*

Grade Level		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
·	Step 1 <sup>a</sup> Mattering	0.82	0.15	31.65	1.00	0.00	2.27	1.71	3.02
	Constant	-1.69	0.12	214.99	1.00	0.00	0.18		
9	Step 1 <sup>a</sup> Mattering	0.78	0.08	87.54	1.00	0.00	2.19	1.86	2.58
	Constant	-2.65	0.07	1493.86	1.00	0.00	0.07		
10	Step 1 <sup>a</sup> Mattering	0.73	0.07	100.88	1.00	0.00	2.08	1.80	2.39
	Constant	-2.23	0.06	1462.45	1.00	0.00	0.11		
11	Step 1 <sup>a</sup> Mattering	0.53	0.07	55.31	1.00	0.00	1.69	1.47	1.95
	Constant	-1.84	0.05	1133.46	1.00	0.00	0.16		
12	Step 1 <sup>a</sup> Mattering	0.56	0.08	55.29	1.00	0.00	1.75	1.51	2.03
	Constant	-1.72	0.06	923.88	1.00	0.00	0.18		

a. Variable(s) entered on step 1: Community Mattering- Percentage of students who answered "Strongly agree" or "Agree".

### Summary

This study included two research questions that established past 30-day use as the dependent variable, community mattering as the independent variable, and sexual orientation, gender identity, and grade level as predictor variables. A multivariate analysis using binary logistic regression was used to examine the strength of association between the dependent and independent variables while accounting for the predictors. Overall, each research question demonstrated statistical significance, indicating that community mattering is strongly associated with past 30-day e-cigarette use, with higher or lower odds predicted depending on confounding variables.

For research question 1, “What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for sexual orientation and gender identity (SOGI)?”, the analysis revealed a statistically significant association between community mattering and past 30-day e-cigarette use, with youth who reported feeling as though they matter to people in their community having 1.84 higher odds of past 30-day use. Additionally, sexual orientation and gender identity were statistically significant. Compared to youth who identified as transgender, youth who were questioning their gender identity had 42% lower odds of past 30-day e-cigarette use. Therefore, the null hypothesis for this research question is rejected.

For research question 2, “What is the association between community mattering and e-cigarette use among Maine adolescents when controlling for grade level (9–12)?”, the analysis showed statistical significance between community mattering and past 30-day 3-cigarette use. The model was run for all grade levels (9–12), with all grade levels showing statistical significance. While Grades 9 and 10 grade showed the highest odds of past 30-day use when indicating that they feel as though they matter to people in their community, all grade levels demonstrated a positive association. Based on this analysis, the null hypothesis for research question 2 is rejected.

E-cigarette use is a risky health behavior experienced by different populations of Maine adolescents. The purpose of this analysis was to examine the association between past 30-day e-cigarette use and community mattering while studying the relationship between the variables that either increase or decrease the strength of that association.

Section 4 will include a summary and interpretation of the key findings, study limitations, and implications for professional practice and social change.

## Section 4: Application to Professional Practice and Implications for Social Change

### **Introduction**

E-cigarette use among adolescents is a significant public health issue. In Maine, approximately 15.6% of high school students used an EVP at least once in the past 30 days. These products, which can contain substances such as nicotine or cannabis, pose significant adverse health effects, making their use during a critical period of development among youth concerning. The purpose of this quantitative study was to examine the association between past 30-day e-cigarette use among Maine high school students and whether or not they agreed that they mattered to people in their community while controlling for sociodemographic variables, such as sexual orientation, gender identity, and grade level.

A cross-sectional research design utilizing the 2023 MIYHS data was used to explore the research questions that guided this study. The 2023 MIYHS included the necessary variables needed to address the research questions, such as:

- Dependent variable: Past 30-day e-cigarette use (self-reported past 30-day use).
- Independent variable: Community mattering (students who either agreed or disagreed that they mattered to people in their community).
- Control variables: sexual orientation (heterosexual, gay/lesbian, bisexual, questioning), gender identity (cisgender, transgender, unsure of identity), and grade level (9–12).

