THE PREVALENCE OF VAPING AND VAPING ADDICTION AMONG A SAMPLE

OF COLLEGE STUDENTS

By

Kathryn A. Swinson

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by

Kathryn A. Swinson

Greenville, NC

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Approved by:

Ryan J. Martin, PhD.

Department of Health Education and Promotion, College of Health and Human Performance

Abstract

Nicotine and e-cigarette use has been on the rise over the past decade. Young adults are rapidly

getting involved in the trend and the rising incidence of involvement is alarming as there are

long-term health impacts which have not been sufficiently researched. Additionally, there is

more research done to explore vape addiction among high school students, but less data is

available on those entering universities. The primary goals of the study were to measure

prevalence of vaping among a sample of college students and to examine differences in vaping

behaviors among two demographic groups: first-semester university status and gender. The study

involves a secondary analysis of survey data collected by professors in the East Carolina

University (ECU) Department of Health Promotion and Education. The online Qualtrics survey,

conducted during the Fall 2019 semester, administered to HLTH 1000 students (n = 1377) and

completed anonymously, assessed health behaviors among participants. Using SPSS, frequencies

were reported for demographic variables (e.g., gender, first-semester university status) and the

following vaping-related variables of interest: those who have ever vaped, current vape users,

and vape addiction/dependence sumscores. Next, a series of chi-square tests were computed to

examine differences in the vaping-related variables of interest by two demographic factors

(gender, first-semester university status). The majority of the sample was female (65.6%), white

(77.5%), and in their first semester of college (88.1%). Prevalence rates for the vaping behaviors

of interest are as follows: Ever vaped (57.7%), currently vape (34.3%), and had a vape

addiction/dependence sumscore greater than 2 (3.2%). Chi-square results indicated that there

were no statistically significant differences in the vaping related behaviors based on gender or

first-semester university status. However, males were more likely to currently vape ($X^2 = 2.957$,

p = 0.085) and indicate higher vaping addiction sumscores ($X^2 = 2.101$, p = 0.147). Since

differences in demographic factors were not found, the results of the study may encourage

universities to include more information on the health impacts of regularly vaping to all students

in required health courses. This would result in students being able to make more educated health

decisions regarding vaping and the information would reach students in all majors and

departments.

Keywords: Vaping Addiction, College Students

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Vaping and Electronic Cigarettes: Introduction

Inhaling any substance into one's body has an inherent risk to the user, a risk many are willing to accept. Like cigarettes, vaping is the newest way to get a nicotine fix quickly and conveniently. Being more of a recent development, there are many aspects of vaping which are unknown to researchers, as there has not been reasonable time to observe effects of the long-term use of vapes and e-cigarettes.

More recent research has proven that there are several health-related impacts that are like the impacts of cigarettes which are affecting users like Lung Cancer, Chronic Obstructive Pulmonary Disease (COPD), Heart Disease, and lung injuries. There are other health impacts which are not as sufficiently researched, such as the toxic effects of inhaling the heavy metals, flavor additives included in the nicotine juices and pods and other added chemicals. Through the flavors and wide varieties of vaping products being sold, the vaping market has been targeting younger consumers and the rates of young adults vaping have sky-rocketed in recent years. These aspects of the vaping industry, and due to less research done about vaping behaviors of university students over high school students, led to the current study analyzing prevalence of vaping among a sample of college students and to examine differences in vaping behaviors of three demographic groups: first-semester university status, males and females.

Review of Literature

Origin of E-Cigarette Development

Nicotine has been around in the Americas for a long time and there is evidence of tobacco leaves being smoked from as early as 700 C.E. (Karpan, 2019). Use has also been

promoted outside of North America since around 1590, but it was not until 1949 that research

was performed and discovered that there are adverse health effects involved in smoking tobacco

(Karpan, 2019). Nicotine, an addictive substance, has caused problems for users for as long as it

has been around. Cigarette addiction has plagued a countless number of individuals across the

world, some struggling with quitting and the health consequences for years. With more research

on the long-term effects of cigarettes, like lung cancer and COPD, there have been prevention

efforts launched to educate the public on what health issues could result from regular smoking.

