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Understanding the Relationship Between How the Availability of Vaping Devices and Student Use Are Related: A Quantitative Study

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UNDERSTANDING THE RELATIONSHIP BETWEEN HOW THE AVAILABILITY OF VAPING DEVICES AND STUDENT USE ARE RELATED: A QUANTITATIVE STUDY

By

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Dedication

I am dedicating this dissertation to my family. You all have offered unwavering support through this journey. I hope the sacrifices you have endured when I was distracted and distant while pursing my dream will encourage you to dream big and strive for success in your future. My love for all three of you is immeasurable!

To my husband, Tim, who has always supported my educational endeavors and served as a sounding board to work through the stressful eras of being a graduate student, wife, mother, daughter, friend, and educational administrator.

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As I am able to celebrate the end of this journey, let it serve as a model of my favorite Bible verse: “I can do all things through Christ which strengthen me.” Philippians 4:13 (King James Version)

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ABSTRACT

Understanding The Relationship Between How the Availability Of Vaping Devices and Student Use Are Related: A Quantitative Study

Felicia L. Owen

The number of teens in Arkansas who are vaping continues to increase despite state and national laws and regulations. The availability of vaping devices to teens continues to occur; but limited research is available that explores if the availability is accessible through peers, families, or community members, or is self-sought. It is crucial to gain a better understanding of why vaping continues to increase among high school students in Arkansas. The purpose of this study is to understand the relationship between how the availability of vaping devices and student use are related. The analysis of exposure and student use varies by demographics, personal beliefs, and access on school campus, at school activities, in the home, or through peers will also be studied. The findings will report the demographic relationships between gender, grade, race, and access groups in relation to use and exposure. The data describing how the availability of vaping devices and student use are related will provide knowledge to educators, families, and students with the potential to provide Arkansas schools with valuable information. Gaining insights into availability and the student use relationships can allow school leaders to develop vaping-related education and prevention strategies as well as develop procedures and policies to reduce use at school and school related activities.

Keywords: vaping, vaping devices, availability, exposure, student use

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CHAPTER I

INTRODUCTION

According to the Centers for Disease Control and Prevention (CDC, 2022), studies show that large numbers of youth in the United States (U.S.) reported using e-cigarettes. With just over 14% of high school students throughout the nation having reported throughout the nation using e-cigarettes, this trend is impacting public schools across the country (CDC, 2022). In 2019, the CDC reported that 44% of high school seniors have used e-cigarettes at least once with 20% reporting they use the devices regularly (Mackay, 2019). This study will seek to understand the relationship between how the availability of vaping devices and student use are related. This chapter will outline the background and statement of the problem, purpose of the study, define key terms, and list the research questions for the study. The significance of the study, assumptions, limitations, delimitations, and organizational of the study will follow the research questions and conclude the introductory chapter.

Background and Statement of the Problem

Vaping is on the rise in Arkansas public schools according to the 2021 Arkansas Prevention Needs Assessment (APNA) Student Survey (Arkansas Department of Human Services, 2021). The 2022 APNA survey shows that 19% of students in grade 8, 10, and 12 reported “any vaping” (p. 13) related behaviors; this has increased by 0.9% since 2020 (Arkansas Department of Human Services, 2021). Looking at seniors only, more than half of those surveyed reported that vaping liquids and devices were obtained easily (Arkansas Department of Human Services, 2021). The Arkansas Department of Health is working with lawmakers to put an end to teen vaping in the state (Mackay, 2019).

To prevent the youth in Arkansas from vaping, the Arkansas Attorney General's office has a Youth Vaping Initiative (Attorney General of Arkansas, 2023). In 2019, the age to purchase tobacco, including e-cigarettes and vaping related materials, was raised to 21 in the State of Arkansas (ACT 580, 2019). This state-wide change followed national legislation signed into law at the end of 2019 known as the "Tobacco 21" law, which raised the federal minimum age for sale of tobacco products to 21 years of age from the previous age requirement of 18 (U.S. Food and Drug Administration, 2021). Although the law prohibits sales to persons under the age of 18, in February 2023, the American Lung Association reported Arkansas as failing regarding cessation and tobacco prevention, with 19.6% of high school students reporting use of electronic vaping devices (Montgomery, 2023). According to the Arkansas Department of Health (2020) website, investigations regarding vaping-related lung illnesses are underway with eight confirmed cases in the state.

With the number of teens vaping in Arkansas increasing, specific research is needed to understand the availability of devices, peer pressure to use the devices, and students' beliefs regarding health risks. It is vital to gain a better understanding of how the availability and use of vaping devices are related between teens and their peers and/or family members. More information is also needed to determine the relationship between how the availability of and access to vaping devices relates to student use.

Purpose of the Study

The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. This quantitative study is correlational and will explore two variables of interest – V_1: student exposure to vaping

devices and V_2: student use of vaping devices. The study examined if exposure and student use vary by demographics, personal beliefs, and access on school campus, at school activities, in the home, or through peers. The independent variables used to explore the demographic relationships will be gender, grade, race, and access group; the dependent variables will be use and exposure.

Definition of Terms

The following definitions are given to provide consistent clarity and aid in understanding key terms used within the context of this study:

- **Access/Availability:** the ability to purchase or acquire vaping devices from others.
- **Adolescents:** children between the ages of 10-19 (World Health Organization, 2023).
- **Aerosolized Vapor:** battery powered liquid that delivers nicotine when inhaled (Schmidt, 2020).
- **Cartridges:** (referred to as carts) refillable storage tank for containing vaping liquids (Schmidt, 2020).
- **Cessation:** temporary or final ceasing of an action (Merriam-Webster, n.d.a).
- **Cigar:** combustible tobacco wrapped in a tobacco leaf (Centers for Disease Control, 2023a).
- **Cigarettes:** combustible tobacco wrapped in paper (Schmidt, 2020).
- **Cost:** financial expense of obtaining vaping devices.
- **Combustion:** the act of burning (Merriam-Webster, n.d.b).

- **Electronic Cigarettes (e-cigarettes):** devices that are battery operated using solution cartridges heated for inhaling (Okonkwo, 2021).
- **Exposure:** the act of seeing vaping devices being used or in the possession of others.
- **High school students:** students attending traditional public school in grades 9-12.
- **Inhale:** to breathe in (Schmidt, 2020).
- **Marijuana:** the dried leaves from a cannabis plant that contains the mind-altering chemical, THC (National Institute on Drug Abuse (NIDA), 2020).
- **Marijuana vaping:** the use of vaporizers to inhale THC and/or a liquid marijuana extract (NIDA, 2020b).
- **Mods:** refillable storage unit that holds vaping liquids with adjustable voltage for a customizable experience (Schmidt, 2020).
- **Nicotine:** an addictive substance that absorbs into the blood and acts as a stimulus (NIDA, 2021).
- **Pods:** disposable, pre-filled unit that holds vaping liquids (Polosa et al., 2022).
- **Smoking:** burning tobacco products (NIDA, 2021).
- **Student Use:** the act of using a vaping device.
- **Tanks:** refillable storage unit that holds vaping liquids (Polosa et al., 2022).
- **Teens:** defined as humans between the ages of 13-19 (Merriam-Webster, n.d.c).
- **Tetrahydrocannabinol (THC):** chemical found in cannabis (NIDA, 2020b).
- **Tobacco:** a plant grown for the leaves which contain nicotine and is used by burning it (NIDA, 2021)

- **Vaping:** the use of electronic devices that provide an alternative to regular cigarettes for nicotine delivery (Douglass & Solecki, 2017).
- **Vaping Devices:** also known as electronic cigarettes (e-cigarettes) (Okonkwo, 2021).
- **Vaping Liquids:** also called e-liquid or e-juice stored in a cartridge or pod; may contain nicotine, flavorings, THC, and/or other chemicals (NIDA, 2021).
- **Youth:** age span 15-24 years (World Health Organization, 2023).

Research Questions

The following research questions will be explored in this study:

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?

RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?

RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?

RQ4: How do vaping use and exposure vary by student demographics?

Significance of the Study

The study of the relationship between how the availability of vaping devices and student use are related will provide knowledge to educators, families, students, and lawmakers. The results of this study may provide Arkansas schools with data that can assist in policy and procedure development for implementation of vaping-related education and prevention efforts. Providing the results to local and state lawmakers may provide insights to officials and assist with policy improvements that reduce access to

youth in Arkansas. Furthermore, the study will explore if a relationship exists between student exposure to vaping devices at school and/or home and student use of vaping devices. Additionally, this study may provide useful information that could help public schools within the State of Arkansas.

Assumptions

This quantitative study will collect data through the form of self-reported surveys. It is assumed that participants in the study will provide honest and expressive answers. Also, the assumption is that the school and students participating in the study are representative of the State of Arkansas.

Limitations

Using a quantitative approach, the study was conducted in Arkansas public high schools, in a limited number of districts throughout the 2023-2024 school year. The participants will self-report their knowledge, exposure, and experiences related to teen vaping at school, home, and in the community. The relationship between how the availability of vaping devices and student use are related may or may not be clear due to the length of time for collecting responses and the validity of self-reported data. The geographic location of public schools in Arkansas will limit generalizations due to the diverse community and school demographics throughout the state and nation.

Delimitations

Delimitations of the study include the number of participating Arkansas public high schools, which will limit the number of overall participants. The geographic location (within the State of Arkansas) combined with the length of the study (two to three weeks) are also delimitations. Conclusively, the researcher is a building administrator at an

Arkansas public high school and observes, monitors, and issues consequences with vaping-related incidents frequently.

Organization of the Study

In this quantitative study, the first chapter will include the background and statement of the problem, purpose of the study, definition of key terms, significance of the study, assumptions, limitations, and delimitations. The second chapter will contain a literature review regarding vaping, vaping in schools, vaping in schools in Arkansas, and the theoretical perspective. The following chapter will describe the methodology of this quantitative study including the research design and survey instrument details. The analysis of the collected data will comprise the fourth chapter. Lastly, chapter five will include a summary of the results, conclusion, and implications for future research.

CHAPTER II

LITERATURE REVIEW

This chapter provides background information and outlines existing literature regarding the research topic. The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. This study examined vaping use with regard to students' demographics, personal beliefs, and access to devices on school campus, at school activities, in the home, or through peers.

The literature review is organized around three major themes: a) vaping, b) vaping in schools, and c) vaping in schools in Arkansas. Within the themes, vaping is described, laws and regulations are explained, and the availability of devices and health risks to teens are clarified. In addition, a theoretical perspective is defined.

Vaping

Vaping is the use of electronic devices that provide an alternative to regular cigarettes for nicotine delivery (Douglass & Solecki, 2017). The practice of vaping has been increasing among high school students in the U.S., and the availability through social media advertising links is a reason some youth experiment with vaping (Santistevan, 2016). The Centers for Disease Control (CDC; 2022) reports that large numbers of youth in the U.S. are vaping. Arkansas public schools conduct the Arkansas Prevention Needs Assessment (APNA) with students annually, and results show an increase in teen vaping continues to occur each year (Arkansas Department of Human Services, 2021). Despite these trends, limited research has been conducted to explore the relationship between how the availability of vaping devices and student use are related.

What is Vaping?

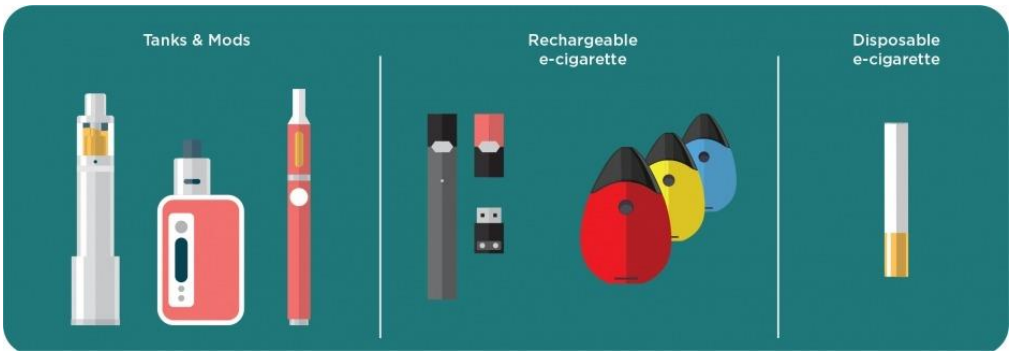
In recent years, traditional tobacco use and the enjoyment of cigarettes have decreased across the nation (Hudson, 2023). The idea of replacing traditional cigarettes with a safer and "harmless" (p. 24) method was patented by Herbert Gilbert in 1965; this became known as the e-cigarette (Douglass & Solecki, 2017). Newer models of e-cigarettes have been modernized and are known today as "personal vaporizers" (p. 24) or vaping devices (Douglass & Solecki, 2017). The use of a vape, also known as an e-cigarette, is the practice of using an electronic nicotine delivery system that is battery-operated and delivers an inhalable vapor (Santistevan, 2016). The popularity of vaping started with traditional cigarette users looking for ways to stop smoking, and vaping was being marketed as a safer alternative (Hudson, 2023).

Vaping devices are small and created to provide the simulation of a traditional cigarette or cigar; but rather than the traditional combustible process which produces smoke, the vape uses an aerosolized vapor (Hudson, 2023). Through the vaping process, the liquid is vaporized using a heating element and is inhaled, which then allows the user to release puffs of vapor back into the air (Hudson, 2023). There are three main types of e-cigarette devices: 1) disposable; 2) reusable with refillable tanks or mods; 3) reusable with attached pods or cartridges (referred to as carts) (Polosa et al., 2022). The refillable tanks or mods are the part of the e-cigarette that holds the e-liquid, which is added by the consumer (Polosa et al., 2022). The pods or carts attach to a reusable e-cigarette and are purchased with the liquid already inside (Polosa et al., 2022). Some vaping devices look like traditional tobacco cigarettes while others look like everyday items such as pens,

highlighters, or USB (universal serial bus) memory sticks (National Institute on Drug Abuse, 2020a; see Figure 1).

Figure 1

E-Cigarette Device Images



Note. National Institute on Drug Abuse, 2020a.

Between 2011 and 2013, marketing campaigns for vaping and vaping products focused on youth through a plethora of internet outlets that included social media; television advertisements for vaping also significantly increased (Douglass & Solecki, 2017). Vaping products were described as containing a variety of flavorings with appealing taste options in the marketing campaigns (Douglass & Solecki, 2017). As the popularity of vaping increased in youth, reasons for vaping have been described as experimental in order to experience the taste or "what it's like" (para. 18) to vape, be accepted socially, relax and feel good, get high, quit cigarettes, or satisfy an addiction (Hudson, 2023). Nicotine consumption and dependence can occur through vaping just as they occur through the use of traditional cigarettes (Polosa et al., 2022).

Laws and Regulations Regarding Smoking, Tobacco Use, and Vaping

Tobacco laws and regulations apply to any products that contain tobacco such as cigarettes, smokeless and non-smokeless tobacco, and vaping devices (U.S. Food and

Drug Administration, 2021). In 2009, The Tobacco Control Act was signed into law; it gives the Federal Drug Administration (FDA) full authority to "regulate the manufacture, distribution, and marketing of tobacco products" (U.S. Food and Drug Administration, 2020b, para. 1). The purpose of the Tobacco Control Act is to create a healthier future and protect the public in America (U.S. Food and Drug Administration, 2020b). The FDA believes that imposing regulatory controls on the tobacco industry will promote the cessation of and reduce the risk of diseases in tobacco users as well as reduce the social costs associated with tobacco-related diseases (U.S. Food and Drug Administration, 2018). State and local government regulations are preserved in the Tobacco Control Act (U.S. Food and Drug Administration, 2018). The progression of national and state level laws will be discussed next.

National Laws and Regulations. The surgeon general in 1964 first reported the adverse health effects of smoking (Institute of Medicine et al., 2010). Data from that report suggests that secondhand smoke exposure can be linked to heart disease and may result in cardiovascular effects for those who do not smoke (Institute of Medicine et al., 2010). The 1964 report led to the first law related to health warnings and tobacco use: The Cigarette Labeling and Advertising Act of 1965 required packages and labeling to include health warnings (Institute of Medicine et al., 2010). Throughout the 1970s, bans were put into place for advertising cigarettes on the radio and television, the surgeon general released a report about potential health effects of secondhand smoke from the use of tobacco products, and states began placing restrictions on smoking in public places (Institute of Medicine et al., 2010).

Increased awareness of health consequences from secondhand smoke led to nonsmokers' rights and changes in public opinion related to smoking in the 1980s; bans on smoking indoors, on domestic flights, and in some government buildings throughout the U.S. were instated (Institute of Medicine et al., 2010). By the 1990s, respiratory health and lung cancer became a focus in the US, and the Environmental Protection Agency (EPA) released a report that the health impact of "environmental tobacco smoke is responsible for lung cancer deaths" (Institute of Medicine et al., 2010, p. 113). From the late 1990s into the early 2000s, the US saw many state and local governments enact restrictive smoking bans in public places such as workplaces, bars, and restaurants (Institute of Medicine et al., 2010).

The American Lung Association raised awareness about the dangers of tobacco products and advocated that the age for tobacco sales be changed from 18 to 21 (American Lung Association, 2022). Legislation known as "Tobacco 21" was signed into law December 20, 2019, raising the federal minimum age for sale of tobacco products from 18 to 21 years of age (U.S. Food and Drug Administration, 2021). Tobacco 21 (T21) encompasses all tobacco products, which includes vaping devices and went into effect immediately (U.S. Food and Drug Administration, 2021).

The FDA has reported increases in the use of vaping products among youth taken from national survey data (U.S. Food and Drug Administration, 2022a). According to the American Lung Association (2022), reducing flavored tobacco products, online sales, and increased taxes need to occur and to be enforced to further reduce the risk of tobacco related deaths. In January 2020, the FDA issued an enforcement and regulation policy for unauthorized flavored e-cigarette products that appeal to youth – specifically fruit and

mint (U.S. Food and Drug Administration, 2020a). The prioritization of enforcement against the flavored products that are widely used by youth is intended to address the crisis of nicotine addiction and e-cigarette use (U.S. Food and Drug Administration, 2020a).

With the passage of the federal T21 law, local and state governments began increasing their legal sales age to 21 (American Lung Association, 2022). Following the T21 law and the FDA's plan to end the e-cigarette flavorings, many states have passed legislation that follows the national laws and regulations (American Lung Association, 2022). The State of Arkansas followed the national legislation of 2019, raising the sales age for tobacco products to 21 (ACT 580, 2019). Arkansas laws and regulations will be further discussed next.

Arkansas Laws and Regulations. Many states have passed legislation to support the national laws and regulations combatting the health risks associated with tobacco use (American Lung Association, 2022). The State of Arkansas created the Tobacco Control Board in 1997; the agency regulates manufacturing, wholesale, and retail of tobacco products in Arkansas (Arkansas Tobacco Control, 2023). Tobacco prevention and cessation programs were launched in 2001 by the State of Arkansas to address nicotine addiction of tobacco users and health effects of non-tobacco users (National Association of State Boards of Education, 2021).

In 2006, the US Surgeon General issued a report that described non-smokers' exposure to secondhand smoke increases the risk of heart disease and lung cancer (Arkansas Department of Health, 2006). Due to increased knowledge of exposure to secondhand smoke having adverse health effects and Arkansas' "third-leading cause of

preventable deaths related to secondhand smoke," (para. 5) the Arkansas Clean Indoor Air Act was passed in 2006 (Arkansas Department of Health, 2006). The Clean Indoor Air Act was passed to protect Arkansans from exposure to secondhand smoke in public places (Arkansas Department of Health, 2006). In addition, the state has established a "Tobacco Free Environment" policy prohibiting smoking or tobacco use on school campuses, including vaping on school campuses (National Association of State Boards of Education, 2021). Local school districts are required to adopt and enforce a "comprehensive tobacco-free" policy (National Association of State Boards of Education, 2021). To align with the T21 national legislation of 2019, the age to purchase tobacco, vaping devices, and related materials was raised to 21 in 2019 in the state of Arkansas (ACT 580, 2019). With the current laws to prevent tobacco use, including vaping, in youth, Arkansas does not have a state law regarding flavorings of tobacco products (American Lung Association, 2022).

Availability of Vaping Devices

This study will explore the availability of vaping devices to high school students, although laws and regulations are in place to prevent access for this population. Examining the cost and various forms of exposure to vaping devices will provide insightful information to adolescents gaining and/or having access.