This section provides a summary of the study results, limitations, recommendations based on findings, and implications for professional practice and social change.

### **Summarization of Key Findings**

The data set used for this study included the variables of past 30-day e-cigarette use, community mattering, sexual orientation, gender identity, and grade level. Missing variables were not included in the analysis. Additionally, the response for the variables sexual orientation and gender identity, “do not understand the question,” were excluded from the analysis.

Frequency distributions were conducted for all study variables. Of the valid 28,002 respondents for grade level, 27.5% were in ninth grade, 26.3% in 10<sup>th</sup> grade, 22.2% in 11<sup>th</sup> grade, and 18% in 12<sup>th</sup> grade. For sexual orientation, 68.2% respondents identified as heterosexual, 3.8% identified as gay/lesbian, 12.1% identified as bisexual, and 3.9% as questioning. For gender identity, 87.7% respondents identified as cisgender, 4.4% transgender, and 2.6% were not sure if they identified as transgender. For community mattering, 45.5% of students agreed or strongly agreed that they mattered to people in their community and 47.7% of students disagreed or strongly disagreed that they mattered to people in their community. Of the valid 27,236 respondents for past 30 days e-cigarette use, 77.5% did not use an e-cigarette and 14% used an e-cigarette one or more times in the past 30 days.

To address the research questions, a multivariate analysis using binary logistic regression was conducted to examine associations between the dependent variable (past 30 day e-cigarette use) and the independent and predictor variables. The analysis

determined a significant association between past 30-day e-cigarette use and community mattering, with having used an e-cigarette and feeling as though they matter to people in the community being positively associated.

When controlling for sexual orientation and gender identity, the results found that in comparison to heterosexual students, youth who identified as gay/lesbian or bisexual were 1.45 or 1.70 times more likely to use an e-cigarette in the past 30 days if they felt as though they mattered to people in the community. There was no statistical significance between youth who identified as questioning and past 30-day e-cigarette use. When examining associations between e-cigarette use and community mattering, gender identity also demonstrated statistical significance. When compared to transgender youth, cisgender youth did not differ significantly in their odds of past 30 day e-cigarette use. However, youth who were unsure of their gender identity had 42% lower odds of past 30 day e-cigarette use in comparison to transgender youth. With sexual orientation and gender identity statistically significant, the null hypothesis for research question 1 was rejected.

When controlling for grade levels 9 through 12, across all grade levels, community mattering was a significant predictor of past 30-day e-cigarette use. Grade levels 9 and 10 had slightly higher odds ( $p < .001$ , 95% CI [1.8-2.57]) of use when feeling as though they mattered to people in their community than grades 11 and 12 ( $p < .001$ , 95% CI [1.47-2.03]). Based on these results, the null for research question 2 was rejected.

## **Interpretation of The Findings**

Many researchers have explored the relationship between e-cigarettes among adolescents in the United States and risk and protective factors, such as interpersonal relationships, or the relationship between youth and their families or peers (Abadi et al., 2022; Awad et al., 2024; Azagba et al., 2025; Fortier et al., 2022; Guerra Castillo et al., 2025; Han & Son, 2022; Hesse & Fite, 2024; Kwon et al., 2018; McCausland et al., 2024; Steeger et al., 2025; Tilton et al., 2023; Villanueva-Blasco et al., 2025; Wang et al., 2022). Additionally, the feelings of mattering, or being valued and bringing value to others, has also been a focus for some researchers, especially its connection to mental health (Dyrendahl et al., 2025; Flett, 2024; Flett et al., 2022; Paradisi et al., 2024). However, it is not well documented the connection between feelings of mattering to people in the community and adolescent e-cigarette use, especially when considering sociodemographic factors such as sexual orientation, gender identity, and grade level. Using data from the 2023 MIYHS, this study reported the associations between past 30-day e-cigarette use and community mattering among Maine adolescents while considering these sociodemographic factors.