The World Health Organization has even named nicotine the "single greatest preventable cause

of death" (Karpan, 2019). Now no one can purchase a cigarette carton without a warning label on

it, visit the doctor without being questioned on whether they smoke or use tobacco products, and

smoking in public has been banned in the United States to prevent second-hand smoke

inhalation. Smoking is an unhealthy habit, one which is difficult to quit once started, and nicotine

replacements have been developed to help people attempting smoking cessation.

Such replacements include nicotine patches, nicotine gum, and e-cigarette devices. E-

cigarettes were thought to be a preferable smoking method as they did not release the cancerous

tar-tint of cigarettes, but instead water-vapor thought to be harmless (Karpan, 2019). Vapes could

seemingly help wean an addicted smoker off cigarettes with some juices having little to no

nicotine. Original flavors included those like flavors of cigarettes such as tobacco or menthol.

The purpose was clear at the beginning of their development, but as companies like Juul and Blu

produced new flavors and levels of nicotine, juice sales began to rise. Unfortunately, the sales of

vapes started to target the wrong consumer; individuals who had never smoked before began

vaping for the sole purpose of the added nicotine.

Prevalence of Vaping in Young Adults

Vaping has been on the rise for the past decade, and younger generations have been getting involved in the trend. In an interview with the Journal of the American Medical Association (JAMA), Dr. Rose Marie Robertson of the American Heart Association (AHA) spoke about the rise in vaping among adolescents and young people. Dr. Robertson said that it was not until around 2010 to 2011 when researchers first began to see children get involved with e-cigarettes (Abbasi, 2020). As the products became more popular though, marketing efforts rose incredibly, and many children and young adults began regularly vaping (Abbasi, 2020). Dr. Robertson went on to discuss that many children acknowledged that they were addicted to the devices, desperate to quit, but just could not (Abbasi, 2020).

The Centers for Disease Control and Prevention has performed the Nation Youth Tobacco Survey for years, and between 2011 and 2019 e-cigarette use increased more rapidly than any other form of tobacco use, including cigarettes, smokeless tobacco, hookah, pipes, and cigars (King, et. al. 2020). The regular use of e-cigarette rates in US high school students has risen from less than three percent of the student population in 2011 to around 27% as of 2019 (King, et. al. 2020). The vaping epidemic is alarming and is only continuing to rise.

There are increasing cases of lung injuries related to vaping, these injuries are being reported as E-cigarette and Vaping Associated Lung Injury (EVALI). As of January 2020, the CDC received reports of 2,602 cases of EVALI in the United States (King, et. al. 2020). Of those 2,602 cases, the CDC reported the median age of the patients to be 26 years old, 16% under the age of 18, and 62% of them were between the ages of 18 and 34 (King, et. al. 2020). These rates

reflect the predominantly young individuals involved with vaping and how the majority of

EVALI cases are the young population.

Addiction, Marketing, and Regulations

As e-cigarettes become more popular, the market for selling them is targeting younger

consumers. This correlates greatly with why the prevalence of vaping is higher in high schoolers

and young adults. Some main marketing strategies implemented by companies which produce

vapes are social media platform promotion, the variety of vaping models and colors of devices,

the variety of different flavors, and the differing levels of nicotine content one can purchase.

With so many elements of the industry luring in young individuals to begin vaping, a larger

amount of this age-group's population is getting hooked on the products and using juices higher

in nicotine concentrations as they continue vaping.

The huge variety of vaping devices was explored in a 2014 survey of online vape

distributing sites reported that there were at least 466 different brands of vapes, 7,764 different

vape juice flavors, and around four to five different strengths of nicotine (Braak, 2019). Many of

the vape juices being marketed include fruity flavors which are more appealing to young

individuals or to those who did not begin vaping with the purpose of smoking cessation (Braak,

2019). Dr. Robertson stated in her JAMA interview "We should've been more suspicious when

they were advertised with flavors like bubblegum, and unicorn, and cotton candy. Those aren't

the names you'd use if you were reaching for an adult audience" (Abbasi, 2020). Typically, those

who have a history of smoking cigarettes or use of other tobacco products would choose the

tobacco or menthol flavors like those they were used to experiencing (St. Helen et. al., 2018).