Access. Vaping devices can be purchased in retail stores or online; despite bans of sales to minors, minors can purchase vaping devices online and are easily accessible with a Google search (Williams, 2020). A study conducted in California revealed that some youth buy vapes directly from older peers to avoid the age verification process (Schiff et al., 2021). That same study reported that the various types of retailers may not verify age

or are not able to distinguish between a real or false identification card (Schiff et al., 2021). Online purchases are often an easy way for youth to access vaping devices because the customer is certifying they meet the age requirement for purchase (Williams, 2020). Once underage customers find a retail store or online vendor that makes for an easy purchase, products are generally purchased in bulk for resale to their peers (Schiff et al., 2021). It is believed that most youth who use vaping devices regularly are using devices that do not belong to them (Schiff et al., 2021).

Cost. According to reports by the SingleCare Team, vaping is less expensive than traditional cigarettes or tobacco (Hudson, 2023). The amount of nicotine in an e-cigarette is more than what is in a traditional cigarette; the concentration increases from 1% - 6% and varies by brand (Noguchi, 2022). The average cost of a pack of cigarettes is $6.43 per pack; across the U.S., the price varies by state and brand (Petrovska, 2023). Vaping device prices vary depending on the brand, design, size, battery, and substances used in the devices (Jacobs, 2022). An average single device price range is "$15 to $100" (Jacobs, 2022, para. 14). The cost of the device and refillable substances are separate; therefore, the financial expenditures do not end with the purchase of the device. An average cost of the prefilled pods is "$20 per week or $1,008 per year" (Jacobs, 2022, para. 15). An alternate to the pods is the refillable e-liquid which has an average cost of "$30 weekly or $1,512" annually (Jacobs, 2022, para. 15). With vaping devices containing a higher concentration of nicotine than traditional cigarettes, "$20 spent will provide the nicotine-equivalent of 40 packs of traditional cigarettes" (Noguchi, 2022). By comparison, the vaping expense of $20 would approximate $257.20 of traditional cigarettes.

Exposure. With high school students not being legal age for the purchase of vaping devices, it is important to study where students are exposed to vaping products and how accessible they are for students. With online purchases, sellers' reliability in age verification practices is questioned (Schmidt, 2020). Social media platforms are widely used for discussion about vaping and generally provide positive and/or neutral followers regarding the use of vape devices (Becker & Rice, 2022). The use of vapes by youth is influenced by other people's attitudes and behaviors regarding vaping (Becker & Rice, 2022). For this study, the researcher defines exposure as visibly seeing vaping products in person or online and/or having access to vaping products by location or through others. The availability and enticement through exposure was analyzed and will be discussed in the findings as both school and home experiences were examined.

School. Students should not have access to vaping devices or any tobacco products at school due to required district policies and state regulations (National Association of State Boards of Education, 2021). With the growing problem of teenagers vaping across the nation (Centers for Disease Control, 2022), researchers are looking at how students gain access and what entices them to vape. The use of vapes by youth is influenced by others' attitudes and behaviors around them regarding vaping (Becker & Rice, 2022). Observing vaping on a school campus reinforces the mindset that it is socially acceptable and may influence use by peers (Mantey, 2021). Students in upper grades are more likely to use vaping devices due to behavior choices and influences of peers (Okonkwo, 2021). A recent study reports that 64.3% of adolescents self-reported vaping occurring on school campus, and in-school exposure was associated with increased odds of "use and susceptibility" (Mantey, 2021).

Home. The attitudes regarding tobacco use as modeled and accepted by parents in the home is a risk factor for the children to use tobacco products (Becker & Rice, 2022). Many studies have linked parental smoking to youth smoking, but there are few studies that examine if the relationship holds true for vaping (Green et al., 2020). Green et al. (2020) explains that the relationships related to vaping between parents and youth is complex and has many variables. The authors found that if parents were previous smokers and switched to vaping, there were less instances of risk in the youth vaping; however, the use of smoking and vaping in the home normalized the practice and resulted in the youth behaviors linking to vaping (Green et al., 2020). The family dynamics in some homes may provide struggles for adults in setting boundaries on their youth having access to vaping devices (Becker & Rice, 2022).

Use of Vaping Devices

One of the most attractive features of vaping devices for adolescents is the flavoring and scents of the vape liquids (Schmidt, 2020). The FDA has released federal data showing that large numbers of youth have reported using vape devices (U.S. Food and Drug Administration, 2022b). The following paragraphs describe demographics, including age and societal factors, and frequency of use among youth using vape devices.

Demographics. According to the data released by the FDA in November 2022, "11.3% of middle and high school students reported using any tobacco product; e-cigarettes were reported as being the devices used most often" (U.S. Food and Drug Administration, 2022b, para. 2). The online survey conducted in 2022 was provided to "middle school (grades 6-8) and high school (grades 9-12) students in the U.S.; students were able to participate in the classroom or at home" (U.S. Food and Drug

Administration, 2022b). When studying trends related to demographics, no gender difference has been reported nationally, as with current data (Polosa et al., 2022). However, "White, non-Hispanic youth have the highest vaping rates in the nation" (Polosa et al., 2022).

Age. A larger percentage of high school aged students – 16.5%, compared with middle school at 4.5% – reported tobacco use in the nation (U.S. Food and Drug Administration, 2022b). Of the students who reported using tobacco products, "14.1% of high school students and 3.3% of middle school students reported using e-cigarettes" (U.S. Food and Drug Administration, 2022b, para. 7). Flavored e-cigarettes were the device of choice for "nearly 85%" of the current users (U.S. Food and Drug Administration, 2022b, para. 8).

Societal Factors. With large numbers of youth reporting vaping, it is important to explore social and economic factors related to those engaged in the practice. Although vaping encompasses many students consuming tobacco, "11.3% of high and middle school students reported they use multiple forms of tobacco" (U.S. Food and Drug Administration, 2022b, para. 2). Of those students, 3.5% reported they use more than two types of tobacco products (U.S. Food and Drug Administration, 2022b, para. 2). The products reported being used include e-cigarettes, cigars, cigarettes, smokeless, hookahs, nicotine patches, heated tobacco products, and pipe tobacco (U.S. Food and Drug Administration, 2022b, para. 3). E-cigarettes are most popular and have been reported as being used most often: 9.4% of all types of devices reported (U.S. Food and Drug Administration, 2022b, para. 3). High school students have reported that "stress relief and peer influence" (p. 1) are the biggest reasons for vaping (Donaldson et al., 2022). In the

2022 FDA report, middle and high school students reported "severe symptoms of psychological distress accounts for 18.3% of current users while 27.2% of current users self-reported low academic achievements" (U.S. Food and Drug Administration, 2022b, para. 4).

Frequency of Use. When considering vaping related behaviors, the frequency of use is a relevant factor to discuss. Included in the 2022 FDA data report, 27.6% of e-cigarette users reported using a product every day; and 40.0% of users reported using e-cigarettes at least 20 out of 30 days (U.S. Food and Drug Administration, 2022b). It is estimated that 1 in 10 youth, which represents "more than 2.5 million high and middle school students reported using e-cigarettes" in the past 30 days (U.S. Food and Drug Administration, 2022b, para. 7). Of the large number of high and middle school students currently using e-cigarettes, more than "1 in 4" reported using them daily (U.S. Food and Drug Administration, 2022b, para. 7).

Health Risks

To explore the health risks of vaping, one must be familiar with the terms used for these vaping devices: "vapes, vape pens, e-cigs, e-hookahs, mods, and tank systems" (p. 24) and consider the delivery of nicotine and/or other products contained in the devices (Douglass & Solecki, 2017). Limited research is available regarding the exposure to secondhand vapors emitted from the vaping devices, but a limited study of mice shows the vapors contain dangerous metals and toxins (Schmidt, 2020). The actual health effects and exploration of vaping serving a gateway drug will be discussed next.

Known Health Effects. It is known that nicotine dependence has adverse health effects; but the information available regarding the non-combustible products, known as

vaping devices, is “limited” (p. 2832) concerning adolescents (Polosa et al., 2022). Some youth have misconceptions of what the liquids used in vaping devices are comprised of and therefore consider use because of the taste and curiousness of the experience (Douglass & Solecki, 2017). Known health effects of using nicotine include an increase in heart rate and higher blood pressure (Douglass & Solecki, 2017). The brain develops during adolescence, and the use of nicotine during brain development may result in addiction that potentially has “harmful consequences such as behavioral and cognitive impairments, memory issues, inattention, and executive function impairments” (Douglass & Solecki, 2017, pg. 28).

Dependence upon nicotine occurs when mental and/or physical effects occur without the use of it (Polosa et al., 2022). The concern of health risks among users of vaping devices examines the frequency of use, nicotine contents, type of devices, type of liquid additives to provide flavorings, and history of nicotine use (Polosa et al., 2022). Along with nicotine dependence, marijuana vaping is growing popular among young adults; and this brings concern of the health risks associated with adolescence use of marijuana (Polosa et al., 2022). Risks related to marijuana use have been designated as respiratory and lung injuries and have also been linked to a “decline in memory, attention, and learning” (p. 2833) among adolescents (Polosa et al., 2022).

Because there is limited information known about the dangers of using vaping devices as adolescents, these devices may not have the same effect on adults. The use of vaping devices has been proposed for “harm reduction” (p. 2831) in comparison to cigarette smoking and encouraged for smoking cessation in adults (Polosa et al., 2022). The practice of vaping simulates traditional smoking with the action of “hand-to-mouth”

(p. 663), but there is no burning of tobacco (Besaratinia & Tommasi, 2020). Some believe that the vapor found in the vaping devices is a "less unhealthy alternative to smoking" (pg. 663) because the toxins that are present are generally lower in concentrated form (Besaratinia & Tommasi, 2020). The exposure to the vapors released into the air compared to the traditional secondhand smoke is currently being investigated to determine if there are harmful consequences to those exposed (Besaratinia & Tommasi, 2020). The effects of the heated and aerosolized vapors are not fully understood, but some studies have shown there are "potentially toxic chemicals" (p. 29) being emitted into the air (Douglass & Solecki, 2017). Determining the hazards and potential health risks is necessary to the U.S. Environmental Protection Agency (Polosa et al., 2022).

The Arkansas Department of Health has established a Tobacco Prevention and Cessation Program which focuses on tobacco prevention and cessation programs (Arkansas Code Title 19, 2022). The Tobacco Prevention and Cessation Program is to focus on prevention programs that prioritize reducing tobacco use among youth and to ensure the enforcement of youth tobacco control laws (Arkansas Code Title 19, 2022).

Vaping as a Gateway Drug. The use of e-cigarettes by youth has raised concerns about the potential for future substance abuse (Duan, 2021). The idea that one substance addiction, such as nicotine, will lead to other substance abuse is known as the Gateway Theory and was brought into light beginning in the 1970s (American Addiction Centers, 2022). The use of tobacco in the U.S. has yielded studies that reflect the earlier in life a person begins using tobacco products, the likelihood of "developing issues with other substances such as alcohol, marijuana, cocaine, heroin, etc." may occur (American Addiction Centers, 2022, para. 8).

Current literature reveals conflicting views on how vaping influences other substance abuse (Duan, 2021). However, with the increase of vaping among today's youth, it is possible that vaping could lead to cigarette, marijuana, and/or alcohol abuse (Duan, 2021). Nicotine affects "neural pathways underlying pleasure and reward and may increase the brain's long-term sensitivity to other psychoactive substances and drug-seeking behaviors" (Becker & Rice, 2022, p. 456). Additional research studies are needed that focus on vaping use among youth and patterns of substance abuse as they age to know the ramifications of how vaping influences potential drug or alcohol abuse in the adolescents' future.

Vaping in Schools

Vaping has increased among high school students in the U.S., and the availability through social media advertising links is a given reason some youth experiment with vaping (Santistevan, 2016). Unfortunately, the experimentation sometimes occurs at school when students are around their peers; and some teens describe "peer pressure" (p. 72) as a reason for experimenting with vaping (Santistevan, 2016). The use of vaping devices on school campuses is prevalent, and students report the common locations being in the bathroom, locker rooms, and parking lots (Mantey, 2021).

The Vaping Phenomenon in Schools

Due to the exposure to vaping devices at school and increased peer pressured risks for new users to experiment and current users to sustain the behavior, there is a crisis for students observing and/or partaking in vaping-related activities on school campuses (Mantey, 2021). On-campus exposure to vaping activities more than doubled the odds of use according to one study (Mantey, 2021). Student perceptions in vaping-

related behaviors being normal and consistently observed lends to the beliefs that peer pressure may influence behaviors (Mantey, 2021).

Students' and Families' Beliefs about Vaping

The use of vapes by youth is influenced by attitudes and behaviors around them regarding vaping (Becker & Rice, 2022). Some studies have reported that vaping is safer than traditional smoking; but the high doses of nicotine could result in a stronger addiction, and those risks should be considered (Becker & Rice, 2022). The reason given most often for why youth begin vaping is the view of it being less harmful, more acceptable, easier to conceal, and containing attractive flavorings (Green et al., 2020). The relationship between parental vaping and youth vaping varies based on the continued use and former use of tobacco products in general, not just vaping devices (Green et al., 2020). The study conducted by Green et al. (2020) reported that if parents were former smokers and now current vapers, there yielded no interest in vaping by the youth in the home.

Vaping in Arkansas Schools

Vaping is present in Arkansas public schools; and according to the APNA student survey in 2021, it is on the rise among Arkansas' students (Arkansas Department of Human Services, 2021). APNA survey, which is administered to Arkansas Students in grades 6, 8, 10, and 12, added questions about vaping products beginning in 2020 (ACHI, 2022).

Vaping Prevalence in Arkansas Schools

With vaping being prevalent in Arkansas' schools, the Arkansas Center for Health Improvement (ACHI) summarized the APNA results and published *A Closer Look* that

described the 2021 data (ACHI, 2022). Arkansas' students reported that 11.7% used any vape product in the past 30 days, which is an increase of 0.6% from the previous year (ACHI, 2022). Also, the use of nicotine vape products increased 0.7% reporting 9.6% of students used them. According to the 2021 study, the number of students who reported using any vape at least once significantly increased as they aged as shown in Table 1.

Table 1

Percentage of Students Who Used Any Vape at Least Once

Grade	Percentage of students
6	6.7%
8	16.1%
10	25.5%
12	30.5%

Note. (ACHI, 2022)

The average age of Arkansas' students who experiment with vaping for the first time is 13.4 years of age (ACHI, 2022). As shown in Table 1, students in grade 12 use vape products more than any other grade level (ACHI, 2022). Through the APNA data, 14.2% of grade 12 students reported they obtained their vape products from a friend (Arkansas Department of Human Services, 2021).

As vaping continues to be a problem in Arkansas' schools, administrators are faced with the challenge of students using the products in the restrooms, gym, and locker rooms (Savage, 2023). School districts across Arkansas are installing detectors that will notify staff when vape particles are detected in the air (Savage, 2023). The Walnut Ridge high school principal reports that students seek to conceal the vape devices and products

in “personal regions” (Savage, 2023, para. 12). Walnut Ridge High School has added metal-detector wands to combat students hiding the devices (Savage, 2023). The Arkansas Department of Education (2023) reported that 10,961 disciplinary infractions occurred under the category “Tobacco/e-Cigarettes/Vaping Devices” for the 2022-2023 school year, which was an increase of 1,283 reported incidents (Arkansas Department of Education, 2023). Schools across Arkansas have added detecting devices and metal detector wands in an effort to stop the use of vaping devices at school (Savage, 2023; Nexstar Media Group, Inc., 2019; Hogg, 2023).

Hypotheses / Research Questions

The following research questions and hypotheses will be explored in this study:

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?

H1: Exposure to vaping devices at school and teens’ vaping use are positively correlated.

H2: Exposure to vaping devices through close friends is positively correlated to teens’ vaping use.

RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?

H3: Exposure to vaping devices at home and teens’ vaping use are positively correlated.

RQ3: How do teens’ perceptions of personal health risks influence the use of vaping devices?

H4: The perception that vaping is healthier than traditional smoking and teens' vaping use are positively correlated.

H5: The perception that vaping does not result in nicotine dependence and teens' vaping use are positively correlated.

H6: The perception that vaping is not harmful and teens' vaping use are positively correlated.

RQ4: How do vaping use and exposure vary by student demographics?

H7: There is no difference in vaping use between males and females.

H8: There is no difference in vaping exposure between males and females.

H9: There is no difference in vaping use between students in different grades.

H10: There is no difference in vaping exposure between students in different grades.

H11: There is no difference in vaping use between students of different races.

H12: There is no difference in vaping exposure between students of different races.

H13: There is no difference in how students get access to vape devices between peers and family members.

Theoretical Perspective

Social cognitive theory (SCT; Bandura, 1986) was renamed from the social learning theory (Bandura, 1977) after years of study by Bandura. The theory asserts that humans have some control over cognitive choices through self-efficacy but can be influenced socially by observing others. Bandura (1977) focused on behaviors and choices through the observations of what other humans' model with consideration to the

environment and cognitive influences. The two key ideas of SCT are 1) stimuli and responses facilitate thought processes, 2) observations through the environment fosters behavior (Bandura, 1977).

Examining thought processes related to stimuli considers the cognitive realm with decision making (Bandura, 1977). When looking at behaviors forming through environmental experiences, Bandura (1977) describes learned behavior as a process through observing actions that are modeled and developed by others which directly relates to the cognitive role in memory and acquiring new information. The behavioral outcomes should be formed through self-efficacy and personal conviction, but Bandura (1977) believes that actions may change through influences of situations and the personal development of coping skills.

Self-efficacy will determine a person's ability to be confident in choices and behavior (Bandura, 1986). Psychological factors such as the ability to cope with anxiety, fear, and vulnerability influence self- efficacy when managing stressful situations (Bandura, 1977). The perception of the physical and social experiences through the environment vitally impacts the learning and observing that occurs (James et al., 1978). The self-efficacy and cognitive development of each person provides different learning experiences (James et al., 1978). Recognizing that the learning process can be associated with environmental and social factors is important to the SCT (Niaura, 2000).

Expectations based on self-efficacy and "effortful behaviors" (p. S156) describes the fundamentals of SCT (Niaura, 2000). The expectations are measured in that a given action will result in a planned consequence; this is the if, then framework (Niaura, 2000). To gain an understanding of this, the author described a scenario: "If I smoke a cigarette,

then I will relax" (Niaura, 2000, p. S156). Learning a behavior because of a planned outcome may be a result of weak self-efficacy or observing others with the behaviors that create the desired experiences (Niaura, 2000). SCT recognizes the cognitive and social aspects of behavior through learning developments (Niaura, 2000).

SCT informed this study concerning how the availability and use of vaping devices are related. The theory helped explain the relationship between teen vaping and the availability of the devices through their peers and/or family members vaping. According to Bandura (1986), a person's beliefs will guide his or her ability to accomplish tasks through confidence. Demonstrating the strength of self-efficacy influences one's personal well-being and accomplishments through a strong commitment of reaching goals and self-determination (Bandura, 1986). Examining the SCT and specifically the lack of self-efficacy will inform this study because the lack of goals and presence of self-doubt forces reliance on peers and/or family members to guide decision making and serve as a direct influence on behaviors and beliefs (Bandura, 1986).

Summary

This quantitative, correlational study will explore the relationship between how the availability of vaping devices and student use are related. The literature review contained information that focused on three main ideas: vaping, vaping in schools, and vaping in schools in Arkansas. Vaping was defined and described, laws and regulations were explained, and the availability of devices and health risks to teens were clarified. A theoretical perspective was described and supported the study by examining self-efficacy and how behaviors are influenced cognitively and socially. The availability of vaping devices, peer pressure to use the devices, and students' beliefs regarding health risks was

relevant information and supported the topic and analysis of the relationships between the availability of devices and student use.

CHAPTER III

METHOD

This chapter outlines the data collection methods that were used in this study. The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. The focus of the study was to understand if exposure and student use vary by demographics, personal beliefs, and access on school campus, at school activities, in the home, or through peers.

This chapter describes the research questions and design, participants, sampling, data collection, instruments, data analysis, and chapter summary. The study incorporated the theoretical framework based on Bandura's Social Cognitive Theory (SCT) which focuses on self-efficacy which allows a person to be confident in choices and behaviors (Bandura, 1986). The study followed all rules and regulations regarding research ethics and gained approval from the Arkansas Tech University (ATU) Institutional Review Board (IRB), as shown in Appendix O, before recruitment of participants or data collection began.

Research Questions and Hypotheses

The following research questions and hypotheses were explored in this study:

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?

H1: Exposure to vaping devices at school and teens' vaping use are positively correlated.

H2: Exposure to vaping devices through close friends is positively correlated to teens' vaping use.

RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?

H3: Exposure to vaping devices at home and teens' vaping use are positively correlated.

RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?

H4: The perception that vaping is healthier than traditional smoking and teens' vaping use are positively correlated.

H5: The perception that vaping does not result in nicotine dependence and teens' vaping use are positively correlated.