### **Relevant Associations Between Variables**

In this study, a multivariate analysis using binary logistic regression was used to evaluate associations between e-cigarette use and feelings of mattering to people in the community among Maine adolescents while controlling for sociodemographic variables such as sexual orientation, gender identity, and grade level. A significant relationship was identified between past 30-day e-cigarette use and community mattering and all control

variables. The binary logistic regression revealed that gay/lesbian youth had 1.45 times higher odds and bisexual youth had 1.70 times higher odds of past 30-day e-cigarette use compared to heterosexual youth when they felt they mattered to people in their community. While cisgender and transgender youth did not differ significantly in their odds of past 30-day e-cigarette use, youth who were unsure of their gender identity had 42% lower odds of past 30-day e-cigarette use in comparison to transgender youth. While Azagba et al. (2025) explored associations between e-cigarette use and sexual and gender identities among adolescents, little to no research has explored their connection in the context of community mattering.

### **Limitations**

When considering these results, several limitations should be considered. First, as the 2023 MIYHS includes self-reported health behavior data, such as past 30-day e-cigarette use, it may be subject to some biases, such as social desirability and recall (Azagba et al., 2025; Tilton et al., 2023). Second, while the 2023 MIYHS is considered representative of Maine's youth population, it was only conducted in public and quasi-public schools. Students attending private schools, semi-private schools, or who were homeschooled were not included in the survey. Additionally, the only youth population included in this study was in high school and who were not opted out by parents and guardians to participate in the MIYHS, meaning the findings would not be generalizable to all adolescent populations (Ramirez et al., 2024; Tilton et al., 2023). It is also important to note that missing data and some survey responses, such as "do not understand the question," were not included in the analysis. Additionally, not all

sociodemographic variables were included in this study (e.g., sex, socioeconomic status, race, and ethnicity), which means this study could not account for other factors that may influence e-cigarette use or mattering among this population. Thirdly, the MIYHS, a cross-sectional survey, cannot determine causality between variables, nor can it account for longitudinal changes in adolescent health behaviors (Awad et al., 2024; Tilton et al., 2023).

Finally, while e-cigarettes were a focus of this study, it did not consider the substances used within these devices. For example, one of the questions asked within the 2023 MIYHS is, “The last time you used an electronic vapor product, what was in the vapor you inhaled?” (MDHHS, 2023). Survey respondents could select from nicotine, just flavoring, not sure, marijuana, THC, hash oil, or that they have never vaped (MDHHS, 2023). It is not clear whether the substance used within the e-cigarettes may impact the relationship between past 30-day e-cigarette use and community mattering among adolescents.

### **Recommendations**

This study’s findings provided insight into the association between e-cigarette use and community mattering while accounting for factors that influence the strength of their association. Future studies can further explore this relationship by examining other protective and risk factors that exist within each level of the SEM. For example, the MIYHS includes questions to collect data on youth experiences at school related to peer and staff connection, bullying and violence, and policy enforcement. Additionally, substance use, mental health, parental monitoring, and other risky health behaviors are

also assessed within the survey. Any of these factors may influence adolescent e-cigarette use or impact feelings of mattering. For example, Awad et al. (2024) conducted a meta-analysis of the literature and found that mental health conditions, such as depression, anxiety, and suicidal ideation, were associated with e-cigarette use among youth. Future studies can further explore how mental health may impact feelings of mattering and e-cigarette use.

Additionally, qualitative insights into the concept of community mattering among adolescents should be explored. Barron (2022) explored how adolescents' exclusion from public and private realms impacted their sense of community. In this case, community was more broadly used in reference to locations within an area or region that contained public and private spaces that were accessible or non-accessible to youth. The study by Barron noted that spaces often designated for youth use are often developed by adults and their perception of what youth may want, like, or need, without input from young people. Future studies should explore mattering and youth perception and beliefs regarding community, especially among more marginalized and vulnerable populations of youth.

Finally, as the MIYHS is a cross-sectional biennial survey of health behaviors and trends among middle and high school youth, it is unable to determine long-term trends in e-cigarette use and behaviors. Future studies can explore long-term trends in e-cigarette use and mattering among different populations of youth, including sociodemographic variables and other health risk behaviors not used in this study, such as race, ethnicity, socioeconomic status, mental health, and other substance use.