The large variety of vaping devices to pick from lure in more consumers and contribute to

addictions. Users go through the experience of deciding what color, flavor, and delivery method

they would prefer. There are three primary vaping systems and depending on what system a

vaping device has, the different effect of nicotine delivery to the body (Braak, 2019). Depending

on the efficiency of delivery of the nicotine, the more difficult it would be for a smoker to cut out

nicotine and easier for an individual to become addicted to the products (Braak, 2019).

Many countries have taken different approaches to regulating the sale of vapes and for a

while there was little regulation in the United States. There was a debate on what to consider

vaping devices since the health impacts were not immediately evident (Braak, 2019). Initially, it

was not known whether to consider and regulate vapes and e-cigarettes as tobacco products,

therapeutic goods, medical devices, or consumer lifestyle products (Braak, 2019). Ultimately,

they are considered and regulated as tobacco products. The age to purchase tobacco products and

vaping devices was set at 18 years old, but on December 20, 2019 this age increased to 21 with

the passing of the Tobacco 21 legislation to amend the Food, Drug and Cosmetic Act (FDA,

2020). This legislation made it more difficult for high school aged students to become involved

with vaping. In addition, one pod of juice is typically equivalent in nicotine content to an entire

pack of combustible cigarettes, and it is not uncommon for people to go through two to three of

those pods a day (Abbasi, 2020). Considering how addictive combustible cigarettes already are,

the amount of nicotine in only a pod contributes greatly to addictions to e-cigarettes and can

often lead to users switching over to use combustible cigarettes (Abbasi, 2020). With these

elements of vape marketing and addiction considered it is crucial to explore what aspects of

vapes and marketing need to be regulated to prevent further rapid increase in users.

Health Impacts

Inhaling any substance into your body can and will cause damage in the long run; this goes for vaping as well. Vaping is a relatively new development of substances for people to use to get a nicotine fix, having only hit the market in 2007, but the health impacts have still not fully been identified (King, et. al., 2020). Vaping seems to cause health issues like what smoking causes in individuals. Lung cancer, COPD, and Heart Disease are some of the more well studied health effects (Couzin-Frankle, 2019). There are also health impacts from inhaling the heavy metals, propylene glycol, and chemical substances found in flavor additives which cause effects from long-term use (Abbasi, 2020). To generally categorize the lung injuries caused by e-cigarettes and vaping, the name E-cigarette and Vaping Associate Lung Injury (EVALI) was coined (Christiani, 2020). With the development of vaping devices being relatively recent, the first developments occurring in 2003, and popularity of devices sparking in 2010 the long-term effects are just now surfacing in research (Karpan, 2020).

The contents of many popular brands of vape manufactures utilize nicotine salts in their pods or juices (Abbasi, 2020). With the substitution of nicotine salts, the "pulls" or "puffs" from these vapes are easier to inhale and cause less irritation to airways making them a more appealing form of nicotine (Abbasi, 2020). Salts also allow the nicotine content to be higher, usually higher than that of a combustible cigarette, making the resulting rush of nicotine buzz occur rapidly (Abbasi, 2020). Nicotine itself poses several known health risks to users and the more nicotine content included in these vapes, the higher the risk of negative health impacts.

Cardiovascular health is affected negatively when nicotine is regularly abused by an

individual, and studies show solid evidence for this when researching combustible cigarettes and

other forms of tobacco. There are several conditions which may result from nicotine use

including atherosclerosis, arrythmias, sudden cardiac death, and atrial fibrillation (Abbasi, 2020).