H6: The perception that vaping is not harmful and teens' vaping use are positively correlated.

RQ4: How do vaping use and exposure vary by student demographics?

H7: There is no difference in vaping use between males and females.

H8: There is no difference in vaping exposure between males and females.

H9: There is no difference in vaping use between students in different grades.

H10: There is no difference in vaping exposure between students in different grades.

H11: There is no difference in vaping use between students of different races.

H12: There is no difference in vaping exposure between students of different races.

H13: There is no difference in how students get access to vape devices between peers and family members.

Research Design

This study used a quantitative, correlational, cross-sectional survey design. The quantitative approach was used in this study because the data could be described and summarized using numerical values (Blackstone, 2012). The study was correlational in the manner it explored the relationships between variables (Blackstone, 2012). Survey research was the most appropriate method of data collection because "predetermined questions" (p. 90) were posed to a sample that was representative of all Arkansas high school students (Blackstone, 2012). A cross-sectional survey that captured a "snapshot of one point in time" (Blackstone, 2012, p. 93) was administered; a cross-sectional survey was most appropriate given the time-constraints surrounding data collection and provided an understanding of the vaping phenomenon through the behaviors and opinions collected from the representative sample of Arkansas high school students. This survey design was cost effective and allowed for timely responses from a large sampling of high school students. The data from this study was numerical and was analyzed using statistical software which aligns with quantitative research methods (Vanderstoep & Johnston, 2009). The research questions with corresponding hypotheses, variables, data collection, and analysis methods are outlined below as shown in Table 2.

Table 2

Research Design

Research Questions Hypotheses Variables	Proposed Design		Analysis Descriptions	
	Survey Questions	Statistical Test	Survey Questions	Findings

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?				
H1: Exposure to vaping devices at school and teens' vaping use are positively correlated.				
V1: student exposure to vaping devices	Sum of Q9, Q10, Q11, Q12	Correlation	Q12, Q13	Positive correlation
V2: student use of vaping devices	Sum of Q6, Q7, Q8		Q6, Q7	
H2: Exposure to vaping devices through close friends is positively correlated to teens' vaping use.				
V1: student exposure to vaping devices	Sum of Q9, Q10, Q11, Q12	Correlation	Q11, Q12	Not testable
V2: student use of vaping devices	Sum of Q6, Q7, Q8		Q6, Q7	
RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?				
H3: Exposure to vaping devices at home and teens' vaping use are positively correlated.				
V1: student exposure to vaping devices	Sum of Q9, Q10, Q11, Q12	Correlation	Q10	Not testable
V2: student use of vaping devices.	Sum of Q6, Q7, Q8		Q6, Q7	

RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?				
H4: The perception that vaping is healthier than traditional smoking and teens' vaping use are positively correlated.				
V1: student beliefs of vaping as healthier than traditional smoking	Sum of Q9, Q10, Q11, Q12, Q13, Q14	Correlation	Q14, Q15 (healthier)	No correlation
V2: student use of vaping devices.	Sum of Q6, Q7, Q8, Q13, Q14		Q7	
H5: The perception that vaping does not result in nicotine dependence and teens' vaping use are positively correlated.				
V1: student beliefs of vaping and nicotine dependence	Sum of Q9, Q10, Q11, Q12, Q13, Q14	Correlation	Q14 (dependence)	Positive correlation
V2: student use of vaping devices.	Sum of Q6, Q7, Q8, Q13, Q14		Q7	
H6: The perception that vaping is not harmful and teens' vaping use are positively correlated.				
V1: student beliefs of vaping as harmful	Sum of Q9, Q10, Q11, Q12, Q13, Q14	Correlation	Q14 (harmful)	No correlation
V2: student use of vaping devices.	Sum of Q6, Q7,		Q7	

	Q8, Q13, Q14			
RQ4: How do vaping use and exposure vary by student demographics?				
H7: There is no difference in vaping use between males and females.				
IV: Gender	Q4	T-test	Q4	Significant difference
DV: Use	Sum of Q6, Q7, Q8		Q7	
H8: There is no difference in vaping exposure between males and females.				
IV: Gender	Q4	T-test	Q4	Not testable
DV: Exposure	Sum of Q9, Q10, Q11, Q12		Q10	
H9: There is no difference in vaping use between students in different grades.				
IV: Grade	Q3	ANOVA	Q3	No significant difference
DV: Use	Sum of Q6, Q7, Q8		Q7	
H10: There is no difference in vaping exposure between students in different grades.				
IV: Grade	Q3	ANOVA	Q3	Not testable
DV: Exposure	Sum of Q9, Q10, Q11, Q12		Q10	

H11: There is no difference in vaping use between students of different races.				
IV: Race	Q5	ANOVA replaced with T-test	Q5	Significant Difference
DV: Use	Sum of Q6, Q7, Q8		Q7	
H12: There is no difference in vaping exposure between students of different races.				
IV: Race	Q5	ANOVA	Q5	Not testable
DV: Exposure	Sum of Q9, Q10, Q11, Q12		Q10	
H13: There is no difference in how students get access to vape devices between peers and family members.				
IV: Access Group (purchased, peers/close friends, family, more than one method)	Q9	ANOVA	Q10	No significant difference
DV: Use	Sum of Q6, Q7, Q8		Q7	

Participants

In the 2022-2023 school year, the State of Arkansas public school system was represented through 15 educational cooperatives with public school enrollment at 148,457 in grades 9-12 (Arkansas Department of Education, 2023a). This study sought

individual high school students (grades 9-12), currently enrolled in Arkansas public schools to serve as participants. The population, context of the study, sample, and sampling method will be discussed below.

Population and Context of the Study

The goal of sampling for this study was to create a sample that represented all high school students in Arkansas. The focus area for participant selection was the high schools located within the Guy Fenter Educational Service Cooperative (GFESC), located in the River Valley of Western Arkansas. The GFESC, comprised of 13,885 high school students in grades 9-12, represents 6 counties, 22 districts, and 25 high schools with the high school population representing 10% of all high school students in the state (Arkansas Department of Education, 2023c). The high schools that were invited to participate in the study and their enrollment data are listed in Table 3.

Table 3

GFESC High Schools Enrollment Data

County	District	School	High School Enrollment 2021-2022
Crawford	Alma	High School	1,020
	Cedarville	High School	253
	Mountainburg	High School	201
	Mulberry/Pleasant View	High School	126
	Van Buren	Freshmen Academy	442
		High School	1,139
Franklin	Charleston	High School	449
	County Line	High School	243
	Ozark	Jr/Sr High School	694

Johnson	Clarksville	High School	565
	Lamar	High School	364
	Westside	High School	348
Logan	Booneville	High School	252
	Magazine	High School	224
	Paris	High School	307
	Scranton	High School	206
Scott	Waldron	High School	444
Sebastian	Fort Smith	Southside	1,794
		Northside	2,497
	Greenwood	Freshmen Center	331
		High School	874
	Hackett	High School	359
	Lavaca	High School	256
	Mansfield	High School	246
	Future School of Fort Smith	High School	251
	GFESC Total High School Enrollment		13,885

The high school students within the GFESC region are representative of the state's racial, socio-economic, and gender enrollments. Although the population of White students has a differential of 7% greater than the state enrollment and the Black student population is 15% lower, the percentage of Hispanic and Native American students is significantly greater in the GFESC region (Arkansas Department of Education, 2023b). A comparison chart of GFESC and the state demographics is shown in Table 4 (Arkansas Department of Education, 2023b).

Table 4

Demographic Comparison Table of High School Enrollment Percentages

	GFESC High School (9-12) Enrollment Percentages	State Level High School (9-12) Enrollment Percentages	State Level (K-12) Enrollment Percentages
Race			
2 or more races	5%	3%	4%
Asian	3%	2%	2%
Black	4%	19%	19%
Hispanic	18%	14%	14%
Native American	1%	6%	1%
Native Hawaiian/Pacific Islander	0.1%	0.1%	1%
White	67%	60%	60%
Gender			
Female	49%	-	49%
Male	51%	-	51%
Additional Populations			
Low-income	57%	-	65%
English Language Learners	9%	-	8%
Special Education	13%	-	14%

Note: Data not available from the Arkansas Department of Education for high school specific categories are recorded with a dash.

The setting of schools in this study was the GFESC which encompasses six counties in Arkansas: Crawford, Franklin, Johnson, Logan, Scott, and Sebastian. These counties represent the western portion of the state and are known as the River Valley because of their proximity to the Arkansas River. The average value of homes owned

within these counties range from $82,000 in Scott County to $136,600 in Sebastian County; these values are above the state average of $52,528, which explains the low-income percentage for this region being 8% less than all public schools (United States Census Bureau, 2023).

Sample

An overview of the study along with the data collection survey was provided to the GFESC director, asking for assistance in gaining voluntary support for data collection from all 25 high schools in GFESC – a total of 13,885 students according to the State Report Card data reporting (Arkansas Department of Education, 2023c). As shown in Table 4, the GFESC region is representative of the state demographically. In addition, this researcher has established administrative relationships, and the region is in close proximity. Administrators at each school were asked by the GFESC director to complete the point of contact form, so the researcher could directly contact the designated school staff member who would distribute the survey to students in who had parental/guardian consent and were enrolled in grades 9-12. Students who were not enrolled in public high schools within the GFESC region and/or were not in grades 9-12 were not eligible to participate.

Sampling Method

Non-probability sampling design was used in this study and incorporated both voluntary response and convenience sampling methods. Convenience sampling quickly collects data from people with opportune access to the researcher quickly (Blackstone, 2012). Voluntary response sampling allows participants within the target population to choose to participate in the study or not (Murairwa, 2015). These sampling methods

provided an appropriate, cost-effective way to obtain participants within the time constraints of this study.

Data Collection

This study's exact time frame and procedures for data collection were planned to occur during Fall 2023. Upon approval from the dissertation committee and IRB, the request for participants was emailed to the GFESC director for assistance in recruiting participating districts. Once the researcher received notification of willingness to participate through the point of contact form, the researcher provided informative details about the study to the designee within each participating district.

As the fall 2023 semester closed, the researcher was not satisfied with the response rate in the number of schools willing to participate. A modification to the IRB approval was submitted by the researcher. The modification form asked for an extension in the time frame for data collection to allow additional recruiting efforts to ensue. In the modification form request, the researcher asked to be the direct communicator with district- and building- level administrators of the remaining school districts in the GFESC in the second phase of recruitment. Once the IRB modification approval was granted, as shown in Appendix P, the researcher began the additional recruitment efforts in the spring of 2024 by emailing the Recruitment Letter for District and High School Administrators (spring 2024; see Appendix J) to administrators from the remaining districts in the GFESC.

The digital informed consent form, as shown in Appendix A, was provided to the participating district's point of contact, along with the Parent/Guardian Informational Letter, as shown in Appendix D. The point of contact was asked to forward the digital

consent form and informational letter to all parents/guardians of possible participants through the district's messaging system. The digital responses from the consent forms were collected in a digital form that was submitted directly to the researcher. Once eligible participants were determined based on the collected consent forms, a list of eligible participants was emailed to each district's point of contact, along with information to provide to eligible participants. The district's point of contact was asked to generate a report of students aged 18 or older and to provide those students with the Student Recruiting Information Letter, shown in Appendix E, and the electronic consent form, shown in Appendix B. Also, the point of contact was asked to provide the eligible participants (list of students with received consent by a parent/guardian) the Student Recruiting Informational Letter, shown in Appendix E, and an electronic assent form, shown in Appendix F; the assent form and consent to take the survey was embedded at the start of the survey as shown in Appendix G.

Administration of the emailed surveys occurred in the classrooms under the direction of classroom teachers or other staff as designated by the school's administration and/or point of contact. The survey itself was made available electronically via Google Forms. This survey tool was selected for affordability, convenience, and anonymity in responses. Further, Google Forms is the most familiar and accessible tool available to public school students in the GFESC region. Data was and will continue to be securely stored in a password-protected drive accessible via a password-protected computer. Participants completed the digital survey form using a school-approved device. Students responded to survey questions in the Google Form, and a spreadsheet of data was generated once all participating students completed the survey. To gain as many

participants as possible, the survey was available for students to complete over the duration of 14 days. A reminder email regarding survey distribution was sent to the district's administration email on/around day seven. At the end of day 14, the researcher adjusted the Google Form responses settings to stop collecting responses; this date was clearly communicated to school administrators before the surveys were administered.

Instrument

The instrument used to collect responses was a digital survey that was created by the researcher, as shown in Appendix G. With no current surveys exploring the relationship of availability of vaping devices and students' self-reported vaping use, the researcher designed survey questions to best collect data that would help answer the research questions of this study.

Reliability. Reliability in measurement means an instrument consistently achieves the same result under the same circumstances among all participants (Blackstone, 2012). It was important to have survey questions that would yield consistent responses from the participants so that the findings would be trustworthy (Blackstone, 2012). In this study, reliability was ensured in several ways. First, the survey asked participants to recall frequency regarding vaping practices within the past 14 days (rather than use a yes/no approach), which was forthright and should yield reliable results (Blackstone, 2012). Further, the survey relied on self-reported data from participants; seeking thoughts, feelings, and behaviors directly from the respondents would be more accurate than relying on a researcher to interpret the participants' experiences, which may bring in researcher bias if the data was not self-reported (Jhangiani et al., 2019). Finally, two questions were designed with intentional repetition to minimize errors and to provide

clean data: Q6 (During the past 14 days, how many days did you use a vaping device?) and Q7 [How many times per day did you use a vaping device? (Consider each time per day representing approximately 15 puffs)]. If the response of Q6 or Q7 contradicts the other, the data may not be reliable and therefore may not be used in the study.

Validity. Validity in measurement means the instrument accurately measures what it is intended to measure (Blackstone, 2012). Validity is important in research because it helps assure the data are sound, and the results are accurate (Blackstone, 2012). In this study, the survey was intended to measure if exposure to vaping devices and student use vary by demographics, personal beliefs, and access on school campus, at school activities, in the home, or through peers. The survey questions were formatted with multiple choice and checkbox type responses to clarify participants' understanding regarding what information was being asked of them.

Since the survey used in this study was created by the researcher, face validity was pursued for this instrument. Face validity means that the instrument appears valid to the participants who will complete it (Krabbe, 2017). It was important that face validity is judged by those who use it to verify the survey questions will provide a common understanding of all participants to yield valid answers (Blackstone, 2012). In this study, the survey questions were reviewed by a sophomore student, high school health teacher, and high school parent. Feedback was provided by each person, and the questions were thought to be purposeful and would provide valid data from the participants. Although the responses from participants may vary, the selections will provide self-reported, ordinal-level data pertaining to vaping practices, exposure to devices, and perceptions of

health risks. This measurement method was intended to recognize patterns of the participants and to give value to the data collected (Jhangiani et al., 2019).

Self-reported data by the participants should reflect honesty because respondents are describing their own experiences and are assured anonymity (Jhangiani et al., 2019). The validity of self-reported data has been studied and if the survey instrument is designed where respondents can understand what is being asked, have the memory to recall the information accurately, and trust the anonymity of the responses, the most valid answers will be provided by the participants (Brener et al., 2003).

Data Analysis

The data was collected electronically and analyzed using SPSS (Statistical Package for the Social Sciences) software. Descriptive statistics means samples of relationships using variables (Blackstone, 2012). The statistical tests used in this study were correlations, T-tests, and ANOVAs. The specific analyses used varied by hypothesis and are outlined in Table 2 above.

Summary

This quantitative, correlational study explored the relationship between how the availability of vaping devices and student use are related. This chapter contained information that described the research questions and hypotheses, research design, sampling techniques, participants, data collection method/instrument, and data analysis.

CHAPTER IV

RESULTS

The purpose of this quantitative, correlational, cross-sectional study was to understand the relationship between how the availability of vaping devices and student use are related. The exploration of vaping exposure and student use in select Arkansas schools was examined through data collected regarding student demographics, personal beliefs, and access on school campus, at school activities, and in the home, or through peers. The researcher used the following questions to guide this study:

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?

RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?

RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?

RQ4: How do vaping use and exposure vary by student demographics?

This chapter is divided into three sections. The first section describes the sample of the study, which includes the invited sample and data collection demographics of the participants. The next section outlines data analysis and findings for each research question and hypothesis. The final section of the chapter will end with a summary.

Description of the Sample

The goal of sampling for this study was to gather participants who were representative of all high schools in Arkansas. The focus area for selecting participants was the high schools located within the Guy Fenter Educational Service Cooperative

(GFESC). The invited sample and sample demographic information will be described next.

Invited Sample

The target population for this study was public high school students, grades 9-12, located in the River Valley of western Arkansas. The schools selected to participate were the 25 schools that span across six counites within the GFESC region; these schools have a total enrollment of 13,885 high school students (Arkansas Department of Education, 2023c).

Once IRB approval was granted, the researcher emailed the Introductory Letter (see Appendix H) to the GFESC director and asked the director to assist with recruiting districts by emailing the district-level administrators from all 25 high schools. In the email from the director that went to the administrators, the Recruitment Letter for District Administrators (fall 2023; see Appendix I) was attached. Districts that chose to participate were asked to provide a point of contact for distribution of the Parent/Guardian Informational Letter (see Appendix D). In the fall semester of 2023, eight schools agreed to participate in the study.

At the end of the fall 2023 semester, the number of participating schools yielded 32% of schools within the target population, and the researcher was not satisfied with the response rate out of concern that it would not be representative of the entire state. A modification to the IRB approval was submitted by the researcher asking for an extension in the data collection time frame. In addition, the researcher asked to email district-level and building-level administrators of the remaining districts within the GFESC directly as the second phase of recruitment. Once IRB approval was granted for data collection to

continue into the spring 2024 semester, the researcher emailed the Recruitment Letter for District and High School Administrators (spring 2024; see Appendix J) to the remaining districts in the GFESC region. An additional four schools agreed to participate in the study.

The Point of Contact Initial Email (see Appendix K) was forwarded to each participating school. Once the participating schools distributed the Parent/Guardian Informational Letter (see Appendix D) to families of students in grades 9-12 within their respective districts, parents and guardians were able to complete the Informed Consent Form digitally (see Appendix A). After consent forms were received, a list of eligible participants was provided to each district's point of contact with details for the digital survey distribution (see Appendix L). The point of contact was asked to designate a staff member to oversee the survey distribution. Eligible participants in each district were emailed the Student Recruitment Informational Letter (see Appendix E). The letter contained the Assent Form link that, upon completion of the digital form, would provide the anonymous questionnaire immediately on the screen. The Participant Assent and Consent to Take the Survey is shown in Appendix F.

As a follow-up to the initial email, the researcher sent a Reminder Email for the Point of Contact (see Appendix M) to each district's point of contact. After the 14-day data collection window, a Final Email for Point of Contact (see Appendix N) was sent to show appreciation for participation in the study.

Sample Demographic Information

The participating sample for this study represented six counties (100%), 13 schools (52%), and 267 students (1.9%) within the GFESC region. All counties within the

GFESC were represented: Crawford, Franklin, Johnson, Logan, Scott, and Sebastian. The schools represented in the study were Alma High School, County Line High School, Fort Smith Southside High School, Greenwood Freshmen Center, Greenwood High School, Hackett High School, Lavaca High School, Mansfield High School, Mountainburg High School, Mulberry/Pleasant View High School, Ozark High School, Scranton High School, and Westside High School. For demographic reporting, the Greenwood Freshmen Center and Greenwood High School responses were combined due to the students being housed in one location and due to the grade 9 students' responses being reported as Greenwood High School. The county and school sample demographic information are presented below in Table 5.

Table 5

Sample Demographics by County and School

		Number of Participants	Percent of Participants
County			
	Crawford	64	24.0%
	Franklin	27	10.1%
	Johnson	14	5.2%
	Logan	6	2.2%
	Scott	2	<1%
	Sebastian	152	56.9%
	No response	2	<1%
Totals		267	100%
School			
	Alma High School	44	16.5%
	County Line High School	4	1.5%
	Fort Smith Southside High School	45	16.9%

	Greenwood High School	27	10.1%
	Hackett High School	22	8.2%
	Lavaca High School	56	21.0%
	Mansfield High School	7	2.6%
	Mountainburg High School	4	1.5%
	Mulberry/Pleasant View High School	18	6.7%
	Ozark High School	18	6.7%
	Scranton High School	4	1.5%
	Westside High School	15	5.6%
	No response	3	1.1%
Totals		267	100%

Considering the participating schools, the number of survey responses represented 3.9% of the total high school enrollments in the GFESC. Parent/Guardian consent forms were received for 419 students, which represented 6.2% of the student enrollments in the participating schools. Of the 419 eligible participants, 232 (55.3%) students completed the student assent form. For students aged 18 and over, 48 students completed the student consent form. The combined assent and consent forms was 280 (4.2%), which represents the number of students that could have served as participants. The number of survey responses received (267) was less than the number of eligible participants. The school enrollments, received forms, and number of participants are shown below in Table 6.