### **Implications for Professional Practice and Social Change**

While studies have focused on e-cigarette use among adolescents, the theory of mattering, and the mediating role of identity and other sociodemographic factors on adolescent health behaviors, few researchers have explored the association between mattering on the community level and adolescent e-cigarette use. This study is unique in that it addresses this gap while exploring factors, such as sexual orientation, gender identity, and grade level, that may influence the relationship between e-cigarette use and community mattering. The findings from this study provide implications for professional practice in public health and positive social change.

The implications for public health practice outlined below encompass a combination of strategies derived from the results of the literature review, the theoretical foundation that guided this study, and the findings. A policy memo brief (see Appendix A) provides an overview of current strategies, recommendations, and constituencies for adolescent e-cigarette prevention. Additionally, a community health intervention plan (see Appendix B) was developed to guide the implementation of recommendations highlighted in the policy memo brief.

#### **Implications for Professional Practice**

This study provided deeper insight into the association between past 30-day e-cigarette use and community mattering among adolescents. Additionally, it accounted for factors that may influence this association, such as sexual orientation, gender identity, and grade level. While mattering is considered a protective factor against poor mental health, this study found that youth who felt as though they mattered to people in their

community were more likely to report past 30-day e-cigarette use than youth who did not feel as though they mattered. It is possible that where vaping is largely considered a social activity or behavior among adolescents, it may play a role in the sense of community and mattering with youth (Scheffels et al., 2023; Valente et al., 2023). The findings from this study highlight the need for public health practices and strategies to account for the social aspect of e-cigarette use among youth populations, while considering a multi-pronged approach to mattering.

### **Implications for Positive Social Change**

The findings from this study have the potential to elicit positive social change by addressing a critical gap in the literature related to the interplay of intrapersonal, interpersonal, and community-level factors that contribute to e-cigarette use among youth. This addition to the literature will help public health practitioners and other stakeholders to identify appropriate public health strategies and interventions to prevent or reduce the initiation of e-cigarette use among adolescents. Additionally, this study provided insight into different populations of youth who may experience mattering or e-cigarette use at higher or lower rates in comparison to other youth. This insight could assist public health practitioners in tailoring interventions to reach populations disproportionately impacted by e-cigarette use.

Additionally, the findings suggest that solely addressing mattering as a protective factor against e-cigarette use among youth may not be enough to prevent or mitigate the effects of this behavior. Valente et al. (2023) and Scheffels et al. (2023) noted the inherently social aspect of vaping among youth and suggested that environmental policies

aimed at addressing the social networking nature of e-cigarette use be a strategy for prevention. For example, Lockett et al. (2024) assessed the knowledge, behaviors, and attitudes of youth, school personnel, and parents regarding vaping and noted that social connection played a large role in its use. Based on their findings, Lockett et al. suggested that comprehensive prevention strategies that address social norms and influence within youth communities may impact youth use rates.

Finally, the data from this study could be used to inform local, state, or national policy that directly impacts adolescent e-cigarette use. As indicated in studies by Valente et al. (2023) and Scheffels et al. (2023), the social aspect of vaping may be a large contributing factor to adolescent e-cigarette initiation and continued use. Although it has not been fully explored, the concept of community may be linked to social interactions of youth, whether that is at school or within other public or private spaces. Policies established and enforced by these settings may directly or indirectly impact adolescent e-cigarette use. For example, Scheffels et al. found that e-cigarette sales restrictions and bans on use in public spaces may have generated lower prevalence of youth e-cigarette use in Nordic countries. A similar approach in other locations, such as in Maine or nationally, may hold similar results, especially given the association between community mattering and e-cigarette use.