The reason these conditions develop with nicotine use is due to nicotine's effect on heart rate,

blood pressure and myocardial contractibility (Couzin-Frankle, 2019). As e-cigarettes have very

high levels of nicotine, it is also affecting the body negatively like these other forms of tobacco

products. Not only this, but a study looking into flavored nicotine juices shows some flavors to

have greater effects on myocardial contractibility and electrophysiology (Abbasi, 2020).

Endothelial cells and platelets also suffer from toxic effects of the inhaled chemicals, and the

severity to which these issues develop are based around flavoring, nicotine concentrations and

delivery systems of vape devices (Abbasi, 2020).

Lung cancer and injuries are also health concerns when exploring impacts of vaping.

EVALI cases have drawn attention in the media recently due to more cases being identified. As

of January 7, 2020, there had been 2,602 identified cases reported to the CDC in the US and 57

confirmed deaths (King, et. al., 2020). Every patient diagnosed with EVALI used vapes, many

claiming to have received them from informal sources (King, et. al., 2020). Due to these rapidly

rising cases of EVALI, public health advisories on the federal and state level and restrictions on

sales have since been implemented (King, et. al., 2020). A study performed by the University of

New York School of Medicine also suggests that vaping and e-cigarettes can lead to increased

chances of developing lung cancer (Couzin-Frankle, 2019). The study involved exposing mice to

e-cigarettes for 54 weeks straight. The results showed that the mice did have an increased risk of

lung cancer as well as changes in bladder cells which showed higher risks of cancer development in those cells (Couzin-Frankle, 2019). These results do not necessarily reflect what effects e-cigarettes have on human cells but do foretell danger in frequent usage of the devices.

E-cigarettes and nicotine juices include heavy metals and chemicals which are toxic to the body, some not regulated or approved by the FDA, and cause damage to cells when frequently and regularly inhaled (Abbasi, 2020). Many of the compounds included in e-cigarettes do have known toxic effects and some have not been thoroughly researched to determine the effects of inhalation (Abbasi, 2020). Vegetable glycerin and propylene glycol are two of the compounds with known toxic effects on the lungs (Couzin-Frankle, 2019). These two compounds are known to break down surfactant, a lipoprotein involved in gas exchange in the lungs (Couzin-Frankle, 2019). A study at Baylor College of Medicine lead by Dr. Farrah Kheradmand saw this effect in mice lungs which were exposed to e-cigarettes for four months (Couzin-Frankle, 2019). Kheradmand and her team discovered swollen macrophages filled with surfactant fat and linked this breakdown of surfactant to the vegetable glycerin and propylene glycol (Couzin-Frankle, 2019). It was seen that following the increased level of swollen macrophages and lack of surfactant left many of the mice with weakened immune systems (Couzin-Frankle, 2019). While this study explored the impact of the vegetable glycerin and propylene glycol, vape juices have been shown to contain at least seven different groups of what could be toxic compounds resulting in lung injury and illness like pneumonia, alveolar damage and acute respiratory distress syndrome (ARDS) (Christiani, 2020).

Purpose

The current study investigates the prevalence of vaping behaviors among different demographics of college students (e.g., first-semester university status and gender) and explores the differences between each group. With there being significantly less research done on vaping behavior habits in first-semester college students, this data will contribute to supplying insight on this sub-group of college students. Health interventions, such as including the harmful effects of vaping in entry level university health courses, could be inspired by the study with the goal of lowering the number of students that vape. As of 2019, the rate of US high school students regularly using e-cigarettes was around 27% and the number of males using e-cigarettes was higher compared to females (King, et. al. 2020). Consistent with this and the other studies explored, it is expected in this study that at least a quarter or 25% of participants will be current vapers and that males are more likely to partake in vaping behaviors and indicate higher vape addiction sumscores.

