Vaping and Its Relationship to Other Risky Behaviors in College Students: A Secondary Analysis of the ACHA National College Health Assessment

A Senior Honors Thesis

Submitted in Partial Fulfillment of the Requirements for Graduation in the Honors College

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The College At Brockport
May 21, 2021

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Abstract

There is a high likelihood that the use of electronic cigarettes has a relationship with participation in risky behaviors in college students. The aim of this study was to identify the relationship between the use of electronic cigarettes and six risky behaviors. This was a secondary analysis using the Spring 2019 American College Health Association National College Health Assessment. In addition to an extensive literature review multiple bivariate analyses were conducted using SPSS to identify the relationship between the use of electronic cigarettes and each individual risk behavior. A total of 34 survey questions were analyzed where eight survey questions indicated a correlation when compared to electronic cigarette use. The analysis found that alcohol use and substance use are directly related to electronic cigarette use in college students. College students who use electronic cigarettes are more likely to use alcohol one or more times within a 30-day period as well as drink five or more drinks in one sitting. College students who use electronic cigarettes are more likely to use marjuana and/or cocaine one or more times within a 30-day period. From this analysis, recommendations can be made about future programs or health messages with the focus on the use of electronic cigarettes on college campuses. Future interventions should focus on the known relationship between electronic cigarette use and alcohol use and substance use. Due to the rising popularity and increased usage, the American College Health Association should include more survey measures related to electronic cigarette use among college students.

Introduction

By any measure, college students make up one of the largest populations in the United States (U.S) today. According to the U.S Census bureau, there are over 18.4 million students attending colleges across the country with 16.2% of these students attending an undergraduate four year institution (U.S Census Bureau, n.d.). The largest percent of undergraduate students are aged 25 and younger, at an age where students are increasingly susceptible to partaking in potentially risky behavior throughout their undergraduate years. The college years are part of a phase known as emerging adulthood, housing people aged 18-25 (Aldeis, 2013). This is a time full of new experiences that provide students with opportunities to explore their identity, interests, and decision making apart from their parents and home life. During this time of exploration, students are increasingly susceptible to peer pressure and outside influences from media and relationships (Aldeis, 2013). Newfound independence and an important transition period leads college students to increased levels of stress and behavioral problems brought on by the introduction of risky behaviors (Aldeis, 2013). Due to a lack of parental monitoring or monitoring in general, students are exposed to various risky behaviors on a daily basis (Aldeis, 2013). When these behaviors become a part of daily living they are normalized and part of the

general college experience including socialization, recreation, and enjoyment (Lanza, 2018).

However, risky behaviors increase the risk for destructive behavior in aspects such as physical, social and psychological health (Aldeis, 2013). College campuses are home to a melting pot of various risk behaviors that millions of young adults choose to take part in as they go through their college years. According to the World Health Organization, risky behaviors are defined as a "specific form of behavior, which is proven to be associated with increased susceptibility to a specific disease or ill health" (World Health Organization, 1998). Risky behaviors can include but are not limited to alcohol use and binge drinking, tobacco use, substance use, risky sexual behavior, interpersonal violence, and mental health illness. While these behaviors are important in the overall growth of college students, they do negatively affect their health and wellbeing. Risky behaviors lead to consequences such as premature death, disability, and increased risk of chronic disease (Aldeis, 2013). The vulnerability of college students in engaging in risky behaviors is largely dependent on a number of different factors (Kenne, 2017).

The vaping culture is the newest risky trend to grace campuses with its sleek design and fun flavors that have been marked as a college must have. Vaping is a common term used among college students that describes the act of using e-cigarettes. The term has increased in popularity as well as terms such as "hitting a vape". Due to the low popularity of the devices high trends did not start until 2015 and 2016 when big name e-cigarettes brands hit the market such as JUUL, Smok and Hyde. Because much of the focus from public health professionals was on the cigarette epidemic, the vaping epidemic was able to rise to extensive heights. A 12% increase in college student vaping was shown from 2015 to 2018, this finally showing a cause for concern (PEW Research Center, 2019). Two in ten Americans aged 18 to 29 say they vape daily, while 1 in 5 say they vape occasionally (PEW Research Center, 2019). The substantial rise in vaping is reported to be the largest proportional increase for any substance according to the Monitoring The Future (MTF) survey that was established nearly 40 years ago (U.S Department of Health and Human Services, 2019). Vaping is seen as an emerging health issue from a public health standpoint and measures similar to what was done for the original smoking epidemic are being taken in order to control the growing problem.