### **Conclusion**

E-cigarette use is a risky health behavior prevalent among high school-aged youth in Maine. The rate of use among youth is concerning, given the potential for adverse health effects and social outcomes. When comparing subpopulations of youth, youth who

identify as LGBTQ+ have higher rates of substance use and lower rates of community mattering than their non-LGBTQ+ peers. Additionally, youth from different grade levels also experience varying rates of mattering and e-cigarette use. As a result, prevention strategies aimed at different age groups and identities have been implemented over the years in an attempt to reduce the prevalence of e-cigarette use among the youth population. Unfortunately, few studies or strategies have focused on the connection between protective factors such as mattering and e-cigarette use, particularly among different subpopulations and grade levels. This study expanded the current literature by examining the association between a community-level protective factor, mattering, and e-cigarette use while controlling for sexual orientation, gender identity, and grade level. The results from this study found that youth who felt as though they mattered to people in their community had higher odds of past 30-day e-cigarette use than youth who felt as though they did not matter. The results from this study can be used by public health practitioners and other relevant stakeholders to identify and implement comprehensive, evidence-based strategies that address e-cigarette prevention among youth. Additionally, the data from this study could provide a foundation for future studies that explore the concept of community mattering and its impact on adolescent e-cigarette use and other risky health behaviors.

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## Appendix A: E-Cigarettes and Adolescents: A Policy Memo Brief

### **Introduction**

E-cigarettes are a tobacco product that may contain nicotine or cannabis. The chemicals and matter present in these products pose a significant risk for adverse physical or mental health outcomes (CDC, 2024; Fiegel & Frank, 2023). Despite progress made to reduce tobacco use among adolescents, e-cigarettes are poised to reverse decades of progress made to reduce overall tobacco product use among this population.

### **Scope of the Problem**

In the United States, approximately 5.9% of middle and high school students currently use an e-cigarette (CDC, 2024). Some populations at youth, such as LGBTQ+, have even higher rates of use (McCauley et al, 2024). The use of these products is a significant concern, considering that adolescence is a critical time for brain development (Awad et al, 2024; Fiegel & Frank, 2023).

### **Current Approaches and Proposed Program**

Current strategies for reducing youth tobacco use include raising the legal age to purchase tobacco products, increasing the cost, implementing smoke-free policies, and mass-reach health communication campaigns (CDC, 2014). However, many of these strategies need to consider subpopulations of youth and protective factors. Addressing a combination of risk and protective factors associated with e-cigarette use on different levels of influence is essential for youth e-cigarette prevention programs. Strategies may include evidence-based practices, such as implementing policies, addressing social norms, and providing individual and interpersonal education and skill-building.

### **Major Constituencies**

Public health professionals, policymakers, community members, and youth must collaborate to implement comprehensive, evidence-based strategies that address risk and protective factors, while tailoring these strategies to meet the needs of young people.

### **Conclusions**

E-cigarette use among youth is a significant public health issue, with the potential to cause numerous adverse effects. E-cigarettes pose a unique challenge to the regulatory and social landscape. Programs should be tailored to the youth and their unique backgrounds and experiences, incorporating strategies that address both risk and protective factors.

## Appendix B: Impacting Youth E-Cigarette Use: A Comprehensive Approach Using the Socioecological Model

### **Problem Definition:**

In the United States, approximately 5.9% of middle and high school students use e-cigarettes. These devices can contain nicotine or cannabis, which may interfere with healthy brain development and increase the risk of addiction. Factors contributing to e-cigarette use among this population include a combination of intrapersonal, interpersonal, community, and environmental factors. Examples of these include mental health conditions, peer and/or familial use, community and social norms, and access to products.

### **Goal Setting:**

Goal 1: By December 31, 2026, establish a mass-reach health communication campaign promoting healthy social norms.

Goal 2: By June 30, 2027, reduce by 20% the number of youth who report that e-cigarettes are easy to get.

Goal 3: By December 31, 2027, reduce by 10% the number of youth who used an e-cigarette at least once in the past 30 days.

### **Target Population:**

The target population for this intervention primarily consists of middle and high school-aged youth. As some subpopulations of youth are disproportionately impacted by tobacco and e-cigarette use, such as those who identify as sexual or gender minorities, these interventions will be tailored to meet the unique experiences and identities of these youth.