Methods

A secondary data analysis was performed utilizing survey data collected by professors in the ECU Department of Health Education and Promotion. Because there was no identifiable information in the dataset, this study was classified as exempt by the Institutional Review Board (IRB) (see Appendix A). The primary goals of the current study were to measure the prevalence of vaping behaviors among a sample of college students and to investigate differences in vaping addiction of two demographic groups: first-semester university status and gender. The online Qualtrics survey was conducted in the Fall 2019 semester and was administered to students enrolled in the HLTH 1000 course, a required general education health course commonly taken in a student's first semester. Participants (n = 1377) responded to the survey which assessed

several health behaviors. Participants were to complete the survey anonymously and voluntarily

outside of the classroom. The questions and response options which were utilized in the study are

included in Table 1.

Table 1. Survey questions and response options

Survey Questions	Response Options
Demographics	
How old are you?	(1) 18, (2) 19, (3) 20, (4) 21, (5) 22, (6) Older than 22
How do you describe your gender identity?	(1) Male, (2) Female, (3) Transgender, (4) Other gender identity
What is your class standing?	(1) Freshman, (2) Sophomore, (3) Junior, (4) Senior, (5) Other
How do you describe yourself?	White or Caucasian, Black or African American, Asian, American Indian or Alaska Native, Middle Eastern or North African, Native Hawaiian, Other race, ethnicity or origin
Not including summer school, is Fall 2019 your first semester at ECU?	(1) Yes, (2) No
Vaping Prevalence	
Have you ever used an electronic cigarette? When we say electronic cigarettes, this includes all types such as vapes, vape pens, mods, e-hookahs, e-cigars, JUUL, etc.	(4) Yes, (5) No
Do you currently use an e-cigarette/vaping device?	(1) Every day, (2) Some days, (3) Not at all
Vaping Addiction	
I find myself reaching for my e-cigarette/vaping device without thinking about it. (Morjean et al., 2019)	(0) Never, (1) Rarely, (2) Sometimes, (3) Often, (4) Almost always
I drop everything to go out and buy e-cigarettes or e-juice. (Morjean et al., 2019)	(0) Never, (1) Rarely, (2) Sometimes, (3) Often, (4) Almost always
I vape more before going into a situation where vaping is not allowed. (Morjean et al., 2019)	(0) Never, (1) Rarely, (2) Sometimes, (3) Often, (4) Almost always

When I haven't been able to vape for a few hours, the craving gets intolerable. (Morjean et al., 2019)	(0) Never, (1) Rarely, (2) Sometimes, (3) Often, (4) Almost always

Variables

Vaping prevalence was a dichotomous variable: Ever vaped (yes or no). Current vaping prevalence was re-coded into a dichotomous variable: Every day and some days (yes), not at all (no). Only participants who currently vaped were asked the four questions about vaping addiction (Morean et al., 2019). Those four questions were on a 0-4 scale and were sumscored (0-16) with higher sumscores indicating a higher level of addiction/dependance. Next the total sumscore was divided by four for a final composite sumscore (0-4). Based on the recommendation of other researchers, the composite sumscore was dichotomized: 0-1.99 and 2-4.

Gender identity was re-coded into a dichotomous variable: Male and female. Prior to the recoded, there were up to four different response options for identifying gender: Male, female, transgender, and other gender identity. Only data from participants which responded as male or female was utilized in the current study as to focus on those two genders. Class standing was also coded into five variables: Freshmen, sophomore, junior, senior, and other, specify. These responses were not used to determine semester status as the question on whether it was a student's first semester at ECU was utilized and was a dichotomous variable: First-semester status (yes or no).

Data Analysis

Data analyses were performed using the Statistical Package for the Social Sciences

(SPSS). The primary survey data was inputted into SPSS and frequencies were reported for

demographics (e.g., male, female and first-semester university status) and the following vaping-

related health behaviors of interest: those who have ever vaped, current vape users, and vape

addiction/dependence sumscores. Next, a series of crosstabulation tests were computed with the

purpose of examining the differences in the vaping-related behaviors of interest among the

demographic groups of interest: males, females and first-semester university status. The

crosstabulation tests that were computed for the demographics and health behaviors of interest

were: Females and males and those which have ever vaped, females and males and those which

currently vaped, females and males and those which had vape addiction sumscores greater than

2, first-semester university status and those which have ever vaped, first-semester university

status and those which currently vapes, and first-semester university status and those which had

vape addiction sumscores greater than 2. Chi-square and asymptotic values were computed for

each crosstabulation test. Ultimately, six crosstabulation tests were completed along with chi-

square tests with the goal of finding whether there were significant relationships between the

vaping-related behaviors and demographics of interest to determine.