Table 6

Comparisons: School Enrollments, Eligible Participants, Survey Responses

School	Total High School Enrollment	Parent/ Guardian Consent Forms Received	Student Assent Forms Received (Ages 14-17)	Student Consent Forms Received (Age 18 and up)	Survey Responses Received
Alma High School	1,020	74	40	4	44
County Line High School	243	16	3	1	4
Fort Smith Southside High School	1,794	98	47	4	45
Greenwood High School	1205	88	33	0	27
Hackett High School	359	25	23	0	22
Lavaca High School	256	33	31	25	56
Mansfield High School	246	9	8	0	7
Mountainburg High School	201	21	4	1	4
Mulberry/Pleasant View High School	126	19	15	3	18
Ozark High School	694	26	19	0	18
Scranton High School	206	4	4	0	4
Westside High School	348	6	5	10	15
No Response*	-	-	-	-	3
Totals	6,698	419	232	48	267

Note. The dash represents the information in the corresponding columns is not applicable due to survey responses received with questions that did not have a response.

*Three participants did not select a school when completing the survey; the district is not identifiable.

Participants in this study consisted of 53 (19.9%) of grade 9 students, 65 (24.3%) of grade 10 students, 70 (26.2%) of grade 11 students, 77 (28.8%) of grade 12 students, and 2 (0.7%) students that did not respond with the grade level. There were 146 (54.7%) female and 119 (44.6%) male participants with 2 (0.7%) students who did not respond to the gender question. The breakdown in high school enrollment percentages for the GFESC region has 2% more male than female students in grade grades 9-12. However, of the students who served as participants for this study, there were 10.1% more females than males.

Participants were asked to select their race, and the breakdown in participants by race for this study are as follows: 25 (9.4%) two or more races; 1 (0.4%) Asian; 2 (0.7%) Black; 4 (1.5%) Hispanic; 6 (2.2%) Native American; 0 (0%) Native Hawaiian/Pacific Islander; 226 (84.6%) White; and 3 (1.1%) no response. Categorized another way (White vs. non-White), the racial breakdown of this sample was 226 (84.6%) White; 38 (14.2%) non-White; and 3 (1.1%) no response. In analyzing the data, the researcher chose to combine the non-White groups due to a large group of respondents that selected White. In public school reporting, values lower than 10 are often categorized as restricted values for providing confidential and anonymous data regarding student responses and/or performances. Collapsing the race categories into White vs. non-White provided for a more comprehensive comparison between the groups. The participant demographics are shown in Table 7.

Table 7

Participant Demographics Table

		Number of Participants	Percent of Participants
Grade			
	9	53	19.9%
	10	65	24.3%
	11	70	26.2%
	12	77	28.8%
	No response	2	<1%
Totals		267	100%
Gender			
	Female	146	54.7%
	Male	119	44.6%
	No response	2	<1%
Totals		267	100%
Race			
	2 or more races	25	9.4%
	Asian	1	<1%
	Black	2	<1%
	Hispanic	4	1.5%
	Native American	6	2.2%
	Native Hawaiian/Pacific Islander	0	0
	White	226	84.6%
	No response	3	1.1%
Totals		267	100%
Race: Comprehensive Comparison			
	Non-White	226	14.2%
	White	38	84.6%
	No response	3	1.1%

Totals	267	100%

This study was designed to represent Arkansas' high schools. When analyzing the demographics within the sample, the researcher compared the focus area (GFESC), state, and the study's participant demographics. The representation of the genders had less than a 10% difference when comparing the GFESC enrollment percentages to the participants' percentages; 7% more females and 6% less males were represented in the study than the total percentages within the GFESC. The variances in race between the focus area, state, and participants' demographics was widened. The state percentage of White high school students is 25% less than the percentage of White participants in this study. Although the focus area had a 7% larger White enrollment than the state average, the participants' White percentage is 18% larger than the total percentage within the GFESC. Additional populations' information of the participants such as socioeconomic status, English Language learner designations, and special education services were not collected due to the age of the participants and to further protect anonymity in the data collection process. The enrollment comparison percentages between the GFESC, state, and participants are shown in Table 8.

Table 8

Enrollment and Participant Demographics Comparison Table

	GFESC High School (9-12) Enrollment Percentages	State Level High School (9-12) Enrollment Percentages	Participant Demographic Percentages
Gender			

Female	48%	-	55%
Male	51%	-	45%
Race			
2 or more races	5%	3%	9%
Asian	3%	2%	<1%
Black	4%	19%	<1%
Hispanic	18%	14%	2%
Native American	1%	6%	2%
Native Hawaiian/Pacific Islander	<1%	<1%	0%
White	67%	60%	85%
Race: Comprehensive Comparison			
Non-White	33%	40%	14%
White	67%	60%	85%
No response*	-	-	1%

Note. Data not available from the Arkansas Department of Education for high school specific categories are recorded with a dash.

*Participants that did not select a race when completing the survey.

Data Analysis

Data was collected electronically and analyzed using IBM SPSS Statistics 29 software. Descriptive statistics, correlations, T-tests, and ANOVA were used for data analysis. The following sections will discuss the findings of the study.

Findings

The following section outlines the analysis of data and findings for each of the four research questions in the study. Additional findings are also included with relevant information that was recorded during data analysis.

The statistical testing that was used for this study were correlations, t-tests, and ANOVAs. Spearman rho correlations were conducted to determine if there were

relationships between variables; it is appropriate because the variables were ordinal (Knapp, 2017). Ordinal variables are data that has importance to the order, but the distance between the intervals is not continuous (Knapp, 2017).

Research Question 1. The first research question was *How are the availability and use of vaping devices related between teens and their peers at school?* The purpose of this question was to determine if a relationship exists between exposure and the use of vaping devices in teens. Hypotheses one and two in this study were associated with this research question.

Hypothesis 1. *Exposure to vaping devices at school and teens' vaping use are positively correlated.* "Exposure to vaping devices at school" was measured using participants' responses to questions 12 ("Describe the on-campus location you saw vaping devices. For this question, consider vaping devices not being used but just visible to you. Check all that apply: Parking lot, Hallways, Classrooms, Restrooms, Locker rooms, Lunchroom, Bus Stop, Inside the bus, Other") and 13 ("Describe the on-campus location you saw vaping devices being used. Check all that apply: Parking Lot, Hallways, Classrooms, Restrooms, Locker rooms, Lunchroom, Bus stop, Inside the bus, Other.").

"Teens' vaping use" was calculated using participants' responses to question 6 ("Have you ever tried vaping? I have tried vaping once.; I have tried vaping more than once.; I have never tried vaping") and question 7 ("During the past 14 days, how many days did you use a vaping device?"). Combining the answers to both questions allowed the variable of "use" to be categorized in one of three ways: never, once, or more than once.

A Spearman rho correlation was conducted to test this hypothesis. The variables for this correlation were use and exposure. Both variables represent ordinal variables because they were measured using non-continuous scales. A significant and positive relationship between the exposure and the use of vaping devices was found ($r = 0.129$; $p = 0.05$). Therefore, a relationship between teens who were exposed to vaping devices and their use of the devices was evident in this study—put another way, the more a student reported being exposed to vaping, the more they also reported using vaping devices.

Hypothesis 2. *Exposure to vaping devices through close friends is positively correlated to teens' vaping use.* While teens' vaping use was able to be calculated using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device?"), the variable "exposure by close friends" was not testable due to inconsistencies in participants' responses. For example, some participants reported on question 11 of the survey: "I was not exposed to vaping devices in the past 14 days." However, the same participants reported seeing vaping devices in "classrooms and restrooms" on question 12. Thus, their answer to question 12 (indicating where they had been exposed to vaping devices) directly contradicted their answer to question 14 (saying they were never exposed). This was an indication that participants likely did not understand what the question meant about being "exposed." Further, based on these inconsistencies in responses, the researcher was not able to determine who exposed the students to the devices (e.g., a close friend, a family member, etc.). Thus, the researcher was unable to create/code a variable for who exposed the participant to vaping devices. Since one of the variables for this hypothesis was not able to be coded/calculated, the hypothesis was not testable using the data collected for this study.

Research Question 1 Summary. After examining the results from hypothesis testing, the findings indicate a positive relationship between exposure and vaping use exists for the teens in this study. Therefore, the data in this study yields teens' exposure to vaping devices is related to use of vaping devices, but no conclusions can be drawn about who is exposing teens to vaping (due to issues with calculating a variable in H2).

Research Question 2. The second research question was *How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?* This question was intended to determine if a relationship exists between the exposure to vaping devices at home and teens' use of vaping devices. Hypothesis three corresponds to this research question.

Hypothesis 3. *Exposure to vaping devices at home and teens' vaping use are positively correlated.* The variable "exposure to vaping devices at home" was not able to be calculated with the data collected in this study. Using participants' responses to question 10 ("During the past 14 days, how did you get your vaping device? For this question, consider a peer as someone that you know and/or recognize from your school campus; and a close friend is someone that you trust and think of as family, but you are not related. Check all that apply: Purchased at a store.; Purchased on the internet.; Purchased from a peer on campus or at a school related activity.; Purchased from a peer off campus.; Purchased from a close friend on school campus or at a school-related activity.; Borrowed from a peer on school campus or at a school-related activity.; Borrowed from a peer off school campus.; Borrowed from a close friend on school campus or at a school-related activity.; Borrowed from a family member at home.; Borrowed from a family member outside the home.; Other."), descriptions of exposure

did not allow for analysis of whether the student was exposed or not exposed at home. Therefore, the variable could not be calculated. Participants were able to select multiple descriptors for how vaping devices were acquired, which corresponded to how or where the exposure occurred. There were 46 (17%) respondents who reported how they acquired their devices. Analyzing the exposures based on where the devices were acquired, 14 (30%) of those reported exposure in multiple locations with 6 (43%) of the 14 having reported exposure at home as well as other locations. One participant reported stealing a vaping device from a family member inside the home.

"Teens' vaping use" was analyzed using participants' responses to question 6 ("Have you ever tried vaping? I have tried vaping once.; I have tried vaping more than once.; I have never tried vaping.") and question 7 ("During the past 14 days, how many days did you use a vaping device?"). Combining the answers to both questions allowed the variable of "use" to be categorized in one of three ways: never, once, or more than once.

The variables for this research question were use and exposure at home. It was not possible to determine the exposure location with the data collected in this study. Since one of the variables for this hypothesis was not able to be coded for analysis, the hypothesis was not testable using the data collected for this study. The analysis of this hypothesis was performed using the frequencies of participant responses. A frequency table was created to show the findings of use, and exposure to vaping devices based on the acquired location as reported from the participants in this study. The data is shown in Table 9.

Table 9

Use and Exposure Frequencies

		Number of Participant Responses	Percentage of Participant Responses
Use			
	I have never tried vaping.	191	72%
	I have tried vaping once.	33	12%
	I have tried vaping more than once.	41	15%
	No response.	2	<1%
Totals		267	100%
Exposure from acquired location			
	Exposed	46	17%
	Not exposed	157	59%
	No response	64	24%
Totals		267	100%

To test this hypothesis, determining if the exposure occurred at home was needed. However, the responses received did not allow that to be measured because participants were able to select multiple descriptors. Analyzing the exposures was most appropriate through the formation of a frequency table. The summary of how the participants in this study reported obtaining devices is shown in Table 10.

Table 10

Summary of Acquiring Vaping Devices

Participants' Responses to How Vaping Devices are Acquired	Frequency
Purchased at a store.	16
Purchased on the internet.	5
Purchased from a peer on school campus or at a school-related activity.	7

Purchased from a peer off school campus.	9
Purchased from a close friend on school campus or at a school-related activity.	3
Borrowed from a peer on school campus or at a school-related activity.	7
Borrowed from a peer off school campus.	9
Borrowed from a close friend on school campus or at a school-related activity.	7
Borrowed from a family member at home.	5
Borrowed from a family member outside the home.	13
Other (did not acquire a vape responses: none, n/a, don't vape, etc.)	157
No response	64

Research Question 2 Summary. Examination of the results from this research question did not yield any conclusions because the hypothesis was not testable due to data collection issues. However, a breakdown of responses in how teens acquired their devices showed that 30% of those reporting they had acquired devices reported doing so in more than one way.

Research Question 3. The third research question was *How do teens' perceptions of personal health risks influence the use of vaping devices?* The purpose of this question was to determine if teens' perceptions of personal health risks influence their use of vaping devices. Hypotheses four, five, and six were affiliated with this research question.

Hypothesis 4. *The perception that vaping is healthier than traditional smoking and teens' vaping use are positively correlated.* The "perception that vaping is healthier than traditional smoking" was measured using participants' responses to question 14 ("Do you think vaping devices have health risks? Check all that apply: I believe vaping is harmful to teens.; I believe vaping is not harmful to teens.; I believe vaping is healthier than traditional smoking.; I believe vaping does not cause nicotine dependence.; I believe vaping may have health risks, but I have not experienced them so it's not important.;

Other.") and question 15 ("Do you think the type of substance used in a vaping device can impact health? Check all that apply: I believe vaping nicotine is harmful to teens.; I believe vaping nicotine is not harmful to teens.; I believe vaping CBD is harmful to teens.; I believe vaping CBD is not harmful to teens.; I believe vaping THC is harmful to teens.; I believe vaping THC is not harmful to teens.; I believe the various substances may have health risks, but I have not experienced them, so it's not important to me.; Other.").

The "use of vaping devices" by teens was calculated using question 7 ("During the past 14 days, how many days did you use a vaping device?"). Participants were able to select numeric values (0-14) reporting the use of vaping devices within the previous 14 days.

To test this hypothesis, a correlation was conducted to determine if there was a relationship between teens' perceptions of personal health risks and the use of vaping devices. The two ordinal variables for this correlation were use and healthier. Use was measured analyzing if vaping had occurred based on the reported number of times vaping occurred in the past 14 days. Healthier was measured by determining if the participants reported that vaping is healthier than traditional smoking or is not healthier than traditional smoking.

No significant correlation was found between teens' use and perceptions of vaping believed to be healthier than traditional smoking ($r = 0.036$; $p = 0.564$). Therefore, a no relationship existed between these two variables (perceptions of personal health risks and teens' use of vaping devices) for the participants in this study.

Hypothesis 5. *The perception that vaping does not result in nicotine dependence and teens' vaping use are positively correlated.* The "perception that vaping does not result in nicotine dependence" was measured using participants' responses to question 14 ("Do you think vaping devices have health risks? Check all that apply: I believe vaping is harmful to teens.; I believe vaping is not harmful to teens.; I believe vaping is healthier than traditional smoking.; I believe vaping does not cause nicotine dependence.; I believe vaping may have health risks, but I have not experienced them, so it's not important.; Other."). "Teens' vaping use" was calculated as described above using the responses of how many days vaping devices were used in the past 14 days. This data was reported by the participants in question 7.

A correlation was set up to explore if the perception that vaping does not result in nicotine dependence is relational to teens' vaping use. The two variables for this correlation were ordinal: use and dependence. Once again, use was measured analyzing if vaping had occurred based on the reported number of times vaping occurred in the past 14 days. Dependence was measured by analyzing the participants' responses of yes (belief that vaping does not cause nicotine dependence) and no (belief that vaping does cause nicotine dependence). A significant and positive relationship between the belief that vaping does not cause nicotine dependence and teens' vaping use was found ($r = 0.187$; $p = 0.01$). Therefore, a relationship between the perceptions that vaping does not result in nicotine dependence and teens' use of the devices was evident in this study. Put more plainly, if teens reported believing that vaping does not cause nicotine dependence, they also reported more usage of the vaping devices.

Hypothesis 6. *The perception that vaping is not harmful and teens' vaping use are positively correlated.* The "perception that vaping is not harmful" was measured using participants' responses to question 14 ("Do you think vaping devices have health risks? Check all that apply: I believe vaping is harmful to teens.; I believe vaping is not harmful to teens.; I believe vaping is healthier than traditional smoking.; I believe vaping does not cause nicotine dependence.; I believe vaping may have health risks, but I have not experienced them, so it's not important.; Other.").

"Teens' vaping use" was calculated using data taken from question 7 as described above. The participants reported how many days vaping devices were used in the past 14 days.

The final correlation for this research question was conducted to determine if a relationship is evident between the perception that vaping is not harmful and teens' vaping use. This correlation contained two ordinal variables: use and harmful. Use was measured analyzing if vaping had occurred based on the reported number of times vaping occurred in the past 14 days. Harmful was measured using two categories defined as yes (belief that vaping is harmful) and no (belief that vaping is not harmful). No significant correlation was found between teens' use and the perception that vaping is believed to be harmful ($r = -0.026$; $p = 0.676$). Therefore, a no relationship existed between these two variables (the perception that vaping is not harmful and teens' use of vaping devices) for the participants in this study.

Research Question 3 Summary. The results of the statistical analyses for hypotheses four, five, and six varied. The findings indicate a positive relationship between the belief that vaping does not cause nicotine dependence and teens' vaping use.

The analyses also revealed that a relationship is not evident for the perceptions of personal health risks and teens' use of vaping devices or the perception that vaping is not harmful and teens' use of vaping devices.

Research Question 4. The final research question was *How do vaping use and exposure vary by student demographics?* The purpose of this question was to determine if demographic factors (gender, grade level, race, and access) affect vaping use and exposure. Hypotheses 7-13 were associated with this research question.

The statistical tests used to analyze this research question were t-tests and ANOVAs. A t-test was used to determine if statistical significance differences between the means of the two variables was evident (Knapp, 2017). When testing the hypotheses with more than two groups, ANOVAs were conducted. An ANOVA is a statistical test that allows for comparisons of three or more groups using independent and dependent variables (Knapp, 2017). The statistical findings from testing the hypotheses corresponding to this research question are described below.

Hypothesis 7. *There is no difference in vaping use between males and females.* Gender (independent variable) was measured using participants' responses to question 4 ("What is your gender? Male or Female"). Use (the dependent variable) was calculated using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device? 0-14 numerical value options").

A t-test was conducted using the variables gender and use. When comparing females and males, the t-test analysis indicated a significant difference in the mean scores for gender [$t(263) = 1.286$; $p = 0.013$]. Thus, the mean use score for males ($M = 0.33$; SD

= 1.752) was significantly lower than the mean use score for females (M = 0.71; SD = 2.853). This showed females used vaping devices more than males in this study.

Hypothesis 8. *There is no difference in vaping exposure between males and females.* As described above, the exposure variable was conflicted and not testable due to inconsistencies in the participants' responses. Thus, the researcher was not able to analyze exposure to vaping devices between genders using the data collected in this study.

Hypothesis 9. *There is no difference in vaping use between students in different grades.* Grade level (independent variable) was measured using the participants' responses from question 3 ("What grade are you currently in? 9, 10, 11, or 12"). Use (dependent variable) was measured using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device? 0-14 numerical value options").

The statistical test used for testing this hypothesis was an ANOVA with the variables representing grade level and use. There was no significant difference between the mean use scores by grade level [$F(3, 261) = 0.448$; $p = 0.719$]. However, descriptives show that grade 9 participants in this study used vaping devices less (M = 0.28; SD = 1.925) than students in grades 10 (M = 0.77; SD = 2.627), 11 (M = 0.44; SD = 2.217), and 12 (M = 0.54; SD = 2.414).

Hypothesis 10. *There is no difference in vaping exposure between students in different grades.* This hypothesis was not testable due to previously described issues in measuring exposure in this study.

Hypothesis 11. *There is no difference in vaping use between students of different races.* Race (independent variable) was measured using the participants' responses from question 5 ("What is your race?"). The dependent variable, use, was measured using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device? 0-14 numerical value options").

As described previously, in analyzing the responses of the participants regarding race, a large group of respondents selected White. An attempted ANOVA analysis returned errors with homogeneity of variance testing because the number of students who selected two or more races, Asian, Black, Hispanic, Native American, and Native Hawaiian/Pacific Islander was so small. Thus, the researcher again chose to create a dichotomous variable (White vs. Non-White; also described previously) to allow for a more comparable comparison between the groups. When comparing races (White and non-White), the mean use score for White ($M = 0.36$; $SD = 1.939$) was lower than the mean use score for non-White ($M = 1.29$; $SD = 3.841$). The t-test analysis revealed a significant difference in the mean scores for race [$t(262) = -2.293$; $p < 0.023$], indicating that non-White students in this study reported vaping at a higher rate than White students in this study.