### **Intervention Strategies:**

1. Provide education and training for school staff and other relevant stakeholders on Positive Youth Development (PYD) and other frameworks that support youth and adult connections and relationships.
2. Establish policies that prohibit tobacco (including e-cigarettes) and other substance use in settings where youth may be present.
3. Partner with youth (ages 13-18) to establish a mass-reach health communications campaign that includes promoting healthy social norms.
4. In partnership with local and state government, establish policies and local ordinances that restrict youth-focused e-cigarette marketing and flavored tobacco products.
5. Implement evidence-based tobacco prevention programs that are tailored to subpopulations of youth in schools and other youth-serving organizations.

**Implementation Plan:****Timeline**

- 2025: Conduct youth and partner listening sessions and surveys to identify perceptions of e-cigarette use and identify strategies.
- 2026: Develop and launch mass-reach health communication campaigns tailored to youth subpopulations. Additionally, collaborate with local and statewide decision-makers and stakeholders to implement evidence-based tobacco prevention programming and policies.
- 2027: Evaluate outcomes and share results locally and nationally.

**Resources**

- Individuals carrying out intervention strategies, including partners such as schools, municipalities, and decision-makers.
- Funding for materials, stipends for youth involvement in planning, communications, and staff time.
- Printing and media (e.g., radio, television, social media) for mass-reach health messaging campaigns.