Results

Demographics

Among the 1377 survey participants, most were found to be white (75.5%), female

(65.6%), and in their first semester of college (88.1%). More than half of the participants

reported having used a vape at least once in their life (57.7%), while less currently engaged in

vaping and e-cigarettes (34.3%). In addition, there were a relatively small proportion of

participants who had a vaping addiction/dependence sumscore of 2 or higher (3.2%). Among

those -

Table 2. Demographics, vaping behaviors and vape addiction among a sample of college
students (n = 1377)

Demographic	n (%)
Age	
18	1027 (75.1)
19	181 (13.1)
20	69 (5.0)
21	31 (2.3)
22	21 (1.5)
Over 22	39 (2.9)
Class Standing	
Freshman	1067 (77.5)
Sophomore	187 (13.6)
Junior	89 (6.5)
Senior	25 (1.8)
Other	8 (0.6)
First-Semester University Status	
Yes	1212 (88.1)
No	164 (11.9)
Gender	
Male	467 (34.0)
Female	902 (65.6)
Race/Ethnicity	
African American	244 (17.7)
Hispanic/Latino	111 (8.1)
American Indian/Alaskan Native	20 (1.5)
Asian/Pacific Islander	5 (0.4)
White	1039 (77.5)
Other	7 (0.5)
Ever Vaped	
Yes	794 (57.7)
No	583 (42.3)
Currently Vape	
Yes	472 (34.3)
No	905 (65.7)

Vape Addiction/Dependence Sumscore >2 (among the entire sample)	
Yes	44 (3.2)
No	375 (27.2)
Vape Addiction/Dependence Sumscore >2 (among those who currently vape)	
Yes	44 (10.5)
No	375 (89.5)

Table 3. Prevalence rates for demographics and vaping behaviors of interest

Demographic	That Have Ever Vaped (%)	That Currently Vape Regularly (%)	Vape Addiction/Dependence Sumscore >2 (%) Among Those Who Currently Vape
Male	57.8	37.5	13.3
Female	57.8	32.8	8.8
1st Semester in College	57.2	34.2	9.7
2nd Semester or later in College	61.6	35.4	16.3

Chi-Square Tests

Tables 3 and 4 present the overall results of the six crosstabulation and chi-square test results, displaying the prevalence rates for each of the demographics, the chi-square ($\chi 2$) values and the asymptotic (p) values which showed any correlation. To determine whether there was significance in the statistical relationship between any of the crosstabulation tests between the demographics and vaping behaviors, chi-square values and p-values were evaluated. P-values less than 0.05 would be an indication of significance as this would represent the fact that the results of the test have less than a five percent chance of being invalid.

Chi-square results showed that there were no statistically significant differences in the

vaping related behaviors based on gender or first-semester university status. However, males

were more likely to currently vape ($\chi^2 = 2.957$, p = 0.085) and have a vape addiction sumscore

greater than 2 ($\chi^2 = 2.101$, p = 0.147). Additionally, those not of first-semester status were more

likely to have a vape addiction sumscore greater than 2 ($\chi^2 = 2.004$, p = 0.157) than those who

had first-semester university status. This finding was inconsistent with what was expected, which

was that first-semester university students would be more commonly addicted to vaping.