Electronic cigarettes[1] (e-cigarettes) were first introduced into the United States market in 2007 and since the release of these devices modern versions have been introduced and marketed towards younger audiences. Despite their introduction in 2007, it wasn't until recently that their popularity hit a high especially with younger generations. Recent prevalence rates among young adults have reported a 22-30% increase in lifetime electronic cigarette use and 5-9% increase in current electronic cigarette use (Lanza, 2018).

In the last ten years the rates of cigarette use among college students has declined while the rates of electronic cigarettes has inclined. Since their introduction in 2007 e-cigarettes have steadily risen in popularity as an alternative to traditional cigarette smoking. Recent trend studies have shown that e-cigarettes have surpassed traditional cigarettes as the most commonly used tobacco product among youth and young adults (Roberts, 2020). Young adults have the highest prevalence rates of any adult age category, with a staggering 9% prevalence rate reported in 2018 (Mirbolouk, 2018). The prevalence rate of e-cigarette use among young adults is expected to climb further because of the popularity of top brands such as JUUL, Hyde, and Smok. JUUL, the most popular brand of e- cigarette and was introduced into the market in 2015. The JUUL device closely resembles a USB flash drive and utilizes an attachable pod (cartridge)

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[1] For the purpose of this analysis, the term "e-cigarette" will be used; though e-cigarettes are commonly referred to by the public as vapes, vape pens, vape mods, and pod mods or by the brand names such as JUUL, Hyde, and SMOK.

that can be replaced when the e-liquid solution runs out (Roberts, 2020).

E-cigarettes work as battery powered nicotine delivery systems through an e-liquid solution containing nitrosamines, diethylene glycol, and other potentially harmful chemicals (Brown, 2016). These devices typically contain nicotine, flavorings, and other chemicals; while consisting of four parts: a cartridge that holds the liquid, a heating element, a power source/ battery, and a mouthpiece used to inhale (U.S Department of Health and Human Services, n.d.). The nicotine found in e-cigarettes stimulates the brain and triggers the release of dopamine in the brain, in turn reinforcing rewarding behaviors, similarly found in other addictive substances (U.S Department of Health and Human Services, n.d.).

Short term evidence deems e-liquid solutions safe for ingestion but there is little to no evidence on the long term effects of the inhalation of the solution containing nitrosamines, a potent cancer causing chemical (Walley, 2019). E-Cigarettes work by heating the liquid mixture (e-liquid) into an aerosol (vapor), a process that requires no tobacco thus creating an illusion that it is a healthier alternative to traditional cigarettes (Abadi, 2017). The nicotine levels in popular brands including JUUL are highly variable but, one JUUL pod typically contains the same amount of nicotine as one pack of cigarettes (1 pod = 20 individual cigarettes) (JUUL Labs Inc., n.d.)

Short term evidence does suggest that e-cigarettes are 95% less harmful than their traditional counterparts and the levels of these toxic chemicals is about 9-450 times lower than traditional cigarettes but, there is a potential for harm when super heating these chemicals as seen in e-cigarette devices (McKeganey, 2018, Ghosh, 2017). It is still unclear if the levels of carcinogenic carbonyl compounds that are being super heated in these devices are at levels that are below the harm threshold (Ghosh, 2017). The potential dangers of e-cigarette use are what tempers the confidence in declaring e-cigarettes an acceptable nicotine replacement therapy. It is largely proven that e-cigarettes act as a gateway to traditional cigarettes despite the original goal of the device in aiding in cigarette cessation (Kandeal, 2014). This idea stems from the popular use of e-cigarettes in order to quit traditional cigarettes or reduce the harmful effects of combustible tobacco. There is a perceived idea that e-cigarettes are in fact safe because they are an option that is sometimes recommended by health professionals (Saddleson, 2015). This is typically a last resort recommendation when other cessation methods are not providing successful results; health professionals will opt for e-cigarettes as a safer alternative to smoking, which is safer than traditional combustible cigarettes (Saddleson, 2015). College students who in fact had a lower harm perception and perceived e-cigarettes as a conventional method for quitting traditional cigarettes had a significantly higher risk of ever using e-cigarettes (Choi, 2013, Case, 2016). On the contrary, a 2018 report by the National Academies of Science, Engineering, and Medicine indicated that there was limited evidence that e-cigarettes are effective aids in quitting traditional cigarettes (National Academies of Science Engineering, and Medicine, 2018). And according to the FDA, e-cigarettes are not an approved smoking cessation method (U.S Department of Health and Human Services, 2020).