Hypothesis 12. *There is no difference in vaping exposure between students of different races.* As described previously, the researcher was not able to analyze this hypothesis because exposure was not able to be calculated/determined due to issues with data collection in this study.

Hypothesis 13. *There is no difference in how students get access to vape devices between peers and family members.* Access groups (independent variable) was measured

using the participants' responses to question 10 ("During the past 14 days, how did you get your vaping device? For this question, consider a peer as someone that you know and/or recognize from your school campus; and a close friend is someone that you trust and think of as family but you are not related. Check all that apply: Purchased at a store.; Purchased on the internet.; Purchased from a peer on school campus or at a school-related activity.; Purchased from a peer off campus.; Purchased from a close friend on school campus or at a school-related activity.; Borrowed from a peer on school campus or at a school-related activity.; Borrowed from a peer off school campus.; Borrowed from a close friend on school campus or at a school-related activity.; Borrowed from a family member at home.; Borrowed from a family member outside the home. Other."). The researcher collapsed the responses and recategorized them into four access points: 1) purchased at a store; 2) purchased and/or borrowed from a peer and/or close friend; 3) purchased and/or borrowed from a family member; 4) multiple access points. The dependent variable was use and was measured using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device? 0-14 numerical value options").

An ANOVA test was conducted to analyze the differences between the variables, access groups, and use. There was no significant difference in how the participants from this study access vaping devices [$F(3, 38) = 1.037$; $p = 0.387$]. However, in a comparison of the various access groups, the mean use scores for the various groups are as follows: purchased at a store ($M = 3.36$; SD 5.240); purchased and/or borrowed from a peer and/or close friend ($M = 2.13$; $SD = 4.853$); purchased and/or borrowed from a family member ($M = 2.29$; $SD = 5.219$); multiple access points ($M = 5.89$; $SD = 6.194$). The descriptives

show that students with multiple access points have a higher mean use score; meaning, they have a higher average of vaping device use as reported by the participants in this study (though it was not statistically significant).

Research Question 4 Summary. After reviewing the results from hypothesis testing, the findings indicate a significant difference in the mean scores for gender showing that females use vaping devices more than males for teens in this study. Also, a significant difference was revealed when comparing races and the relationship between vaping use – non-White students reported vaping more than White students in this study.

No significant differences were evident between grade levels and students' vaping use or between access groups and vaping use when responses received from participants in this study were analyzed. No conclusions could be drawn between genders, grade levels, or race when determining if a relationship exists with vaping exposure in those three demographic areas due to issues with calculating the variable "exposure" in H8, H10, and H12.

Additional Findings. Analysis of the data provided relevant information that fell outside the realm of the four research questions for this study. Data that was reported by the participants in this study included daily vaping use, substances used in vaping devices, and exposures to vaping devices on campus as described in the following sections.

Vaping Use. The variable use was measured using participants' responses to question 7 ("During the past 14 days, how many days did you use a vaping device? 0-14 numerical value options"). Studying the frequencies for responses to question 7 shows the variances in vaping use as reported by the participants in this study. Less than 10% of

participants reported using a vaping device within the past 14 days. The 14-day vaping use frequencies, as reported in this study, are as shown in Table 11.

Table 11

Vaping Use: 14-day Frequencies

14-day Vaping Use Responses (Q7: During the past 14 days, how many days did you use a vaping device?)	Frequency	Frequency Percentages
0	243	91.0%
1	5	1.9%
2	4	1.5%
3	3	1.1%
4	1	<1%
5	0	0%
6	0	0%
7	1	<1%
8	0	0%
9	0	0%
10	0	0%
11	0	0%
12	1	<1%
13	0	0%
14	7	2.6%
No response	2	<1%
Totals	267	100%

When the researcher was conducting analyses involving the variable "use," responses to survey question 8 ("How many times per day did you use a vaping device? Consider each time per day representing approximately 15 puffs. 0-20 numerical value

options") were not usable/useful due to inconsistencies in corresponding questions. For example, one respondent reported "I have never tried vaping" (Q6) but then reported using a vaping device "2" days within the past 14 days (Q7) followed by using the device "1" time per day (Q8). Although a few respondents provided inconsistent answers, the number of times per day that students reported as having used a vaping device is important information to note. While the vast majority (85.8%) of participants in this study reporting they used a vaping device 0 times per day or responded with "I don't vape," 23 (8.6%) students reporting using a vaping device more than 1 time per day. Vaping use as reported in question 8 is shown in Table 12.

Table 12

Vaping Use: Times per Day

Daily Vaping Use Responses (Q8: How many times per day did you use a vaping device?)	Frequency	Frequency Percentages
0	229	85.8%
1	10	3.7%
3	6	2.2%
5	4	1.5%
7	1	<1%
10	2	<1%
15	2	<1%
17	2	<1%
20	1	<1%
30	1	<1%
20+	2	<1%
More than I can count	2	<1%
No response	5	1.9%

Totals	267	100%

Vaping Substances. Survey question 9 ("On the days that you vaped in the past 14 days, what type of substance did your vaping device(s) contain? Check all that apply: Nicotine; CBD; THC; I am not sure.; Other.") yielded data regarding what students were vaping. There were 208 responses to Q9, which includes 77.9% of all participants in the study. Analyzing the responses regarding vaping substances, 156 (75.0%) of the responses were representative of students who do not vape, which were reported as "none, n/a, don't vape, nothing." The remaining 52 responses represent substances vaped as reported by the teens in this study and are shown in Table 13.

Table 13

Vaping Use: Substances

Vaping Substances Used (Q9: On the days that you vaped in the past 14 days, what type of substance did your vaping device(s) contain?)	Frequency of Reported Substances	Frequency Percentages of Reported Substances
Nicotine	33	63.5%
CBD	0	0%
THC	3	5.7%
I am not sure.	15	28.8%
Other: ("Shrooms")	1	1.9%%
Totals	52	100%

Vaping Exposure: Visibility. Question 12 ("Describe the on-campus location you saw vaping devices. For this question, consider vaping devices not being used but just visible to you. Check all that apply: Parking lot, Hallways, Classrooms, Restrooms. Locker rooms. Lunchroom, Bus stop, Inside the bus, Other.") was designed by the

researcher to gather information regarding exposure to vaping devices. The term exposure in the question considered if the devices were only visible on campus. The school campus for the question represented any affiliation with the school facilities and/or travel to/from the campus.

The responses to this question provided insight to the visibility of vaping devices on school campus. A total of 232 (86.9% of the 267 participants) responses were recorded for this question. Of the recorded responses, 113 (48.7%) of the respondents reported seeing vaping devices in more than one location; 57 (24.5%) reported seeing vaping devices in only one location. Participants were able to check multiple locations where they have seen vaping devices with 62 (26.7%) of the responses representing students who reported they have not been exposed to vaping devices. Sample responses for these students included "did not see; have not seen; I didn't see any; n/a; none." Some respondents reported "other" and the locations they described as seeing vaping devices were "Performing Arts Center; Gym; outside under the pavilion; alley between schools; band room; office." The frequencies of locations that vaping devices were visible to the students in this study are shown in Table 14.

Table 14

Exposure: On Campus Visibility

Exposure: On Campus Visibility (Q12: Describe the on-campus location you saw vaping devices. For this question, consider vaping devices not being used but just visible to you.)	Frequency of Reported Locations
Parking lot	81
Hallways	40
Classrooms	77

Restrooms	140
Locker rooms	32
Lunchroom	41
Bus stop	25
Inside the bus	49
Other	6
Totals	491

Table 14 reveals that students saw the devices in “restrooms” more than any other location on their school campus. As shown in the table, the parking lot was the second location with the most exposure, but “inside classrooms” was only four occurrences behind. With the variances in the responses, due to multiple locations being reported by some of the respondents, the information was not testable to determine if any relationship(s) exist between the demographics or “perceptions of health risks” groups.

Vaping Exposure: Use. Survey question 13 (“Describe the on-campus location you saw vaping devices being used. Check all that apply: Parking lot, Hallways, Classrooms, Restrooms. Locker rooms. Lunchroom, Bus stop, Inside the bus, Other.”) was intended, by the researcher, to gather information regarding exposure by considering if the devices were being used on campus. The responses offered insight into where participants saw vaping devices being used on their school campus. Out of the 267 total participants in this study, 233 (87.2%) total responses were recorded for this question. From the responses, 100 (42.9%) of the respondents reported seeing vaping devices being used in more than location; 73 (31.3%) reported seeing vaping devices being used in only one location. The question contained checkboxes for respondents to report where they had seen vaping devices being used on campus. Sixty of the respondents reported not

being exposed to devices being used; some of their responses were “I haven’t seen any; n/a; none; nowhere; have not personally seen anyone vaping; did not see anyone vaping.” Responses that were reported by participants who checked “other” included: “Gym; Performing Arts Center; under the pavilion, students’ cars, band room; alley between schools.” The frequencies of locations where students in this study reported seeing vaping devices being used are shown in Table 15.

Table 15

Exposure: On Campus Use

Exposure: On Campus Use (Q12: Describe the on-campus location you saw vaping devices being used.)	Frequency of Reported Use
Parking lot	84
Hallways	34
Classrooms	69
Restrooms	136
Locker rooms	35
Lunchroom	38
Bus stop	23
Inside the bus	43
Other	6
Totals	468

As shown in Table 15, “restrooms” were the leading location where vaping use was seen by the students in this study. The “parking lot” was the second most frequently reported location for seeing vaping use. The variances in these responses from respondents choosing more than one location made the information not testable to

determine if any relationships exist between the demographics or perceptions of health risks' groups.

Summary

This chapter presented results of this quantitative study that sought to understand the relationship between how the availability of vaping devices and student use are related. A description of the sample included demographic information for the participants. The demographic data were reported using frequency tables that reported counties, schools, survey responses by school, grade level, race, and participant demographics. Four research questions were addressed, along with 13 hypotheses.

To analyze if a relationship existed between the availability and use of vaping devices at school, correlations, t-tests, and ANOVAs were used as the methods of statistical testing. Table 16 summarizes the findings as correlated to each research question and its hypotheses.

Table 16

Summary of Findings

Research Question	Hypotheses	Statistical Test	Findings
RQ1: How are the availability and use of vaping devices related between teens and their peers at school?	H1: Exposure to vaping devices at school and teens' vaping use are positively correlated. Variables: exposure; use	Correlation	Significant and positive relationship (the more a student was exposed, the more vaping use occurred)
	H2: Exposure to vaping devices through close friends is positively	Correlation	No conclusion (exposure variable not codable)

	correlated to teens' vaping use. Variables: exposure; use		
RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?	H3: Exposure to vaping devices at home and teens' vaping use are positively correlated. Variables: exposure; use	Correlation	No conclusion (exposure variable not codable) Frequency tables reported use, exposure, and access
RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?	H4: The perception that vaping is healthier than traditional smoking and teens' vaping use are positively correlated. Variables: healthier; use	Correlation	No significant correlation was found
	H5: The perception that vaping does not result in nicotine dependence and teens' vaping use are positively correlated. Variables: dependence; use	Correlation	Significant and positive relationship
	H6: The perception that vaping is not harmful and teens' vaping use are positively correlated. Variables: harmful; use	Correlation	No significant correlation was found
RQ4: How do vaping use and exposure	H7: There is no difference in vaping use	T-test	Significant difference (females use vaping

vary by student demographics?	between males and females. Variables: gender (IV); use (DV)		devices more than males).
	H8: There is no difference in vaping exposure between males and females. Variables: gender (IV); exposure (DV)	T-test	No conclusion (exposure variable not codable)
	H9: There is no difference in vaping use between students in different grades. Variables: grade (IV); use (DV)	ANOVA	No significant difference
	H10: There is no difference in vaping exposure between students in different grades. Variables: grade (IV); exposure (DV)	ANOVA	No conclusion (exposure variable not codable)
	H11: There is no difference in vaping use between students of different races. Variables: race (IV); use (DV)	ANOVA	Significant difference (non-White students reported vaping at a higher rate than White students)

H12: There is no difference in vaping exposure between students of different races. Variables: race (IV); exposure (DV)	AVOVA	No conclusion (exposure variable not codable)
H13: There is no difference in how students get access to vape devices between peers and family members. Variables: access group (IV); use (DV)	ANOVA	No significant difference

CHAPTER V

DISCUSSION

The purpose of this quantitative, correlational, cross-sectional study was to understand the relationship between the availability of vaping devices and student use in Western Arkansas public high schools. Arkansas' public schools continue to face increases in teen vaping use according the 2022 Arkansas Prevention Needs Assessment (APNA) survey (Arkansas Department of Human Services, 2021). Despite the state's efforts to prevent youth from vaping and an Arkansas law that prohibits the sale to persons under the age of 18, a 2023 report from the American Lung Association found 19.6% of high school students reported using vaping devices (Montgomery, 2023).

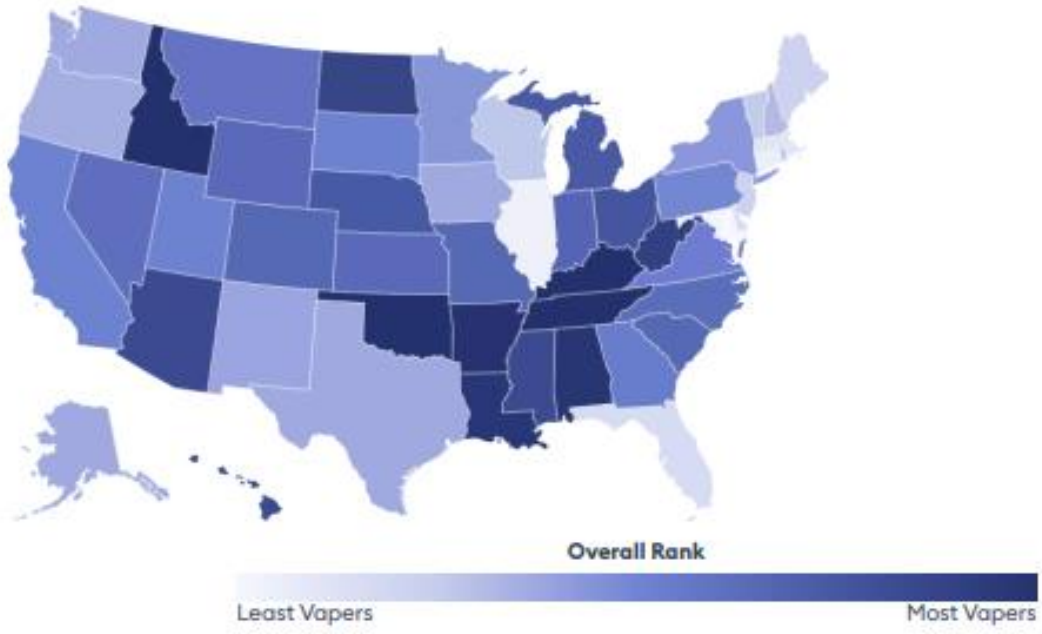
The concern of teen vaping is widespread across the nation; a 2024 report shows that 12.6% of high school students reported using tobacco products with vaping being the most common (Kilroy, 2024). By comparison, the percentage of Arkansas' high school students having reported vaping is 7% higher than the national average. With the increase of teens vaping in Arkansas, specific research is needed to understand this phenomenon. This study sought to explore vaping exposure and student use in select Arkansas schools by analyzing data that was collected regarding student demographics, personal beliefs, and access on school campus, at school activities, and in the home, or through peers.

When examining exposure to vaping devices, the study sought to understand where teens are exposed and how they access their devices. "Arkansas is ranked 5th in the nation for having the most vapers; 5.8% of adults vape every day" (Kilroy, 2024, para. 4).

The national map, as shown in Figure 2, provides a visual of vaping use across the United States; Arkansas is shown as one of the states with the most vapers.

Figure 2

States With the Most and Least E-Cigarette Use



Note: Forbes Advisor (Kilroy, 2024)

It is vital to better understand how the availability and use of vaping devices are related as well as understanding if the availability and access of vaping devices impact student use. Four research questions guided the study:

RQ1: How are the availability and use of vaping devices related between teens and their peers at school?

RQ2: How are the availability and use of vaping devices related between teens and their exposure to use by family members at home?

RQ3: How do teens' perceptions of personal health risks influence the use of vaping devices?

RQ4: How do vaping use and exposure vary by student demographics?

This chapter provides a summary of the findings followed by a discussion of the study. Within the discussion section, implications for practice and future research will be explored. The final section of the chapter will end with a summary.

Summary of Findings

The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. Research question one explored if a relationship exists between the exposure to and the use of vaping devices in teens. After examining the results of the correlation, the findings indicated a positive relationship between exposure and vaping use exists for the teens in this study. More plainly, the more a student reported being exposed to vaping, the more they also reported using vaping devices. Hypothesis two was not testable using the data collected because the researcher was unable to code a variable for exposure of the participant.

Research question two was designed to determine if a relationship exists between the exposure to vaping devices at home and teens' use of vaping devices. The testing of hypothesis three required exposure at home to be measured and due to data collection issues, this was not possible. Therefore, no conclusions were determined.

Research question three aimed to determine if teens' perceptions of personal health risks influence their use of vaping devices. In testing hypothesis four, a correlation revealed that no relationship existed between the perceptions of personal health risk and teens' use of vaping devices for the participants in this study. Testing hypothesis five

showed a significant and positive relationship exists between the belief that vaping does not cause nicotine dependence and teens' vaping use. Clarified, if teens reported believing that vaping does not cause nicotine dependence, they also reported more usage of the vaping devices. No significant correlation was found between teens' use and the perception that vaping is believed to be harmful. Therefore, hypothesis six was rejected for the participants in this study because no relationship existed between the perception that vaping is not harmful and teens' use of vaping devices.

Research question four explored if demographic factors (gender, grade level, race, and access) affects vaping use and exposure through hypotheses 7-13. A t-test analysis indicated a significant difference in the mean scores for gender; the results showed females used vaping devices more than males in this study. The results from an ANOVA yielded no significant difference between grade levels, but descriptives show grade nine students use vaping devices less than the other grade levels. A second t-test analysis revealed a significant difference in the mean scores for race, which indicated that for the participants in this study, non-White students reported vaping at a higher rate than White students. The hypotheses that examined the differences in vaping exposure between gender, grade levels, and race were not testable due to data collection issues within the study. The final ANOVA test showed no significant difference in how the participants from this study access vaping devices. However, the descriptives show that students with multiple access points have a higher average of vaping device use as reported by the participants in this study.

Further discussion of the key findings, as identified by the researcher, will be described with detailed explanations in the next section. Following the discussion section,

the researcher will discuss implications for future practice and research. This chapter will conclude with a summary.

Discussion

The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. The overall findings of this study were presented in the previous section. The researcher has identified four key findings from this study: 1) Vaping is prevalent on school campuses in Western Arkansas, 2) Vaping exposure occurs in multiple locations on school campuses, 3) Vaping exposure and use are positively correlated, and 4) Females reported vaping more than males do. Each key finding is discussed below.

Vaping Prevalence on School Campuses in Western Arkansas

Although Arkansas law and local policies are in place to prohibit tobacco use on school campus (National Association of State Boards of Education, 2021), this study shows that vaping is occurring on school campuses for the districts represented in the data. Research questions one and two explored teens' vaping use and the corresponding survey questions were questions six, seven, and eight. Most students in this study reported not vaping as shown in Table 17.

Table 17

Summary of Teens' Reporting No Vaping Use

Survey Question	No Vaping Use Response	Percentage of Participant Responses
6) Have you tried vaping?	I have never tried vaping.	72%
7) During the past 14 days, how many days did you use a vaping device?	0	92%
8) How many times per day did you use a vaping device?	0	86%

Although a large percentage of the participants in this study reported no vaping use, the survey data shows that it is occurring on school campuses. By comparison (not including no responses), in survey question 8, 26% of the participants reported having tried vaping once or more than once; survey question 7 yielded 8% of the respondents had used a vaping device at least 1 day within the past 14 days; and question 8 reported 12% as having used a vaping devices 1-20+ times per day.

Through analysis of these survey questions, the variable "use" had some inconsistent responses in the data. An example can be described as this: one respondent reported, "I have never tried vaping" (Q6) but then reported using a vaping device "2" days within the past 14 days (Q7) followed by using the device "1" time per day (Q8). A different example of inconsistences within the data is a different respondent's answers: "I have tried vaping once" (Q6) but then reported using a vaping device "2" days within the past 14 days (Q7) followed by using the device "1" time per day (Q8). One final example of inconsistent answers is: "I have never tried vaping" (Q6) but then reported using a

vaping device “4” days within the past 14 days (Q7) followed by using the device “1” time per day (Q8). Even though some inconsistencies occurred in the collected data, some students self-reported vaping use. Considering 8% of the participants reported using a vaping device within the past 14 days and 12% reported using the device at least once per day, the data shows the percentage of vaping high school students represented in this study is less than the state and national averages. Arkansas is ranked 20th in the nation (24.3%) for the “prevalence of teens currently vaping in every state” (Lombardi, 2023, para. 5). Nationally, the percentage of high school students who vape has decreased in the past year, but the current percentage of high school e-cigarette users is 14.1% (Lombardi, 2023).