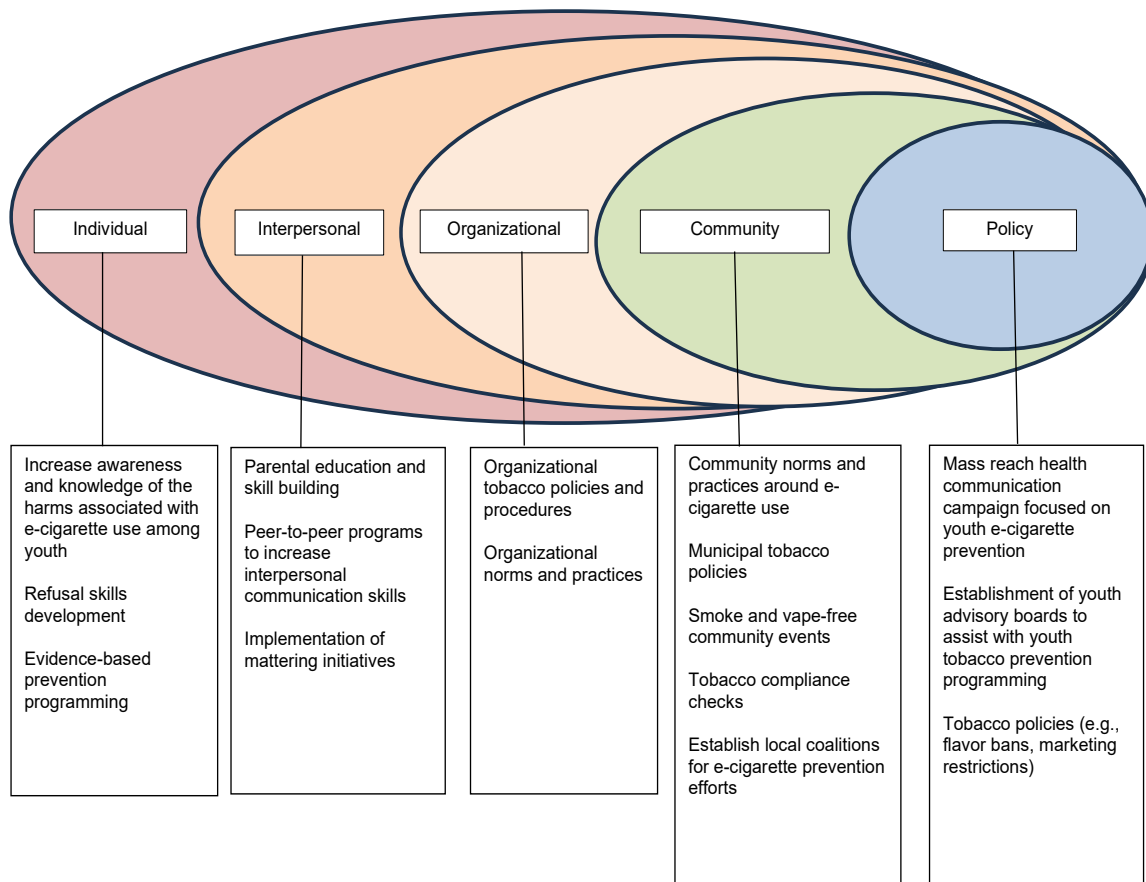
**Roles and Responsibilities**

- Public health and prevention professionals: Oversee implementation, partnership development, and reporting.
- Youth (ages 13-18): Co-design activities, lead campaigns, and provide peer input.
- School and community stakeholders: Host events, support data collection, and promote engagement.
- Local and state policymakers: Supports overall implementation of policies and practices.
- Evaluator: Track progress and outcomes related to the community health intervention plan.





**Evaluation Plan:**

The evaluation plan will utilize a mixed-methods approach. Quantitative measures will include youth and stakeholder surveys, as well as campaign reach metrics. Qualitative measures will include key informant interviews and focus groups with youth and partners. These measures will assess the community and social norms and behaviors regarding e-cigarette use as the intervention is implemented. Additionally, the evaluation will track the implementation of health messaging campaigns, monitor trends in youth e-cigarette use over time, and collect self-report data on the ease of access to tobacco products to track progress toward goal completion.

## Appendix C: Visual Representation of the Intervention Framework



## Appendix D: Youth and E-Cigarettes Factsheet

	<p>An overview:</p> <h2>Youth &amp; E-Cigarettes</h2>
	<h3>Background of Problem</h3> <p>E-cigarettes are a tobacco product first introduced in the United States in the late 2000s. These products contain a substance, such as nicotine or cannabis, that is heated into an aerosol that the user inhales. The chemicals present in the aerosol, such as heavy metals, nicotine or cannabis, flavorings, and fine particulate matter, pose a significant risk for adverse physical or mental health outcomes. Despite progress made to reduce tobacco use among adolescents, e-cigarettes are poised to reverse decades of progress made to reduce overall tobacco product use among this population.</p> <h3>Scope of the Problem</h3> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>7.9% of middle and high school students currently use an e-cigarette</p> </div> <div style="text-align: center;">  <p>Subpopulations of youth, such as LGBTQ+ youth, have higher rates of e-cigarette use</p> </div> <div style="text-align: center;">  <p>Vaping may interfere with healthy brain development, leading to problems with memory, impulse control, and learning</p> </div> </div>
	<h3>What Can Be Done?</h3> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <h4>Individual &amp; Interpersonal Strategies</h4> <ul style="list-style-type: none"> <li>• A combination of education and skill-building (e.g., communication)</li> <li>• Evidence-based prevention programming in schools and youth-serving organizations</li> </ul> <h4>Organizational &amp; Community-Level Strategies</h4> <ul style="list-style-type: none"> <li>• Policies and practices that prohibit tobacco &amp; e-cigarette use</li> <li>• Retail tobacco compliance checks</li> <li>• Smoke/vape-free community events</li> </ul> <h4>Environmental Strategies</h4> <ul style="list-style-type: none"> <li>• E-cigarette marketing restrictions</li> <li>• Mass-reach health communications campaigns</li> <li>• Prohibiting the sale of flavored tobacco products</li> <li>• Establishing youth advisory boards to assist with youth tobacco prevention</li> </ul> </div> <div style="width: 35%; text-align: center;">  </div> </div> <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <h3>Factors Contributing to Adolescent E-Cigarette Use</h3> <ul style="list-style-type: none"> <li>• E-cigarette marketing targeted to youth</li> <li>• Peer and familial tobacco use</li> <li>• Community and social norms favorable to e-cigarette use</li> <li>• Lack of knowledge and awareness of the harms associated with e-cigarettes</li> <li>• Lack of mattering on the interpersonal and community levels.</li> <li>• Availability of and easy access to tobacco products</li> </ul> </div>