The idea that early exposure to tobacco or nicotine will lead to subsequent abuse of nicotine and other harmful substances is known as the gateway concept (Ren, 2019). First year college students are more likely to experiment with new substances during their early years in college. E-cigarettes are most likely to be the first substance that is experimented with, this even before the experimentation with marajuana (Ren, 2019). Nicotine has long been proven to act as a gateway drug, similar to marajuana related claims. The gateway hypothesis, developed by Denise Kandel, has found that young adults who are involved in drugs typically follow a sequence. This sequence usually starts with legal drugs such as nicotine and gradually transitions into illicit drugs, starting with marajuana and moving onto cocaine and other

illicit drugs (Kandel, 2014). A young adult's developing brain can be negatively affected by the use of nicotine in the form of an e-cigarette. Not only does consistent use of nicotine containing e-cigarettes lead to an increased risk of addiction, but it can cause other addictive drugs such as cocaine and methamphetamine to have an increased pleasurable effect on the developing brain (U.S Department of Health and Human Services, 2016).

A study published in 2014 in the New England Journal of Medicine reported that nicotine is a gateway drug because of its ability to create a priming effect on a young brain (Kandel, 2014). This effect happens whether traditional cigarettes or e-cigarettes are used. Despite the decreased risk of combustible tobacco morbidity, e-cigarettes still deliver pure nicotine and carry the same increased risk of addiction and gateway effect (Kandel, 2014). It is widely suggested that e-cigarette lead to new nicotine users that otherwise would not have used nicotine delivery products (Brandon, 2015). The gateway effect is also applicable to the transitions from e-cigarette use to traditional cigarette use. It is found that ever e-cigarette users are at an increased susceptibility to traditional cigarette use than never e-cigarette users (Bunnell 2015, Wills, 2016). The social environment and previous use of e-cigarettes is typically associated with an increased susceptibility of traditional cigarette use but there is also what is known as an intermediate step between nonuse and use of traditional cigarettes. If in this period e-cigarettes are adopted there is a greater risk of use whereas if e-cigarettes are not an adopted behavior than students will be less likely to not use traditional cigarettes (Barrington-Trimis, 2016)

Recent years and changing attitudes have led the U.S Food and Drug Administration (FDA) to place stricter restrictions on the buying and selling of e-cigarettes. This administration along with the Centers for Disease Control and Prevention are jointly working on investigating long term effects of e-cigarette use and severe incidents related to this (U.S Food and Drug Administration., 2020). In 2016, the FDA placed stricter regulations on e-cigarettes by expanding the Covered Tobacco Product (CTP) authority to cover all tobacco products including e-cigarettes (U.S Food and Drug Administration., 2020). This being the first time e-cigarettes were regulated on the same level as traditional cigarettes. These regulations ensured that manufacturing complied with federal rules, the inclusion of warning statements on labels, and the raising of the federal minimum age to purchase tobacco products from 18 to 21 (U.S Food and Drug Administration., 2020). These changes in regulation were the result of increasing problems surrounding the trend which include its harmful destruction of youth and young adult brains (Douglass, 2017). Research has shown that the brains of college students are still developing up until age 25 (Understanding the teen brain, n.d.). In addition to being highly addictive to a developing brian, nicotine can also cause behavioral consequences and cognitive impairments including memory loss, inattention, and function impairments (Douglass, 2017). Nicotine is proven to impair the brain circuits that control attention and learning, while also hindering one's flight or fight ability in turn harming oneself or others (U.S Department of Health and Human Services, 2016). The aerosol created by the process of vaping has also been shown to cause respiratory and eye irritation, this is especially harmful for those with asthma (Douglass, 2017).

Despite increasing regulation and a decrease in overall use, the tobacco industry is still booming and is considered one of the largest in the United States. According to the Federal Trade Commission, the tobacco industry spent over $750 million on promotional expenditures for smokeless tobacco in 2018 (FTC, 2018). The majority of the promotional expenditures comes from the large social media presence of top companies such as JUUL, Hyde, and SMOK. In 2017, JUUL owned 59% of the market share and by 2018 their market share increased to 72.8% (University of Massachusetts Medical School, 2020).