With a vast majority of participants representing those who reported not vaping, many students reported seeing it on campus in the form of visible vaping devices or vaping devices being used. When asked to describe the on-campus location where vaping devices were seen (Q12), 73% of the respondents reported seeing the devices on school campus. Survey question 13 asked participants to describe where they saw the vaping devices being used, and 74% of the respondents reported having seen the devices being used in more than location on campus. On-campus for the survey questions represented any affiliation with the school facilities and/or travel to/from the campus, including buses and bus stops.

With a large percentage of high school students in Western Arkansas reporting having seen vaping devices on school campus, the researcher dove into the literature for comparisons within the state and nation. Although specific data for Arkansas schools was not available regarding reports from Arkansas students and vaping visibility, students in

other states report seeing it on their school campuses. A 2019 study conducted in Connecticut reported that 45% of the youth e-cigarette users confirmed using a vape device on school campus (Jackson et al., 2020). A different study in New Jersey reported 49% saw other students vaping on school campuses across the state (Fakeh et al., 2020). The results from this study regarding students in Western Arkansas who reported seeing vaping devices on campus show similar statistics from studies conducted in other states regarding high school vaping.

Vaping Exposure on School Campus

This study found that vaping is occurring on school campuses in Western Arkansas with restrooms being the most common location reported where students are being exposed to the devices. Hypotheses two and three considered exposure to vaping devices and the correlation to vaping use when the exposure occurred through close friends and/or at home. Exposure was explored through survey questions 11, 12, and 13 which asked participants to select where devices were seen/available in the past 14 days and/or where devices were seen being used. Of the students in this study, 23% reported acquiring vaping devices. Of the respondents who reported acquiring devices, 22% reported purchasing them from a peer or close friend on campus, and 30% reported borrowing them from a peer or close friend on campus. When asked to describe the on-campus location where vaping devices were seen (Q12), 49% reported seeing the devices in more than one location. Survey question 13 asked participants to describe where they saw the vaping devices being used, and 43% reported having seen the devices being used in more than one location on campus.

There were some inconsistencies in participants' responses for the exposure-related questions. For example, some participants reported on question 11 of the survey: "I was not exposed to vaping devices in the past 14 days." However, the same participants reported seeing vaping devices in "classrooms and restrooms" on question 12; this was a contradiction that some participants made in answering question 11 about not having been exposed to vaping devices. Another example of an inconsistent response is answering (Q11) "I was not exposed to vaping devices in the past 14 days;" and then reporting seeing the devices in other questions, for example (Q12) "restrooms" and (Q13) "restroom." Once again, reporting having seen devices in the restrooms contradicts not being exposed. Although some survey responses were inconsistent, it was evident that exposure occurred on school campus. In analyzing questions 12 and 13 solely, descriptions of where the exposure was occurring was reported. In this study, question 12 revealed that vaping devices were visible, and the most frequent locations as reported in this study were restrooms (60%), parking lots (35%), and classrooms (33%). Question 13 asked participants to identify where vaping device use was seen on campus, and the top three responses were the same – restrooms (58%), parking lots (36%), and classrooms (30%).

The results of this study revealed that students saw vaping devices in the restrooms more than any other location on school campus; the next most popular locations to see vaping devices were parking lots and classrooms. Jackson's (et al., 2020) study from Minnesota reported that "75% current vaping users used the devices in bathrooms followed by 52% outside on school grounds and 46% in classrooms" (Jackson et al., 2020, p. 4). In New Jersey, similar findings were reported. When questioned about

where vaping on school campus occurs, one student in New Jersey responded by saying "anywhere a teacher is not looking" (Fakeh et al., 2020). Fakeh's (et at., 2020) findings reported vaping use by location on school campuses as "55% in bathrooms and 30% in parking lots" (Fakeh, et al., 2020, p. 4). Arkansas schools have and are continuing to install detectors that will notify designated staff when vaping is detected in the air in locations that staff cannot constantly monitor, meaning someone cannot stay in there every minute of the school day (Savage, 2023). The most common locations that vaping occurs, according to Arkansas school administrators are restrooms, the gym, and locker rooms (Savage, 2023). In additional to the available data in various states, national statistics show the most common places for vaping use on school campus is bathrooms and parking lots, both locations reporting vaping use to be at 34% (Mantey, 2021). The literature shows that schools across the nation are facing this vaping phenomenon on their campuses. The location of where vaping occurs can best be described by most school staff as happening in a "discreet location" over other places that are less discreet such as classrooms (Jackson et al., 2020, p. 5). The findings in this study were similar to what the research shows to be true in other states regarding the locations of where vaping on school campuses takes place. The participants in this study reported restrooms, more than any other location, as the place where students saw vaping use.

Vaping Exposure and Use

For participants in this study, the more a student reported being exposed to vaping, the more they also reported using vaping devices (see hypothesis one). In this study, exposure on school campuses was defined as students seeing other students with the devices and/or seeing other students using the vaping devices. This is important

because experiencing the sight of other students' behaviors may influence one's behaviors according to Bandura's (1986) Social Cognitive Theory (SCT), which provided a theoretical perspective for this study. SCT focused on self-efficacy and the confidence a person exhibits regarding choices and behaviors. According to SCT, if a person lacks self-efficacy, he or she is forced to rely on peers and/or family members to guide decision making and serve as a direct influence on behaviors and beliefs (Bandura, 1986).

When a student observes vaping on a school campus, that experience reinforces the mindset that it is socially acceptable and may influence vaping use by peers (Mantey, 2021). When students are around their peers, some teens have described "peer pressure" as a reason for experimentation with vaping (Santistevan, 2016; p. 72). According to the 2021 National Youth Tobacco Survey (NYTS), "peer use and curiosity were the most commonly cited reasons" (p. 11) for the initial experimentation of e-cigarette use (Gentzke et al., 2022). The growing trend of vaping among teens and use on school campus suggests exposure to vaping use among students (Mantey, 2021). These exposures combined with the vulnerability of teens experience due to the influences from their peers reflect an elevation for risk of increased vaping use (Mantey, 2021). This study found that the more a student reported being exposed to vaping, the more they also reported using vaping devices. This is in line with the tenets of SCT as well as Mantey's (2021) study that also reported "exposure to e-cigarette use on school campus was associated with elevated risk for ever and current e-cigarette users among adolescents as well as susceptibility to e-cigarette use among e-cigarette never users" (Mantey, 2021).

Vaping Use by Females

The findings indicated a significant difference in the mean use scores of males and females, with females reporting using vaping devices more than males in this study. When students were asked to self-report vaping usage, 55% of females reported using a vaping device at least 1 day in the past 14 days, compared to 45% of males in this study.

The CDC (2023b) reported that since 2014, "e-cigarettes have been the most commonly used tobacco product among teens" (CDC, 2023b, para. 2). In 2023, 1 out of 10 (10%) high school students reported they had used an e-cigarette within the past 30 days (CDC, 2023b). The CDC (2023b) also reported that for tobacco use of any product, females (14%) lead males (11%) among high school students who are currently using the products. When considering only e-cigarette users, females (12%) once again lead the males (8%), but by a greater margin (CDC, 2023b). The findings in this study are in line with these CDC reports.

Studies have explored reasons that female vaping use exceeds male vaping use. Females report being impacted by environmental influences such as seeing others vape or positive attributes that are displayed in social media advertisements (Davidson & Al-Hamdani, 2023). Additional studies report that females "exhibit unique patterns in their reactions to environments containing e-cigarettes" (Lee & Oh, 2019, para. 2). A Canadian study found that females (45%) explored vaping use at a younger age than males (40%), with curiosity being described as the main reason for using vape products (Dahal, Bhattarai, & Adhikari, 2022). The study from Canada also revealed that the perception of younger people is that vaping is less harmful than traditional cigarette smoking and thus resulted in data that showed increased vaping use in the past 30 days (Dahal, Bhattarai, &

Adhikari, 2022). Some females have reported that the appeal of vaping comes from the variety of flavors and are more likely to experiment with the products (Lee & Oh, 2019). Combining the appeal of the perception that vaping is less harmful than cigarettes and the outside influences that have shown to impact females, these factors make females more likely to be "experimenters" (Groom et al., 2021, p. 4). While there was no correlation between students' perceptions that vaping is healthier and student vaping use in this study, the literature supports the findings of this study that females used vaping devices more than males.

Implications

The purpose of this study was to understand the relationship between how the availability of vaping devices and student use are related. The researcher described four key factors that were significant of the study's findings 1) Vaping is prevalent on school campuses in Western Arkansas, 2) Vaping exposure occurs in multiple locations on school campuses, 3) Vaping exposure and use are positively correlated, and 4) Females reported vaping more than males do. The significance of these findings is the basis for the implications for practice and future research which will be discussed in section below.

Implications for Practice

The following section explores the implications for practice based on the findings from this study. As the study revealed, vaping is present in multiple locations on school campuses across Arkansas and females in this study reported vaping more than their male participants. In addition, exposure to the vaping devices yielded results of increased vaping use. Discussing the relevance of these findings for high school students' families,

school districts, and the State of Arkansas is important due to the influences that those groups have on today's teens who will in turn be our future leaders.

Families. The findings of this study revealed that vaping is happening on school campuses in Western Arkansas. Family education about vaping is critical for being proactive in deterring vaping behaviors (Jeong Choi et al., 2022). Research shows that parents of high school aged children were unaware of their child(ren) vaping, and a study that spanned across eight states showed that more than half of the parents were not able to identify vaping products (Jeong Choi et al., 2022). That same study showed a positive relationship between parental knowledge and how adolescents perceive vaping as harmful (Jeong Choi et al., 2022). Having access to informational brochures about vaping would allow families to become familiar with what vaping is and what products look like. The CDC has a plethora of resources available related to vaping; one example of a family informational brochure is shown in Figure 3 (CDC, 2023c).

Figure 3

E-cigarettes and Youth: What Parents Need to Know Brochure

Note: CDC: Smoking & Tobacco Use (CDC, 2023c)

The CDC (2023c) also encourages families to have conversations with their children about vaping, and here are other tips they challenge families to do: "Set a good example by being tobacco-free.; Try to ensure your child is not exposed to the secondhand smoke or aerosol from any tobacco products, including e-cigarettes.; Talk to your child about why vaping is harmful for them. It's never too late to have that talk.; Let your child know you want them to stay away from all tobacco products, including e-cigarettes because they are not safe for them., Reach out to your child's health care provider for quitting resources" (CDC, 2023c, para. 6). Since vaping is happening on school campuses in Western Arkansas, as the data in this study revealed, parent/guardian

awareness about vaping is important to open lines of communication with their child(ren) about health risks and the dangers of vaping.

School Districts. The findings of this study spotlight the prevalence of vaping devices and students' vaping that occur on school campuses in Western Arkansas. The insights to where vaping devices were seen and seen being used on campus provides school leaders with the knowledge of concerning locations; thus, preemptive measures can be put into place in an effort to detect vaping use among high school students. Nearly half (49%) of the respondents in this study reported seeing vape devices in multiple locations on campus, especially in restrooms, parking lots, and classrooms. Students in this study were also asked to identify the locations where exposure occurred in the form of seeing vaping devices being used, and respondents again reported the same three locations (restrooms, parking lots, and classrooms) most often.

School districts should inform staff of the findings from this study and form teams to make decisions that advocate for systematic changes to combat teens' vaping on school campuses. The average age of students in Arkansas that report experimentation with vaping for the first time is 13.4 years of age (ACHI, 2022). Schools should be diligent in involving staff at both the junior high and high school levels in professional development that should be provided to help school staff become knowledgeable of what vaping devices are, what they look like, and what the health risks are from use. The CDC (2023c) challenges educators to provide students with health-related information regarding tobacco use and specifically the health risks of vaping. A variety of resources are available through the CDC website and a summary of key resources are listed in Table 18.

Table 18

Web Resources for Educators

Web Resources for Educators	
CDC: Electronic Cigarettes https://www.cdc.gov/tobacco/basic_information/e-cigarettes/index.htm?s_cid=OSH_misc_M448	Facts, downloadable resources, fact sheets
FDA: Tobacco Education Resource Library https://digitalmedia.hhs.gov/tobacco/educator_hub?utm_campaign=ctp-connect&utm_content=landingpage&utm_medium=email&utm_source=govdelivery&utm_term=stratcomms	Lesson plans, vaping prevention videos, downloadable classroom materials
ADH: Be Well Arkansas https://www.bewellarkansas.org/	Youth education resources; online, text, or phone support services

Note: (CDC, 2023c).

State of Arkansas. The phenomenon of vaping in high schools is well known across the state; and as a result, the "Tobacco Free Environment" policy that prohibits smoking or tobacco use on school campuses, including vaping, is in place (National Association of State Boards of Education, 2021). In addition, local school districts are required to adopt and enforce a "comprehensive tobacco-free" policy (National Association of State Boards of Education, 2021). Although these state policies are thought to be preventative measures to combat teen vaping, the findings in this study revealed that vaping is still prevalent on high school campuses in Western Arkansas.

Currently, Arkansas does not have a state law regarding flavorings of tobacco products (American Lung Association, 2022), but the state should review the findings of

this study and further investigate usage among teens across the state. The findings regarding the demographic category of gender revealed that 55% of females reported using a vaping device at least 1 day in the past 14 days, compared to 45% of males in this study. An analysis of the data combined with a review of the literature shows that some females are more likely to experiment with vaping products because the variety of flavors are appealing (Lee & Oh, 2019). If flavors were removed from vape devices, it is possible that vaping usage among females in Arkansas could decrease.

As mentioned earlier, family education of vaping related information is crucial to open lines of communication between teens and adults in the home. According to the CDC (2023c), "parents and educators can play an important role in protecting youth from the risks of vaping" (CDC, 2023c, para. 6). The state should partner with school districts to provide informational seminars for families that are facilitated by trained medical professionals to educate families on the health risks of vaping.

Annually, Arkansas public schools conduct the APNA survey. The most recent results show an increase in teen vaping (Arkansas Department of Human Services, 2021). The state should form a team of educators that help design more thorough questions related to vaping. The APNA survey questions access to vaping products by asking if the vaping products were obtained from one of the following ways: "from a friend, bought in a store, from a family member, or other" (Arkansas Department of Human Services, 2021, p. ix). Although this information is of interest to schools and policy makers, more beneficial information for the families and school districts in Arkansas would be to know the various locations of on-campus exposure and impact on student learning. A study in Nevada showed a statistically significant relationship between failing grades and e-

cigarette use among high school students (Rondael, 2023). Previous research considering similar factors nationwide report that lower academic performance can possibly be associated with e-cigarette use (Rondael, 2023). Exploring students' exposure, specifically on school campus, and if relationships exist between students that vape and academic performance will provide valuable information to help the State of Arkansas be a leader in fighting the teen vaping phenomenon.

Implications for Future Research

The purpose of this study was to seek to understand the relationship between how the availability of vaping devices and student use are related. It is apparent that more research is needed to further gain an understanding of how teen vaping is impacting the youth of today. The following section will discuss the inconsistencies within the data of this study and expanding the scope of the study.

Social Desirability Bias. Analysis of the data from this study revealed that some respondents did not respond to various questions throughout the survey. In the recruitment phase, the researcher conveyed anonymity to participants through the consent (adults 18 and older) and assent (youth ages 14-17) forms. Confidentiality was also reiterated within the student recruitment letter and the participant assent and consent to take the survey form. Social desirability bias can be defined as "the tendency to underreport socially undesirable attitudes and behaviors" (Latkin, et al., 2017, p. 2). The number of parent/guardian assent forms received was much greater than the participant consent and assent forms; that leads the researcher to believe that some students chose not to participate due to the topic of vaping. Vaping is an illegal activity for high school students in Arkansas. Students' reluctancy to participate or those participants choosing to

skip specific questions can be described as social desirability bias. Some respondents left the questions blank when asked about vaping use or exposure but then reported seeing vaping devices in various locations on campus. The survey was administered on school campuses under the supervision of school staff. Two participating districts notified the researcher that low participation numbers in those districts were because students did not trust their responses would be confidential, and they were fearful of consequences for answering truthfully. The knowledge that some students were hesitant to participate or answer the survey questions leads to the possibility that vaping use and/or behaviors may have been underreported. Underreporting could have occurred due to students' beliefs that vaping is not socially desirable by the researcher or school staff members assisting with distribution of the survey.

Inconsistencies Within the Data. The instrument for collecting responses was in the form of a digital survey that was created by the researcher, as shown in Appendix G. The survey was designed with intent for high school students to self-report vaping use, exposures, and perceptions about health risks. Though the survey was piloted before being implemented and checked for face validity, inconsistencies in responses made it clear that students did not always understand what was being asked of them. These inconsistencies in responses also made the analysis of the data challenging. Specifically, survey questions 10-13 yielded responses that were occasionally inconsistent regarding how students access their vaping devices, descriptions of exposure to vaping devices, descriptions of exposure to visible vaping devices, and descriptions of exposure to vaping devices being used. Reflecting upon the survey questions and intended responses, the

measurement of access to vaping devices and exposure to vaping devices was problematic and will be discussed next.

Access. The data in this study showed that students have access to vaping devices. However, hypotheses two and three were not measurable. Testing both of those hypotheses required data that described where/whom exposure to vaping devices occurred (H2: close friends; H3: home). The participants' responses to question 10 ("During the past 14 days, how did you get your vaping device? For this question, consider a peer as someone that you know and/or recognize from your school campus; and a close friend is someone that you trust and think of as family but you are not related. Check all that apply: Purchased at a store.; Purchased on the internet.; Purchased from a peer on campus or at a school related activity.; Purchased from a peer off campus.; Purchased from a close friend on school campus or at a school-related activity.; Borrowed from a peer on school campus or at a school-related activity.; Borrowed from a peer off school campus.; Borrowed from a close friend on school campus or at a school-related activity.; Borrowed from a family member at home.; Borrowed from a family member outside the home.; Other.") allowed respondents to select multiple descriptors for how vaping devices were acquired. Due to the various responses and multiple locations selected by some but not all participants (30%), the researcher was not able to analyze where the devices were accessed. One participant reported stealing a vaping device from a family member inside the home, and 43% of the respondents reported vaping exposure at home, which could be inferred that access was available in the home.

With the data's inconsistences, better questioning could have yielded more reliable and relevant information. Splitting the one question, regarding access, into a few

related questions could provide a better description of how the devices are accessed; for example, replace survey question 10 with "During the past 14 days, how did you get your vaping device? Purchased, Borrowed, Other." The following questions would be provided based upon the responses to Q10: For respondents who selected purchased, an additional question that corresponds would ask them to "select your place of purchase: store, internet, or on campus." For respondents who selected borrowed, an additional question that corresponds would ask "select where you borrowed it from: on campus, home, other." For respondents who selected other, they would be asked to explain. For respondents who selected "on campus," additional questions would probe locations of access and who, if anyone, assisted with the acquisition. Additionally, incorporating open ended questions for students to describe experiences with accessing vaping devices could provide valuable information. In future studies, questions designed like this could yield more specific results and allow the researcher to test hypotheses that explore where and from whom vaping devices are accessed.

Exposure. The measurement of exposure afforded the researcher many challenges due to the wording in the survey questions and responses received from the respondents. Exposure was able to be measured through analysis of the responses to question 10, which reported where the vaping devices were acquired. However, determining the location of the exposure or who exposed the respondents was unable to be determined. Survey questions 11-13 in this study were designed to gather data regarding exposure to vaping devices, exposure to visible vaping devices, and exposure to vaping devices being used. However, analysis of the responses to questions 11-13 conveyed that exposure was happening on school campuses, but with the option to select multiple descriptors, coding

the variable to test the hypotheses corresponding to exposure was not possible. Hypotheses 2, 3, 8, 10, and 12 were not able to be tested because of the inability to code the data numerically.