Increased autonomy, peer influence and high stress levels are partly to blame as to why students engage in risky behaviors. While a general

lack of knowledge is also to blame for the interest in trying risky behaviors. It is shown that college students are unaware of the dangers associated with vaping and when asked why they vape, 36.66% say its because it tastes good while 20.27% say its because it helps them have a good time (Evans-Polce, R. J. et. al., 2018). College students continue to prove the high level of uncertainty when discussing the potentially harmful effects of using e-cigarettes. Sanders-Jackson and colleagues found that there are in fact high levels of misinformation and uncertainty regarding the contents of e-cigarettes and the e-liquid (Sanders-Jackson, 2015). The study found that 37% of college students did not know whether or not e-cigarettes contain nicotine, while 48% did not know whether or not e-cigarettes contained any harmful chemicals at all (Sanders-Jackson, 2015). Younger populations continue to show their interest in experience seeking and risk taking behavior including their interest and curiosity in novelty substance use including various types of e-cigarettes (Lanza, 2018).

Studies have shown that college students with one or more friends who use e-cigarettes are more likely to perceive e-cigarette use as having a positive social impact (Wallace, 2018). Never users are also more likely to be offered an e-cigarette or trying an e-cigarette if one or more of their friends are e-cigarette users (Wallace, 2018). This gives insight on the role of environment and peer influence on using e-cigarettes. During this period the college environment fosters a sense of peer influence whether it be positive or negative.

The rise in popularity can also be attributed to the absence of the combustion of tobacco seen in traditional cigarettes as well as the social appeal. Despite traditional uses for e-cigarettes, young adults, especially college students have taken special interest in these devices because of the appeal to this age group. Fun flavors and easy accessibility make e-cigarettes particularly more appealing than traditional cigarettes. Studies have shown that e-cigarettes are more acceptable in social situations including parties, bars, and clubs compared to their traditional counterparts. E-cigarettes are allowed at more locations whereas traditional cigarettes are more likely to be banned at establishments college students frequent. Even when e-cigarettes are not permitted at a location, they are easier to physically hide and mask the sweet scent of the range of flavors. Because of the accessibility of e-cigarettes there is great potential that there will be noticeable increases in tobacco use because of the avoidance of barriers brought on by traditional cigarettes.

Recent studies have looked into the demographic breakdown in e-cigarette users. While usage is highly variable across college campus there are specific groups that report higher prevalence rates. A study conducted in 2020 looked specifically at JUUL usage in college students and found that older youth who identified as white and were of higher socioeconomic status were more likely to use JUUL. These characteristics are often seen in college students compared to the general population (Roberts, 2020). Another study conducted in 2017 found the highest e-cigarettes rates among males, past or present traditional cigarette users, and who were affiliated with Greek life (Hart, 2017).

Due to a lack of extensive research conducted on college students regarding e-cigarette use and lack of knowledge of the effects of usage a research question was created in order to fill gaps in the relationship between e-cigarettes and some of their risky behavior counterparts. Are college students who use e-cigarettes more likely to engage in risk behaviors related to: tobacco use, alcohol use, substance use, sexual risk behavior, interpersonal violence and mental health illness? This study will look into existing data to find correlations between e-cigarette usage and six other risky behaviors that are common among college students. The results of this study will be used to make future recommendations pertaining to the relationships, if any, that are found.

Methods

The American College Health Association (ACHA) was established in 1920 to act as a voice for the health and wellness of college students across the country. At the forefront of advocacy, research and education, the ACHA promotes healthy communities, campuses and students. In addition to the core values and overall mission of the ACHA, the organization understands that college students are a diverse and unique group that has specific needs in terms of health and wellness. In order to address these unique needs the organization created the National College Health Assessment (NCHA), a nationally recognized survey that aims to collect data on health behaviors, attitudes, and habits. This survey is one of the broadest of its kind and conducted twice annually by colleges and universities across the country. The data collected by the survey is used by the ACHA as well as independent researchers granted access for their own use.

The NCHA uses the most prevalent health topics pertaining to college students. Topics include but are not limited to Alcohol, tobacco, and other drug use, sexual health, weight, nutrition, and exercise, mental health, and personal safety and violence. On average, the survey takes 30 minutes and can be conducted as a web based survey using the security platform Qualtrics. The survey is confidential and participating students have to be 18 years of age and provide consent twice.

The survey used for this analysis was conducted in Spring of 2019 using the ACHA-National College Health Assessment II. This verision of the assessment was updated in 2015 in order to include topics such as e-cigarettes, sexual partners, sex and gender identity, and sexal orientation.

Design and sample

A retrospective design was used in this study including a secondary analysis of the cross sectional data from the ACHA National College Health Assessment from Spring 2019. This study was approved by the Institutional Review Board at SUNY Brockport. A total of 67,972 students at 98 institutions in the United States of America (U.S) completed the survey. The Spring 2019 survey only used completed surveys from institutions that surveyed all students or used a random sampling technique; institutions who surveyed students in the 30 days following their spring break were omitted from the final report. The response rate for this survey was 23% overall, 86% for paper survey administration, and 17% for web survey administration.