When looking at the responses to determine exposure, it is possible that some respondents did not understand what the survey questions were asking. An example of contradictory data was that some participants reported on question 11 of the survey: "I was not exposed to vaping devices in the past 14 days." However, the same participants reported seeing vaping devices in "classrooms and restrooms" on question 12. Thus, their answer to question 12 (indicating where they had been exposed to vaping devices) directly contradicted their answer to question 14 (saying they were never exposed). Four other examples of contradictory data were the corresponding responses of 1) "I was not exposed to vaping devices in the past 14 days" but reported seeing vaping devices and vaping devices being used in the "parking lot." 2) "I was not exposed to vaping devices in the past 14 days" but reported seeing vaping devices in the "parking lot and bus stop" as well as vaping devices being used at the "bus stop." 3) "n/a" but reported seeing vaping devices in the "parking lot, classrooms, restrooms, locker rooms, lunchroom" as well as saw vaping devices being used at "parking lot, classrooms, restrooms, locker rooms, lunchroom, inside the bus." 4) "never interested in getting into trouble" with no responses to the on-campus locations of exposure. The researcher could have broken the questions into multiple smaller questions with single response options to provide clearer data as to where and how often the vaping devices were being seen and/or used on campus. An example of a more thorough question would be Did you see vaping devices at school within the past 14 days? followed with questions of who was vaping (close

friends, peers, other) and then location questions following each "who" response. This type of questioning would yield more specific and usable data regarding the locations of exposures and by whom for the occurrences on campus.

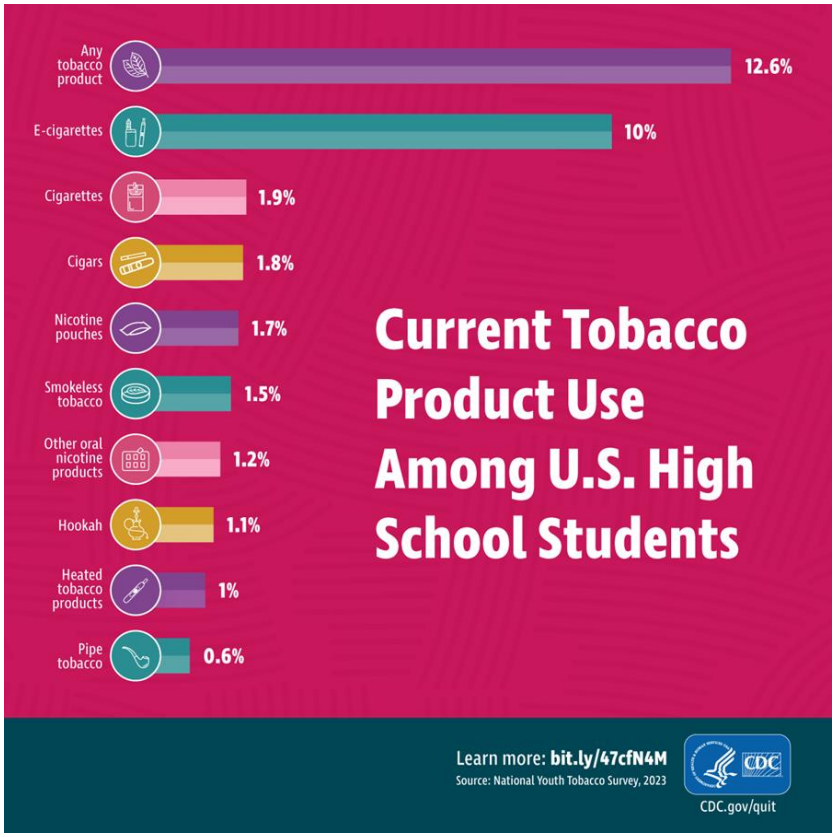
Expanding the Scope of the Study. Although this study revealed pertinent information for families, educators, and state leaders in Arkansas, additional research needs to be conducted. Expanding the scope of this study to include more schools in Arkansas would provide a comprehensive, broader, and more accurate data set for the students in Arkansas. Incorporating middle school and junior high age students (younger than grade 9) into future studies will provide information that corresponds to the average age of first time experimentation in Arkansas as 13 years of age (ACHI, 2022).

In future studies on this topic, it would also be important to consider factors that were not able to be explored in this study, such as the socioeconomic status of respondents, experienced side effects (if any), impact (if any) on academic achievement, and effect (if any) on athletic performance from self-reported student vapers. Incorporating additional questions into the student survey regarding parent/guardian knowledge of vaping behaviors and exposures would also open doors for future research that can be shared with parents/guardians regarding their knowledge of teen vaping in Arkansas. With increased research that has potential to provide specific data regarding students of Arkansas, informed decisions can be made regarding vaping prevention education and efforts throughout the state.

Research shows that e-cigarettes/vaping is the leading product among tobacco users in the U.S. As shown in Figure 4, 10% of high school students who are known tobacco users, prefer, and use e-cigarettes across the nation.

Figure 4

U.S. Current Tobacco Use Statistics



Note: (CDC, 2023b)

On a broad scale of the teen vaping phenomenon, with improved, intentionally specific research questions, this study could be expanded into neighboring states and/or across the nation.

Summary

This quantitative study included high school student participants from public schools located in Western Arkansas. This chapter included a summary of the findings with discussion, implications, and concluded with a summary.

This study's purpose was to understand the relationship between how the availability of vaping devices and student use are related. The previous section contains

the overall findings of this study, but four key findings were identified by the researcher. First, this study found that vaping is prevalent on school campuses in Western Arkansas. Although most participants in this study self-reported as non-vapers, they reported seeing vaping devices and vaping use on school campus. Secondly, students in this study reported that vaping exposure occurred in multiple location on school campuses. Restrooms, parking lots, and classrooms were the three most common locations reported where vaping devices were seen, and vaping use occurred by the students in this study. Third, the findings showed a positive correlation between vaping exposure and use by the students in this study; meaning, the data in this study yields that teens' exposure to vaping devices is related to use of vaping devices. Lastly, based on the results of this study, females reported vaping more than males do. Based on the results of this study, knowledge was revealed about the relationship between how the availability of vaping devices and student use are related for students in Western Arkansas.

Implications for practice include the stakeholder groups: students' families, school districts and the State of Arkansas. Sharing the findings from this study with these groups of stakeholders will foster development in family education regarding vaping, provide insights to educators regarding locations of vaping concerns on school campus, equip teachers with knowledge of vaping tendencies and devices as well as provide resources regarding the health risks of vaping, and advocate for state policy change regarding the sale of flavored vaping liquids and/or devices in an effort to prevent and reduce teen vaping use in Arkansas.

Implications for future research should include revised questioning regarding exposure and access to vaping devices. Improved survey questioning will allow for more

concise responses that should yield data that can be measured to test hypotheses regarding how and where students are exposed and are able to gain access to vaping devices. Additional topics for consideration of future studies are the exploration of the relation of the socioeconomic status to teen vaping; students' self-reported experiences with side effects, academic achievement, and athletic performance; and students' perceptions of parent/guardian knowledge of vaping behaviors and exposures. Expanding this study across all schools in Arkansas, neighboring states, and across the nation should be explored.

Finally, the researcher sought out to understand the relationship between how the availability of vaping devices and students use are related. With future research related to vaping behaviors in teens – families, school districts, and states across our nation will be able to foster informed decisions regarding vaping prevention. Actions to prevent vaping has the potential to positively impact America's high school students of today as they are preparing to be the future leaders of tomorrow.

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APPENDIX A

INFORMED CONSENT FOR NON-MEDICAL RESEARCH:

PARENT/GUARDIAN PERMISSION

Arkansas Tech University

INFORMED CONSENT FOR NON-MEDICAL RESEARCH:
PARENT/GUARDIAN CONSENT

Understanding the relationship between how the availability of vaping devices and student use are related: A Quantitative Study

INTRODUCTION

Your child is invited to take part in a research study conducted by Felicia Owen, doctoral candidate at Arkansas Tech University (ATU) / Lavaca High School (LHS) Principal and Dr. Sarah Gordon, faculty advisor from ATU. As a principal and mother of two Arkansas students (one in high school and one in college), vaping is very real to my everyday life. Vaping is prevalent in the lives of teenagers across Arkansas but there is little information available to help us understand why and how it's impacting our children. I have designed this study to help us gain information about the vaping phenomenon we are experiencing. Your child's participation is voluntary. Please read the information below and ask questions about anything you do not understand before deciding whether to allow your child to participate. Please take as much time as you need to read the consent form. Your child will also be given a form to read and asked for his/her assent to participate. Your child can decline to participate, even if you agree to allow him/her. You and/or your child may also decide to discuss it with your family or friends. If your child decides to participate, you will be asked to sign this form (digitally), and your child will be asked to sign an assent form (digitally). You will be given a copy of this form digitally.

PURPOSE OF THE STUDY

The purpose of this research study is to obtain information on the relationship between how the availability of vaping devices and use are related among high school students in Arkansas. The required qualifications to participate in this study are to be a current high school student in grades 9-12 located within the Guy Fenter Educational Cooperative (GFESC) region of Arkansas. Approximately 22 districts will take part in this research and about 12,000 students are expected to participate.

STUDY PROCEDURES

If you agree to allow your child to participate, your child will be asked to take a 10-minute online survey consisting of 15 questions. Your child will be asked questions about the availability of vaping devices, student use of vaping devices, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or

through peers at school and his/her friends and acquaintances. You can view the survey questions at this link: https://tinyurl.com/ke7sjcyy.

POTENTIAL RISKS AND DISCOMFORTS

There are no risks of any kind that are greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations/tests. At any time, your child has the right to stop participating. Your child does not have to answer any questions he/she chooses not to.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

There are no anticipated direct benefits to your child from taking part in this study. However, some people have experienced a feeling of fulfillment by participating in a research project. Your willingness to allow your child(ren) to take part may help our society to better understand the relationship between availably of vaping devices and student use. Vaping-related education and prevention efforts may be developed for use in schools and homes across Arkansas.

CONFIDENTIALITY

Any identifiable information obtained in connection with this study will be disclosed only with your permission or as required by law. Neither you nor your child's teachers will have access to your child's responses. Your child's responses will not contain any identifiers, such as your child's name, student identification number, address, or phone number. The records may include school name, county, grade, gender, and race but will not be linked to a specific student. The data will be stored with the Principal Investigator as a typed document and in electronic format for a maximum of 5 years at the end of the study. Again, the answers obtained in the survey will not identify your child. Only members of the research team will have access to the surveys and data. When the results of the research are published or discussed in conferences, no personally identifiable information will be shared.

PARTICIPATION AND WITHDRAWAL

Your child's participation is voluntary. Your child's refusal to participate will involve no penalty or loss of benefits to which your child is otherwise entitled. You may withdraw your consent, and your child may withdraw his/her assent, at any time and discontinue participation without penalty. You, or your child, are not waiving any legal claims, rights, or remedies because of your child's participation in this research study.

ALTERNATIVES TO PARTICIPATION

The survey will be administered within a classroom at your child's school. If you or your child has chosen not to participate, then your child will work on their normally scheduled work. Your child's grades will not be affected regardless of whether your child participates in this research study.

INVESTIGATORS CONTACT INFORMATION

If you have any questions or concerns about the research, please contact Felicia Owen, Principal Investigator at [redacted] or by email at fowen@atu.edu.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns, or complaints about your rights as a research participant, you may contact the IRB directly. If you have questions, concerns, complaints about the research and are unable to contact the research team, or if you want to talk to someone independent of the research team, please contact ATU's IRB office at irb@atu.edu.

SIGNATURE OF PARENT(S)

I/we have read the information provided above. I/we have been given a chance to ask questions. My/our questions have been answered to my/our satisfaction, and I/we agree to participate in this study and/or have our child(ren) participate in this study. I/we have been provided a digital copy of this form.

Name of Participant	Grade
Name of Parent/Guardian	
Signature of Parent/Guardian	Date

INFORMED CONSENT (PARENT/GUARDIAN)

Digital link for parents/guardians:
https://forms.gle/9S7XsrWD1SxMNtQH8

Appendix B

INFORMED CONSENT FOR NON-MEDICAL RESEARCH:

ADULTS 18 OR OLDER

Arkansas Tech University

INFORMED CONSENT FOR NON-MEDICAL RESEARCH:
ADULTS AGED 18 OR OLDER

Understanding the relationship between how the availability of vaping devices and student use are related: A Quantitative Study

INTRODUCTION

You are invited to take part in a research study conducted by Felicia Owen, doctoral candidate at Arkansas Tech University (ATU) / Lavaca High School (LHS) Principal and Dr. Sarah Gordon, faculty advisor from ATU because you are a student age 18 or older. As a principal and mother of two Arkansas students (one in high school and one in college), vaping is very real to my everyday life. Vaping is prevalent in the lives of teenagers across Arkansas but there is little information available to help us understand why and how it's impacting our communities. I have designed this study to help us gain information about the vaping phenomenon we are experiencing. Your participation is voluntary. You should read the information below and ask questions about anything you do not understand before deciding to participate. Please take as much time as you need to read the consent form. You can decline to participate. You may also decide to discuss this with your family or friends. If you decide to participate, you will be asked to sign this form (digitally). You will be given a copy of this form digitally.

PURPOSE OF THE STUDY

The purpose of this research study is to obtain information on the relationship between how the availability of vaping devices and use are related among high school students in Arkansas. The required qualifications to participate in this study are to be a current high school student in grades 9-12 located within the Guy Fenter Educational Cooperative (GFESC) region of Arkansas. Approximately 22 districts will take part in this research and about 12,000 students are expected to participate.

STUDY PROCEDURES

If you agree to participate, you will be asked to take a 10-minute, online survey consisting of 15 questions. You will be asked questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You can view the survey questions at this link: https://tinyurl.com/ke7sjcyy.

POTENTIAL RISKS AND DISCOMFORTS

There are no risks of any kind that are greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations/tests. At any time, you have the right to stop participating. You do not have to answer any questions you choose not to.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

There are no anticipated direct benefits from you taking part in this study. However, some people have experienced a feeling of fulfillment by participating in a research project. Your willingness to take part may help our society to better understand the relationship between the availability of vaping devices and student use. Vaping-related education and prevention efforts may be developed for use in schools and homes across Arkansas.

PAYMENT/COMPENSATION FOR PARTICIPATION

You will not be compensated for participating in the research study.

CONFIDENTIALITY

Any identifiable information obtained in connection with this study will be disclosed only with your permission or as required by law. Your parents or teachers will not have access to your responses. Your responses will not contain any identifiers, such as your name, student identification number, address, or phone number. The records may include school name, county, grade, gender, and race but will not be linked to a specific student. The data will be stored with the Principal Investigator as a typed document and in electronic format for a maximum of 5 years at the end of the study. Again, the answers obtained in the survey will not identify you. Only members of the research team will have access to the surveys and data. When the results of the research are published or discussed in conferences, no personally identifiable information will be shared.

PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights, or remedies because of your participation in this research study.

ALTERNATIVES TO PARTICIPATION

The survey will be administered within a classroom at your school. If you have chosen not to participate, then you will work on your normally scheduled work. Your grades will not be affected regardless of whether you participate in this research study.

INVESTIGATORS CONTACT INFORMATION

If you have any questions or concerns about the research, please contact Felicia Owen, Principal Investigator at [redacted] or by email at fowen@atu.edu.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns, or complaints about your rights as a research participant, you may contact the IRB directly. If you have questions, concerns, complaints about the

research and are unable to contact the research team, or if you want to talk to someone independent of the research team, please contact ATU's IRB office at irb@atu.edu.

SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided above. I have been given a chance to ask questions. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been provided a digital copy of this form.

Name of Participant	Grade
Signature of Participant	Date

INFORMED CONSENT (STUDENTS 18 OR OLDER)

Digital link for students 18 or older:
https://forms.gle/WiqQmok4DSsg8Fbs7

Appendix C

ASSENT FOR NON-MEDICAL RESEARCH FOR YOUTH (AGES 14 – 17)

Arkansas Tech University

ASSENT FOR NON-MEDICAL RESEARCH:
YOUTH (AGES 14-17)

Understanding the relationship between how the availability of vaping devices and student use are related: A Quantitative Study

INTRODUCTION

You are invited to take part in a research study conducted by Felicia Owen, doctoral candidate at Arkansas Tech University (ATU) / Lavaca High School (LHS) Principal and Dr. Sarah Gordon, faculty advisor from ATU. As a principal and mother of two Arkansas students (one in high school and one in college), vaping is very real to my everyday life. Vaping is prevalent in the lives of teenagers across Arkansas but there is little information available to help us understand why and how it's impacting our communities. I have designed this study to help us gain information about the vaping phenomenon we are experiencing. Your participation is voluntary. You should read the information below and ask questions about anything you do not understand before deciding to participate. Your parent/guardian's permission will be sought; however, the final decision is yours. Even if your parents agree to your participation by signing a separate consent document, you don't have to participate if you don't want to. Please take as much time as you need to read the consent form. You can decline to participate. You may also decide to discuss this with your family or friends. If you decide to participate, you will be asked to sign this form (digitally). You will be given a copy of this form digitally.

PURPOSE OF THE STUDY

The purpose of this research study is to obtain information on the relationship between how the availability of vaping devices and use are related among high school students in Arkansas. The required qualifications to participate in this study are to be a current high school student in grades 9-12 located within the Guy Fenter Educational Cooperative (GFESC) region of Arkansas. Approximately 22 districts will take part in this research and about 12,000 students are expected to participate.

STUDY PROCEDURES

If you agree to participate, you will be asked to take a 10-minute, online survey consisting of 15 questions. You will be asked questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You can view the survey questions at this link: https://tinyurl.com/ke7sjcyy.

POTENTIAL RISKS AND DISCOMFORTS

There are no risks of any kind that are greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations/tests. At any time, you have the right to stop participating. You do not have to answer any questions you choose not to.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

There are no anticipated direct benefits from you taking part in this study. However, some people have experienced a feeling of fulfillment by participating in a research project. Your willingness to take part may help our society to better understand the relationship between the availability of vaping devices and student use. Vaping-related education and prevention efforts may be developed for use in schools and homes across Arkansas.

PAYMENT/COMPENSATION FOR PARTICIPATION

You will not be compensated for participating in the research study.

CONFIDENTIALITY

Any identifiable information obtained in connection with this study will be disclosed only with your permission or as required by law. Your parents or teachers will not have access to your responses. Your responses will not contain any identifiers, such as your name, student identification number, address, or phone number. The records may include school name, county, grade, gender, and race but will not be linked to a specific student. The data will be stored with the Principal Investigator as a typed document and in electronic format for a maximum of 5 years at the end of the study. Again, the answers obtained in the survey will not identify you. Only members of the research team will have access to the surveys and data. When the results of the research are published or discussed in conferences, no personally identifiable information will be shared.

PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your assent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights, or remedies because of your participation in this research study.

ALTERNATIVES TO PARTICIPATION

The survey will be administered within a classroom at your school. If you have chosen not to participate, then you will work on your normally scheduled work. Your grades will not be affected regardless of whether you participate in this research study.

INVESTIGATOR'S CONTACT INFORMATION

If you have any questions or concerns about the research, please contact Felicia Owen, Principal Investigator at [redacted] or by email at fowen@atu.edu.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns, or complaints about your rights as a research participant, you may contact the IRB directly. If you have questions, concerns, complaints about the

research and are unable to contact the research team, or if you want to talk to someone independent of the research team, please contact ATU's IRB office at irb@atu.edu.

SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided above. I have been given a chance to ask questions. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been provided a digital copy of this form.

Name of Participant	Grade
Signature of Participant	Date

SIGNATURE OF INVESTIGATOR

I have explained the research to the participant and answered all of his/her questions. I believe that he/she understands the information described in this document and freely consents to participate.

Name of Person Obtaining Consent	
Signature of Person Obtaining Consent	Date

ASSENT (STUDENTS 14-17 YEARS OLD)

Digital link for students:
https://forms.gle/hVrq5d1txvoTuiQJ7

Appendix D

PARENT/GUARDIAN INFORMATION LETTER

Dear Parent or Guardian:

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. Because the study involves students under the age of 18, I must obtain parent/guardian permission to involve the student in the study. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life.

I have created a 15-question survey and would like to invite all students in grades 9-12 to participate by completing the online survey. The survey consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. The student will also be asked to select the grade they are in, gender, ethnicity, county, and school for reporting purposes but no other personal information will be obtained. A copy of the survey can be viewed online at the following address: https://tinyurl.com/ke7sjcyy. No one, including me, will know which student completed which questionnaire.

The survey will be administered within a classroom at your child's school and will be done on the computer to further protect the identity of the student. Your child will not be graded on his/her participation. If you prefer that your child not participate, he/she will read or complete class assignments while the survey is being administered. The survey should take less than 10 minutes to complete, and the student may stop answering questions at any time if they feel uncomfortable continuing with the survey.

If you are willing to allow your child(ren) to participate in this survey, please enter his/her name(s) into the permission form and digitally sign (see link below). Also, you will need to digitally sign the Informed Consent Form which is included in the same form. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted]
fowen@atu.edu

Permission and Informed Consent Forms Link:
https://forms.gle/VoaYCkbz8XwbGmvRA
Note: a copy of your digitally signed forms will be emailed to you upon submission.