Demographics were recorded and showed that the survey was distributed evenly across the U.S and included 20 in the Northeast, 19 in the Midwest, 20 in the South, and 39 West. The type of institution was evenly distributed and included 65 public, 33 private, 10 two-year, and 88 four-year. Campus size was distributed evenly and included 19 schools having <2,500 students, 9 schools having 2,500-4,999 students, 14 schools having 5,000-9,999 students, 24 schools having 10,000-19,999 students, and 32 schools having 20,000+ students. The campus setting was evenly distributed and included 20 schools located in a very large city (population over 50,000), 9 schools located in a large city (population 250,000-499,999), 42 schools in a small city (population 50,000-249,999), 20 schools located in a large town (population 10,000-49,999), 4 schools in a small town (population 2,500-9,999), and 3 schools located in a rural community (population under 2,500).

Data Analysis

All analyses were conducted using IBM SPSS version 24. Bivariate analyses were used with selected cases to determine correlations. Several questions from the NCHA were used for this analysis (34 questions total). These questions are directly related to each of the six variables used in the research question. For the purpose of this study, the independent variable used for all analyses was question NQ8A10, within the last 30 days, on how many days did you use e-cigarettes, in which

participants could answer never used, but not in last 30 days, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, or used daily. The dependent variables were each of the 34 survey questions pertaining to the six risky behaviors. Only students who reported e-cigarette use were used in the analysis, students who did not indicate any e-cigarette use were omitted from this analysis.

Results

Table 1 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and tobacco use. This analysis used 4 survey questions to determine the correlation. The correlation between e-cigarette use and cigarette used was found to be statistically significant ($r=.01$). Students who reported using e-cigarettes were more likely to report also using traditional cigarettes

Table 2 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and alcohol use. This analysis used 2 survey questions to determine the correlation. The

Variables of Interest

correlation between e-cigarette use and use of alcohol within the last 30 days was found to be statically significant ($r=.208$, $p<.01$). The correlation between e-cigarette use and having 5 or more drinks in one sitting during the last two weeks was also found to be statistically significant ($r=.340$, $p<.01$). Students who reported using e-cigarettes were more likely to report using alcohol and having 5 or more drinks in one sitting.

Table 3 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and substance use. This analysis used 3 survey questions to determine the correlation. The correlation between e-cigarette use and marajuana use was found to be statistically significant ($r=.132$, $p<.01$). The correlation between e-cigarette use and cocaine use was found to be statistically significant ($r=.015$). Students who reported e-cigarette use were more likely to report using marajuana as well as cocaine.

Table 4 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and risky sexual

Table 1. Summary of tobacco use

Item	Pearson's Correlation	Sig. (2-tailed)	N
NQ8A1	.001	.865	19720
NQ8A2	-.085	.000	18793
NQ8A3	-.066	.000	18124
NQ8A4	-.031	.000	16380

Table 2. Summary of alcohol use

Item	Pearson's R	Sig. (2-tailed)	N
NQ8A5	.208	.000	51003
NQ13	.340	.000	66879

Table 3. Summary of substance use

Item	Pearson's R	Sig. (2-tailed)	N
NQ8A6	.132	.000	31484
NQ8A7	.015	.048	16956
NQ8A8	-.019	.016	15858

Table 4. Summary of risky sexual behavior

Item	Pearson's R	Sig. (2-tailed)	N
NQ19>1	-.059	.000	23701
NQ22A	.062	.000	15288
NQ22B	.069	.000	15286
NQ22C	.036	.000	15252
NQ23A	-.335	.000	19048

Table 5. Summary of interpersonal violence

Item	Pearson's R	Sig. (2-tailed)	N
NQ5A	-.169	.000	16836

Table 6. Summary of mental health illness

Item	Pearson's R	Sig. (2-tailed)	N
NQ30A	-.262	.000	42893
NQ30B	-.092	.000	59600
NQ30C	-.122	.000	58202

NQ30D	-.216	.000	47906
NQ30E	-.191	.000	50496
NQ30F	-.305	.000	37106
NQ30G	-.221	.000	47849
NQ30H	-.317	.000	36070
NQ30I	-.297	.000	19155
NQ30J	-.350	.000	21405
NQ30K	-.156	.000	16267
NQ31A1	-.148	.000	16056
NQ31A2	-.338	.000	26629
NQ31A3	-.239	.000	18116
NQ31A4	-.154	.000	16238
NQ31A5	-.121	.000	15910
NQ31A6	-.338	.000	24578
NQ31A7	-.261	.000	18078
NQ31A8	-.227	.000	16766

behavior. This analysis used 5 survey questions to determine the correlation. The correlation between e-ciagrette use and never or rarely using a condom or other protective barrier during oral sex was foudn to be statistically significant (r=.062, p<,01). The correlation between e-cigarette use and never or rarely using a condom or other protective barrier during vaginal intercourse was found to be statistically significant (r=069, p<.01). The correlation between e-ciagrette use and never or rarely using a condom or other protective barrier during anal intercourse was foudn to be statistically significant (r=.036, p<.01). Students who reported e-ciagrette use were more likely to remote never or rarely using a condom or other protective barrier

during oral sex, vaginal intervourse, or anal intercourswe.

Table 5 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and interpersonal violence. This analysis used 1 survey question to determine the correlation. There was no statistical significance found between e-cigarette use and interpersonal violence.

Table 6 presents the results from the bivariate analysis looking at the correlation between e-cigarette use and mental health illness. This analysis used 19 survey questions to determine the correlation. There was no statistical significance

found between e-cigarette use and mental health illness.

Discussion

The purpose of this study was to examine the relationships between e-cigarette use and six risky behaviors within a sample of U.S college students. In this study, it was determined that e-cigarette use in college students was associated with tobacco use, substance use, alcohol use and risky sexual behavior. This study found that e-cigarette use was not associated with interpersonal violence and mental health illness. This study found the strongest correlations in students who reported using e-cigarettes and also using marjauna or alcohol. Another strong correlation was found in students who reported using e-cigarettes and also having 5 or more drinks in one sitting. These findings demonstrate that e-cigarette use does impact the risk of college students participating in some risky behaviors.

This study has many strengths and is one of the only studies to look at multiple risky behaviors as they relate to e-cigarette use in college students. The large and national sample size that is also evenly distributed allowed the study to represent a large portion of the college student population. The use of a standardized instrument (ACHA NCHA) aids in the continuation of research with this same population. Lastly, multiple variables were used that filled multiple gaps within the existing literature. This allows future research and interventions to focus on variables that are directly related to e-cigarette use.

Future Recommendations

Based on the results of this study, future recommendations can be made in order to further the research on e-cigarette use among college students. While some existing literature did observe the relationship between e-cigarette use and some risky behaviors, little literature went in depth and focused independently on e-cigarette use. Further

research should look into the direct relationship between e-cigarette use and the behaviors that showed the strongest correlations ie. alcohol use, substance use, risky sexual behavior and tobacco use.

Because e-cigarette use is a growing health behavior, especially among college students, it is important that the ACHA include more information and survey questions related to e-cigarette use. The term e-cigarette refers to the broad category of electronic cigarettes despite there being different types and brands. The survey questions should also include the term vape or vaping as this term is more common among college students. With the singular use of the term e-cigarettes, data may have been skewed because of a lack of knowledge of this term compared to the knowledge of the term vape and vaping.

This study identified specific risky behaviors that are related to e-cigarette use. These identified relationships can be used to increase educational programming and interventions on college campuses that focus directly on these relationships. These educational interventions should be aimed at increasing understanding of the relationships that lie between e-cigarette use and the identified risky behaviors.

Conclusion

This study provides insight on existing knowledge pertaining to e-cigarette use among college students. While there is more research to be done, due to the lack of extensive literature for this relatively new health behavior, this study does look into how e-cigarette usage affects other risky behaviors that are known and studied in college students. This study also provides recommendations for not only future research but recommendations for college campuses. There is a need for health programming beyond substance and alcohol use, programs need to expand to incorporate topics such as nicotine and e-cigarette

usage. College students are a complex population who are heavily influenced by the environment they are thrown into, and because of this susceptibility targeted interventions are needed.

Limitations

This study does have limitations. The data from the NCHA ACHA is based on self report by participating students, with the potential for reporting errors and discrepancies in answers to survey questions. There is also potential for information bias. Data used in the analysis was only if the student ever reported using e-cigarettes, this study did not take into account whether the student rarely used or used regularly. The ACHA NCHA provided little information on participating institutions and while they were evenly distributed in multiple categories, the findings may not be generalizable and may not accurately represent all college students across the U.S. Lastly, While the ACHA does omit potential surveys and transitions that can skew data, there is still potential for errors.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the creation of this paper.

Acknowledgements

References

Abadi, S., Couch, E. T., Chaffee, B. W., & Walsh, M. M. (2017). Perceptions Related to Use of Electronic Cigarettes among California College Students. *Journal of Dental Hygiene : JDH, 91*(1), 35–43.