Appendix E

STUDENT RECRUITMENT INFORMATIONAL LETTER (Ages 14-17)

Students,

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life.

I have created a 15-question survey and would like to invite all students in grades 9-12 to voluntarily participate by completing the online survey. The survey consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You will also be asked to select the grade you are in, gender, ethnicity, county, and school for reporting purposes but no other personal information will be obtained. No one, including me, will know which student completed which questionnaire. With the survey being voluntary, you are allowed to stop at any time during the survey.

The survey will be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. You will not be graded on your participation. If you prefer to not participate, you will read or complete class assignments while the survey is being administered. The survey should take less than 10 minutes to complete, and you may stop answering questions at any time if you feel uncomfortable continuing with the survey.

If you are willing to participate in this voluntary survey, I will need permission from you. I have previously received permission from your parent/guardian for you to be eligible to participate. If you are 18 or older, you do not need your parents'/guardians' permission, but you will need to digitally sign the Informed Consent Form. If you are younger than 18, you will need to digitally sign the Assent Form. To get started, click on the survey link below. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted]
fowen@atu.edu

Assent Form link: https://forms.gle/HRrtkhw7FeHLUjx69

Upon submission of the Assent Form you will receive a digital copy. Also, the anonymous questionnaire link will be provided immediately on the screen.

STUDENT RECRUITMENT INFORMATIONAL LETTER (18 or Older)

Students,

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life.

I have created a 15-question survey and would like to invite all students in grades 9-12 to voluntarily participate by completing the online survey. The survey consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You will also be asked to select the grade you are in, gender, ethnicity, county, and school for reporting purposes but no other personal information will be obtained. No one, including me, will know which student completed which questionnaire. With the survey being voluntary, you are allowed to stop at any time during the survey.

The survey will be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. You will not be graded on your participation. If you prefer to not participate, you will read or complete class assignments while the survey is being administered. The survey should take less than 10 minutes to complete, and you may stop answering questions at any time if you feel uncomfortable continuing with the survey.

If you are willing to participate in this voluntary survey, I will need permission from you. Since you are 18 or older, you do not need your parents'/guardians' permission, but you will need to digitally sign the Informed Consent Form. To get started, click on the survey link below. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted]
fowen@atu.edu

Consent Form link (Students 18 or older): https://forms.gle/Ad4kzJ91X2jFfU1H8
Upon submission of the Consent Form, you will receive a digital copy. Also, the anonymous questionnaire link will be provided immediately on the screen.

Appendix F

Participant Assent & Consent to Take the Survey

You are invited to participate in a research study that will explore the relationship between how the availability of vaping devices and student use are related. The focus of the study will be to understand if exposure and student use vary by demographics, personal beliefs, and access on school campus, at school activities, in the home, or through peers. This study is being conducted by Felicia Owen (Lavaca High School Principal), a doctoral student at Arkansas Tech University. This study is not affiliated with Lavaca School District or Guy Fenter Educational Service Cooperative (GFESC). The required qualifications to participate in this study are to be a current high school student in grades 9-12 located within the GFESC region.

Participation in this study is voluntary. No identifiable information will be collected tying responses to a specific person. If you agree to participate in this study, you will be surveyed regarding vaping usage, practices, and exposure. The time needed to complete the survey is approximately 10 minutes. The survey includes questions about student characteristics, frequency of vaping, exposure to vaping, and perceptions regarding personal health risks. Participating in this study will help provide educators, families, and students the understanding of how the relationship between availability of vaping devices and use are connected. Information derived will make a pathway for vaping-related education and prevention efforts to be developed for use in the schools and homes across Arkansas. You may skip any questions that do not apply, and you may end the survey at any time. The information you share, if you participate in this study, will be kept completely confidential. All responses will be kept digitally on a password protected hard drive. Responses will be kept for three years and then deleted. If you have any questions about this study, please contact Mrs. Owen via email at fowen@atu.edu.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your rights as a research subject, please contact the IRB at irb@atu.edu.

Volunteer Rights
Your participation in this study is completely voluntary, and you may choose not to participate. Some questions may not be applicable and may be skipped. You are free to withdraw from the study at any time. Your responses are confidential. By continuing with the survey, you are giving your consent to participate.

Responses will be collected for 21 consecutive days in the fall of 2023 and 14 consecutive days in the spring of 2024. By continuing with the survey, you are giving your consent to participate.

Appendix G

Understanding the relationship between how the availability of vaping devices and student use are related: A Quantitative Study

Research Questions

Participant Demographics

1) What county do you reside in?
   - Crawford
   - Franklin
   - Johnson
   - Logan
   - Scott
   - Sebastian

2) What school do you attend?
   - Alma High School
   - Cedarville High School
   - Mountainburg High School
   - Mulberry/Pleasant View High School
   - Van Buren Freshmen Academy
   - Van Buren High School
   - Charleston High School
   - County Line High School
   - Ozark High School
   - Clarksville High School
   - Lamar High School
   - Westside High School
   - Booneville High School
   - Magazine High School
   - Paris High School
   - Scranton High School
   - Waldron High School
   - Fort Smith Northside
   - Fort Smith Southside
   - Greenwood Freshmen Center
   - Greenwood High School
   - Hackett High School
   - Lavaca High School
   - Mansfield High School
   - Future School of Fort Smith

3) What grade are you currently in?
   - 9
   - 10
   - 11
   - 12

4) What is your gender?
   - Male
   - Female

5) What is your race?
   - 2 or more races
   - Asian
   - Black
   - Hispanic
   - Native American
   - Native Hawaiian/Pacific Islander
   - White

Assessment of Vaping

6) Have you ever tried vaping?
   - I have tried vaping once.
   - I have tried vaping more than once.
   - I have never tried vaping.

7) During the past 14 days, how many days did you use a vaping device?
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10
   - 11
   - 12

- 13
- 14

8) How many times per day did you use a vaping device? (Consider each time per day representing approximately 15 puffs)
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10
   - 11
   - 12
   - 13
   - 14
   - 15
   - 16
   - 17
   - 18
   - 19
   - 20
   - Other: (describe)

9) On the days that you vaped in the past 14 days, what type of substance did your vaping device(s) contain?
   Check all that apply:
   - Nicotine.
   - CBD.
   - THC.
   - I am not sure.
   - Other: (describe)

Sources of Vaping Devices

10) During the past 14 days, how did you get your vaping device?

For this question, consider a peer as someone that you know and/or recognize from your school campus; and a close friend is someone that you trust and think of as family but you are not related.
Check all that apply:

- ☐ Purchased at a store.
- ☐ Purchased on the internet.
- ☐ Purchased from a peer on school campus or at a school-related activity.
- ☐ Purchased from a peer off school campus.
- ☐ Purchased from a close friend on school campus or at a school-related activity.
- ☐ Borrowed from a peer on school campus or at a school-related activity.
- ☐ Borrowed from a peer off school campus.
- ☐ Borrowed from a close friend on school campus or at a school-related activity.
- ☐ Borrowed from a family member at home.
- ☐ Borrowed from a family member outside the home.
- ☐ Other: (describe)

Exposure to Vaping Devices

11) During the past 14 days, how would you describe your exposure to vaping devices?
For this question, consider a peer as someone that you know and/or recognize from your school campus; and a close friend is someone that you trust and think of as family but you are not related.
Check all that apply:

- ☐ I was not exposed to vaping devices in the past 14 days.
- ☐ I saw my peers with vaping devices on school campus or at a school-related activity.
- ☐ I saw my peers using vaping devices off school campus.
- ☐ I saw my close friends with vaping devices on school campus or at a school-related activity.
- ☐ I saw my close friends using vaping devices off school campus.
- ☐ I saw my family members with vaping devices.
- ☐ I saw my family members using vaping devices.
- ☐ Vaping devices are accessible in the home I live in.
- ☐ Vaping devices are accessible in the homes I frequently visit after school hours.
- ☐ Other: (describe)

12) Describe the on-campus location you saw vaping devices.
For this question, consider vaping devices not being used but just visible to you.
Check all that apply:

- Parking lot
- Hallways
- Classrooms
- Restrooms
- Locker rooms
- Lunchroom
- Bus stop
- Inside the bus
- Other: (describe)

13) Describe the on-campus location you saw vaping devices being used.
Check all that apply:
    - Parking lot
    - Hallways
    - Classrooms
    - Restrooms
    - Locker rooms
    - Lunchroom
    - Bus stop
    - Inside the bus
    - Other: (describe)

Perceptions of Health Risks

14) Do you think vaping devices have health risks?
Check all that apply:
    - I believe vaping is harmful to teens.
    - I believe vaping is not harmful to teens.
    - I believe vaping is healthier than traditional smoking.
    - I believe vaping does not cause nicotine dependence.
    - I believe vaping may have health risks, but I have not experienced them so it's not important to me.
    - Other: (describe)

15) Do you think the type of substance used in a vaping device can impact health?
Check all that apply:
    - I believe vaping nicotine is harmful to teens.
    - I believe vaping nicotine is not harmful to teens.
    - I believe vaping CBD is harmful to teens.
    - I believe vaping CBD is not harmful to teens.
    - I believe vaping THC is harmful to teens.
    - I believe vaping THC is not harmful to teens.

- I believe the various vaping substances may have health risks, but I have not experienced them so it's not important to me.
- Other: (describe)

Appendix H

INTRODUCTORY LETTER TO EDUCATIONAL COOPERATIVE DIRECTOR: GUY FENTER EDUCATIONAL SERVICE COOPERATIVE (GFESC)

Mrs. Angela Miller,

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life. The Arkansas Prevention Needs Assessment (APNA) survey reports that students all throughout Arkansas are exposed to this phenomenon.

For my research study, the focus area is the GFESC region. I have created a 15-question survey and would like to invite all high school students (grades 9-12) in the GFESC region to participate. The survey will be digital and take approximately 10 minutes for students to complete it. It consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. My study has been submitted to the ATU Institutional Review Board (IRB) for approval; IRB approval for this study means that this study meets the ethical obligations required by federal law and University policies. Once I receive IRB approval for this study, I will forward you that document for your records.

Would you forward my request for participation in this study to district administrators of the high schools in the GFESC? I have included a recruitment letter for district administrators and included is a link to a form for collecting a point of contact for districts that are willing to participate. Once my IRB approval is received, I will contact the participating districts directly via the point of contact provided to me in that form. If you have any questions regarding this study, please contact me (fowen@atu.edu), my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu), or the ATU IRB (irb@atu.edu).

Thank you,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

Appendix I

RECRUITMENT LETTER FOR DISTRICT ADMINISTRATORS (fall 2023)

GFESC District Administrators,

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life. The Arkansas Prevention Needs Assessment (APNA) survey reports that students all throughout Arkansas are exposed to this phenomenon.

For my research study, the focus area is the GFESC region. I have created a 15-question survey and would like to invite all high school students (grades 9-12) in the GFESC region to participate. The survey will be digital and take less than 10 minutes for students to complete it. It consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You can view the survey questions at this link: https://tinyurl.com/ke7sjcyy.

Students will be asked to select his/her grade, gender, ethnicity, county, and school for aggregate reporting purposes, but no other personal information will be obtained. No one, including me, will know which student completed which questionnaire. The survey will need to be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. The survey should be completed at a designated time within a specific class period as determined by the district administration. The survey can be completed in a 10-minute allotment of time. Students will not be graded on participation. Students with parent/guardian permission to participate will be given the option to participate. Students who prefer to not participate will be asked to read or complete class assignments while the survey is being administered.

If you are willing to allow students in your district to participate, please complete the point of contact form using the QR code below or by visiting this link: https://forms.gle/VDhoobUVxUvjARUY9. I will reach out to the point of contact you designate to ask for assistance with administering the survey to your high school students. Parent/Guardian permission forms will be collected digitally, and names of eligible participants will be communicated with the point of contact.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your students' rights as a research subject, please contact the IRB at irb@atu.edu. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

POINT OF CONTACT FORM

Appendix J

RECRUITMENT LETTER FOR DISTRICT AND HIGH SCHOOL ADMINISTRATORS (spring 2024)

GFESC Administrators,

As part of my doctoral degree program at Arkansas Tech University (ATU), I am conducting a research study to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life. The Arkansas Prevention Needs Assessment (APNA) survey reports that students all throughout Arkansas are exposed to this phenomenon.

For my research study, the focus area is the GFESC region. In the fall 2023 semester, 8 districts agreed to participate. *Data was collected from students in the following districts: County Line, Greenwood, Hackett, Lavaca, Mansfield, Mountainburg, Mulberry/Pleasant View, and Westside. There have been 154 survey responses received from the student participants in the participating districts*. I have created a 15-question survey and would like to invite all high school students (grades 9-12) in the remaining GFESC districts to participate. The survey will be digital and take less than 10 minutes for students to complete it. It consists of questions about the availability of vaping devices, student use, personal beliefs related to vaping, and exposure/access on school campus, at school activities, in the home, or through peers at school and his/her friends and acquaintances. You can view the survey questions at this link: https://tinyurl.com/ke7sjcyy.

Students will be asked to select his/her grade, gender, ethnicity, county, and school for aggregate reporting purposes, but no other personal information will be obtained. No one, including me, will know which student completed which questionnaire. The survey will need to be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. The survey should be completed at a designated time within a specific class period as determined by the district administration. The survey can be completed in a 10-minute allotment of time. Students will not be graded on participation. Students with parent/guardian permission to participate will be given the option to participate. Students who prefer to not participate will be asked to read or complete class assignments while the survey is being administered.

If you are willing to allow students in your district to participate, please complete the point of contact form using the QR code below or by visiting this link: https://forms.gle/VDhoobUVxUvjARUY9. I will reach out to the point of contact you designate to ask for assistance with administering the survey to your high school students. Parent/Guardian permission forms will be collected digitally, and names of eligible participants will be communicated with the point of contact.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your students' rights as a research subject, please contact the IRB at irb@atu.edu. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,
Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

POINT OF CONTACT FORM

Appendix K

POINT OF CONTACT INITIAL EMAIL

District Point of Contact,

I was given your name as a point of contact by {insert name from form response}. Thank you for agreeing to assist with my research study that I am conducting as part of my doctoral degree program at Arkansas Tech University (ATU). My study has been designed to help educators and families understand the relationship between how the availability of vaping devices and student use are related. This study is not affiliated with my role as Principal at Lavaca High School. However, as a high school principal and mother of two students (high school and college) in Arkansas, the prevalence of vaping is very real to my everyday life.

Your assistance with my research study is crucial to my data collection. I have listed the steps below to help you understand the process of administering the survey.

1) Using your district's mass communication tool, provide families of students in grades 9-12 with the attached letter, digitally titled: PARENT/GUARDIAN INFORMATION LETTER. This letter includes the parent/guardian consent form that will be required for each student that will be a participant. *Note: Students will be asked to select his/her grade, gender, ethnicity, county, and school for reporting purposes, but no other personal information will be obtained. No one, including me, will know which student completed which questionnaire.* Please encourage families to complete the consent form within 5 days.
2) After the digital consent forms are completed, I will forward a list of eligible participants and next steps to you.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your students' rights as a research subject, please contact the IRB at irb@atu.edu.

If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

Appendix L

POINT OF CONTACT SURVEY DISTRIBUTION EMAIL

District Point of Contact,

I hope this message finds you well. Regarding my research study that relates to vaping, I am providing you with a list of eligible participants in your district, see the attached list broken down by grade level. The students on this list are eligible because the parent/guarding permission form was completed. The next steps for survey administration are listed below.

1) Coordinate a 10-minute window of time so the survey can be completed inside a classroom. This could be during an advisory period, homeroom, or whatever suits your building best for minimal classroom interruption.
2) Once the time is established, using your district's student email accounts, please forward the digital STUDENT RECRUITMENT INFORMATIONAL LETTER to eligible participants at the designated time. The link to the survey which includes the student assent to participate form is included within the letter.
   Note: There are 2 letters to use (one for students age 14-17 & another for students age 18+). I have included digital links in case that is easier for you to email or facilitate through google classroom.
   Student Recruitment Letter ages 14-17: https://rb.gy/5o70og
   Student Recruitment Letter age 18 or over: https://tinyurl.com/aktntetn
3) The survey will need to be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. Students will not be graded on participation. Students with parent/guardian permission to participate will be given the option to participate. Students that prefer to not participate will be asked to read or complete class assignments while the survey is being administered.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your students' rights as a research subject, please contact the IRB at irb@atu.edu. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

Appendix M

REMINDER EMAIL FOR POINT OF CONTACT

District Point of Contact,

I hope you are having a great day! It has been 7 days since my research study related to vaping started collecting data. As a reminder, the deadline for students to complete the survey is 7 days from now. If you haven't already, would you please follow the steps listed below for the survey administration. As a reminder, only students on the provided list are eligible participants because a parent/guardian permission form has been received. For your convenience, I have attached that list for your reference.

1) Coordinate a 10-minute window of time so the survey can be completed inside a classroom. This could be during an advisory period, homeroom, or whatever suits your building best for minimal classroom interruption.
2) Once the time is established, using your district's student email accounts, please forward the digital STUDENT RECRUITMENT INFORMATIONAL LETTER to eligible participants at the designated time. The link to the survey which includes the student assent to participate form is included within the letter.
   Note: There are 2 letters to use (one for students age 14-17 & another for students age 18+). I have included digital links in case that is easier for you to email or facilitate through google classroom.
   Student Recruitment Letter ages 14-17: https://rb.gy/5o70og
   Student Recruitment Letter age 18 or over: https://tinyurl.com/aktntetn
3) The survey will need to be administered within a classroom at your school and will be done on the computer to further protect the identity of the student. Students will not be graded on participation. Students with parent/guardian permission to participate will be given the option to participate. Students that prefer to not participate will be asked to read or complete class assignments while the survey is being administered.

This study has been reviewed and approved by Arkansas Tech's University's (ATU) Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have any questions regarding your students' rights as a research subject, please contact the IRB at irb@atu.edu. If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thank you,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

Appendix N

FINAL EMAIL FOR POINT OF CONTACT

District Point of Contact,

I wanted to reach out to you as the data collection for my research study has ended. Thank you for your support with my research. I appreciate the time and effort you dedicated to helping me gain data that will provide valuable information to educators, lawmakers, families, and students in the GFESC region. I hope you have a successful end to the school year.

If you have any questions regarding this study, please contact me (fowen@atu.edu) or my ATU advisor, Dr. Sarah Gordon (sgordon6@atu.edu).

Thanks again,

Felicia Owen
[redacted] | [redacted]
fowen@atu.edu | felicia.owen@lavacaschools.com

Appendix O

IRB Approval Letter

ARKANSAS TECH UNIVERSITY

OFFICE OF RESEARCH AND SPONSORED PROGRAMS

1509 North Boulder Avenue
Administration, Room 207
Russellville, AR 72801

479-880-4327
www.atu.edu

November 21, 2023

To Whom It May Concern:

The Arkansas Tech University Institutional Review Board has approved the IRB application for Felicia Owen's proposed research, entitled "Understanding the relationship between how the availability of vaping devices and student use are related: A quantitative study." The Institutional Review Board used an expedited review procedure under 45 CFR 46.110 (7). Please use number 2023-11-02 I when referencing this study.

Please note that in the event that any of the parameters of the study change, the researcher may be required to submit an amended application.

Please proceed with your research. We wish you success with this endeavor.

Sincerely,

Bryan D. Rank

Bryan D. Rank, Ph.D.
Institutional Review Board Chair
Arkansas Tech University

Appendix P

IRB Modification Approval Email

RE: IRB Modification Form

Institutional Review Board <irb@atu.edu>

Fri 1/19/2024 8:56 AM

To:Felicia Owen <fowen@atu.edu>
Cc:Sarah Gordon <sgordon6@atu.edu>

The modification of 2023-11.02 is approved. Please use this email for your records.

Janet Wood
Director of Grants and Sponsored Programs
Arkansas Tech University
479.880.4329 or ext. 4343

From: Felicia Owen <fowen@atu.edu>
Sent: Thursday, January 4, 2024 8:50 AM
To: Institutional Review Board <irb@atu.edu>
Cc: Sarah Gordon <sgordon6@atu.edu>; Felicia Owen <fowen@atu.edu>
Subject: IRB Modification Form

Dear Institutional Review Board at ATU,

I am writing to request your review of my dissertation research study modification request. The IRB modification form, initial application form and appendices' documents are attached with tracked changes highlighted. My request is to allow data collection to continue into the early spring semester of 2024, pending your approval. Please let me know if you need any other information about my research study modification request. Your feedback is much appreciated.

Thank you for your time.

Felicia Owen
Graduate Student
[redacted]