Aldeis, D., & Afifi, T. D. (2013). College students' willingness to reveal risky behaviors: The influence of relationship and message type. *Journal of Family Communication, 13*(2), 92–113. https://doi.org/10.1080/15267431.2013.768246

Barrington-Trimis, J. L., Berhane, K., Unger, J. B., Cruz, T. B., Urman, R., Chou, C. P., Howland, S., Wang, K., Pentz, M. A., Gilreath, T. D., Huh, J., Leventhal, A. M., Samet, J. M., & McConnell, R. (2016). The E-cigarette Social Environment, E-cigarette Use, and Susceptibility to Cigarette Smoking. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine, 59*(1), 75–80. https://doi.org/10.1016/j.jadohealth.2016.03.019

Brandon, T. H., Goniewicz, M. L., Hanna, N. H., Hatsukami, D. K., Herbst, R. S., Hobin, J. A., Ostroff, J. S., Shields, P. G., Toll, B. A., Tyne, C. A., Viswanath, K., & Warren, G. W. (2015). Electronic nicotine delivery systems: a policy statement from the American Association for Cancer Research and the American Society of Clinical Oncology. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology, 33*(8), 952–963. https://doi.org/10.1200/JCO.2014.59.4465

Brown, E. M., Henes, A. L., & Olson, L. T. (2016). E-cigarette policies on college campuses: Students use behaviors, awareness, and policy support. *Journal of Community Health, 41*(6), 1110–1115. https://doi.org/10.1007/s10900-016-0262-y

U.S Census Bureau. *(n.d.).* More than 76 million students enrolled in U. S. Schools, census bureau reports. The United States Census Bureau. Retrieved from *https://www.census.gov/newsroom/press-releases/2018/school-enrollment.html*

Bunnell, R. E., Agaku, I. T., Arrazola, R. A., Apelberg, B. J., Caraballo, R. S., Corey, C. G., Coleman, B. N., Dube, S. R., & King, B. A. (2015). Intentions to smoke cigarettes among never-smoking US middle and high school electronic cigarette users: National Youth Tobacco Survey, 2011-2013. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco, 17*(2), 228–235. https://doi.org/10.1093/ntr/ntu166

Case, K., Crook, B., Lazard, A., & Mackert, M. (2016). Formative research to identify perceptions of e-cigarettes in college students: Implications for future health communication campaigns. *Journal of American college health : J of ACH, 64*(5), 380–389. https://doi.org/10.1080/07448481.2016.1158180

Choi, K., & Forster, J. (2013). Characteristics associated with awareness, perceptions, and use of electronic

nicotine delivery systems among young US Midwestern adults. *American journal of public health, 103*(3), 556–561. https://doi.org/10.2105/AJPH.2012.300947

Douglass, B. L., & Solecki, S. (2017). Teen vaping: time to clear the air. *Contemporary Pediatrics, 34*(8), 24-38.

Ghosh, S., & Drummond, M. B. (2017). Electronic cigarettes as smoking cessation tool: are we there?. *Current opinion in pulmonary medicine, 23*(2), 111–116. https://doi.org/10.1097/MCP.0000000000000348

Hart, E. P., Sears, C. G., Hart, J. L., & Walker, K. L. (2017). Electronic Cigarettes and Communication: An Examination of College Students' Perceptions of Safety and Use. *Kentucky journal of communication*, *36*(1), 35–51.

JUUL Lab Inc.. (2018). JUULpod Basics. Retrieved from https://www.juul.com/learn/pods.

Kandel, E. R., & Kandel, D. B. (2014). A molecular basis for nicotine as a gateway drug. *New England Journal of Medicine*, *371*(10), 932–943. https://doi.org/10.1056/NEJMsa1405092

Kenne, D. R., Fischbein, R. L., Tan, A. S., & Banks, M. (2017). The Use of Substances Other Than Nicotine in Electronic Cigarettes Among College Students. *Substance abuse : research and treatment*, *11*, 1178221817733736. https://doi.org/10.1177/1178221817733736

Lanza, H. I., & Teeter, H. (2018). Electronic nicotine delivery systems (E-cigarette/Vape) use and co-occurring health-risk behaviors among an ethnically diverse sample of young adults. *Substance Use & Misuse*, *53*(1), 154–161. https://doi.org/10.1080/10826084.2017.1327975

McKeganey, N., Barnard, M., & Russell, C. (2018). Vapers and vaping: E-cigarettes users views of vaping and smoking. *Drugs: Education, Prevention and Policy, 25(1), 13–20.* https://doi.org/10.1080/09687637.2017.1296933

Mirbolouk, M., Charkhchi, P., Kianoush, S., Uddin, S. M. I., Orimoloye, O. A., Jaber, R., Bhatnagar, A., Benjamin, E. J., Hall, M. E., DeFilippis, A. P., Maziak, W., Nasir, K., & Blaha, M. J. (2018). Prevalence and Distribution of E-Cigarette Use Among U.S. Adults: Behavioral Risk Factor Surveillance System, 2016. *Annals of Internal Medicine, 169*(7), 429–438. https://doi.org/10.7326/M17-3440

National Academies of Science Engineering, and Medicine. (2018). Public health consequences of e-cigarettes. *Washington, DC: The National Academies Press.* https://doi.org/10.17226/24952

Ren, M., & Lotfipour, S. (2019). Nicotine gateway effects on adolescent substance use. *Western Journal of Emergency Medicine, 20*(5), 696–709. https://doi.org/10.5811/westjem.2019.7.41661

Roberts, M. E., Keller-Hamilton, B., Ferketich, A. K., & Berman, M. L. (2020). Juul and the upsurge of e-cigarette use among college undergraduates. *Journal of American College Health : J of ACH,* 1–4. https://doi.org/10.1080/07448481.2020.1726355

Saddleson, M. L., Kozlowski, L. T., Giovino, G. A., Hawk, L. W., Murphy, J. M., MacLean, M. G., Goniewicz, M. L., Homish, G. G., Wrotniak, B. H., & Mahoney, M. C. (2015). Risky behaviors, e-cigarette use and susceptibility of use among college students. *Drug and Alcohol Dependence, 149,* 25–30. https://doi.org/10.1016/j.drugalcdep.2015.01.001

Sanders-Jackson, A. N., Tan, A. S., Bigman, C. A., & Henriksen, L. (2015). Knowledge About E-Cigarette Constituents and Regulation: Results From a National Survey of U.S. Young Adults. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco*, *17*(10), 1247–1254. https://doi.org/10.1093/ntr/ntu276

Understanding the teen brain—Health encyclopedia. (n.d.). University of Rochester Medical Center. Retrieved from https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=1&ContentID=3051

University Of Massachusetts Medical School. (2020). Basic skills for tobacco treatment. Module 1, slide 22.

U.S Department of Health and Human Services. (2016). E-cigarette use among youth and young adults: a report of the surgeon general- executive summary. Retrieved from https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_Exec_Summ_508.pdf

U.S Department of Health and Human Services. (2019, September 13). Marijuana use at historic highs among college age adults. Retrieved from https://www.drugabuse.gov/news-events/news-releases/2019/09/marijuana-use-at-historic-highs-among-college-age-adults

U.S Department of Health and Human Services. (2020, January 23). Adult smoking cessation- the use of e-cigarettes. Retrieved from https://www.cdc.gov/tobacco/data_statistics/sgr/2020-smoking-cessation/fact-sheets/adult-smoking-cessation-e-cigarettes-use/index.html

U.S Department of Health and Human Services. (2020, January). Vaping devices (electronic cigarettes) drugfacts. Retrieved from https://www.drugabuse.gov/publications/drugfacts/vaping-devices-electronic-cigarettes#ref

U.S Food and Drug Administration. (2020). Vaporizers, e-cigarettes, and other electronic nicotine delivery systems(Ends). FDA. https://www.fda.gov/tobacco-products/products-ingredients-components/vaporizers-e-cigarettes-and-other-electronic-nicotine-delivery-systems-ends

Wallace, L. N., & Roche, M. J. (2018). Vaping in context: Links among e-cigarette use, social status, and peer influence for college students. *Journal of Drug Education*, *48*(1–2), 36–53. https://doi.org/10.1177/0047237918807706

Walley, S. C., Wilson, K. M., Winickoff, J. P., & Groner, J. (2019). A Public Health Crisis: Electronic Cigarettes, Vape, and JUUL. *Pediatrics*, *143*(6). https://doi.org/10.1542/peds.2018-2741

Wills, T. A., Sargent, J. D., Knight, R., Pagano, I., & Gibbons, F. X. (2016). E-cigarette use and willingness to smoke: a sample of adolescent non-smokers. *Tobacco control*, *25*(e1), e52–e59. https://doi.org/10.1136/tobaccocontrol-2015-052349

World Health Organization. (1998). Health promotion glossary. Retrieved from Health Promotion Glossary, 1998 version pdf, 580kb