Table 4. Chi-square test results for males and females for vaping prevalence and addiction

Characteristics	Male n (%)	Female n (%)	χ^2 or F	p
Those that have ever vaped.				
Yes	270 (57.8)	521 (57.8)	0.000	0.984
No	197 (42.2)	381 (42.4)		
Those that currently vape.				
Yes	175 (37.5)	296 (32.8)	2.957	0.085
No	292 (62.5)	606 (67.2)		
Vape Addiction/Dependence Sumscore >2 (from those that currently vape).				
Yes	21 (13.3)	23 (8.8)	2.101	0.147
No	137 (86.7)	238 (91.2)		

Table 5. Chi-square test results for first-semester university status students for vaping prevalence
and addiction

Characteristics	First-semester university status n (%)	2nd Semester or later in College (%)	χ^2 or F	p
Those that have ever vaped.				
Yes	693 (57.2)	101 (61.6)	1.150	0.284
No	519 (42.8)	63 (38.4)		
Those that currently vape.				
Yes	414 (34.2)	58 (35.4)	0.093	0.760
No	798 (65.8)	106 (64.6)		
Vape Addiction/Dependence Sumscore >2 (from those that currently vape).				

Yes	36 (9.7)	8 (16.3)	2.004	0.157
No	334 (90.3)	41 (83.7)		

Vaping Addiction Sumscore

A sumscore scale was used to determine the number of participants which met the

threshold for vape addiction/dependence. To determine the vaping addiction sumscores there

were 16 addiction values which could add up to as high as 16 based off the responses from

participants. Once taking the total sum of the addiction values, these values were then divided by

four to provide end vape addiction sumscore values between 0.00 and 4.00. Those responses

which resulted in sumscores less than 2.00 indicted that there is not vape dependence or

addiction present in those respondents. However, if the vaping sumscore equaled a value of 2.00

or higher, then the threshold for vaping dependence and addiction is met.

While the sumscores had the opportunity to be as high as 4.00, the maximum sumscore

calculated for the participants' responses was 2.75 with only one set of responses meeting this

maximum. Most of the sumscores were not higher than 1.99, having only 44 sumscores above

the vaping addiction threshold. This left 376 sumscores below 2.00 which allowed for the

conclusion that the majority of participants were not addicted to nicotine vaping. The mean

(0.8198), median (0.7500) and mode (0.00) all indicated that the sample leaned towards the low

end of the sumscore range (2.75) and there was few vape addicts among the sample.

Table 6. Vaping addiction sumscore statistics among those who currently vape (n = 419)

Statistic	Value
Mean	0.8198

Median	0.7500
Mode	0.00
Standard Deviation	0.70396
Range	2.75
Minimum	0.00
Maximum	2.75

Table 7. Vape addiction sumscore results

Sumscore	Frequency	Percent (Among the entire sample; n = 1377)	Percent (Among those who currently vape; n = 419)	Cumulative Percent (Among those who currently vape; n = 419)
0.00	87	6.3	20.8	20.8
0.25	58	4.2	13.8	34.6
0.50	54	3.9	12.9	47.5
0.75	44	3.2	10.5	58.0
1.00	44	3.2	10.5	68.5
1.25	33	2.4	7.9	76.4
1.50	31	2.3	7.4	83.8
1.75	24	1.7	5.7	89.5
2.00	24	1.7	5.7	95.2
2.25	12	0.9	2.9	99.1
2.50	7	0.5	1.7	99.8
2.75	1	0.1	0.2	100.0

Discussion and Implications

The study examined whether there was any association between vaping related behaviors

and the demographic groups of interest. The prevalence of vaping among the sample was higher

than the prevalence observed in a sample of US high school students in 2019 (27%, King, et. al.,

2020), the same year that this survey was administered. This showed that the prevalence of

vaping following the transition into college or a university was not greatly affected and that

individuals were possibly more likely to vape while in college. With over one-third of the

participants being current vapers and over one-half having vaped at least once before in their

lives, vaping was not an uncommon occurrence in the survey participants.

Consistent with what was expected of the results, males were found to be more likely to

have ever vaped, currently vape, and have a vape addiction sumscore greater than 2. In contrast

to this, an unexpected result was that participants in their second semester or later were more

likely to have ever vaped, currently vape, or have a vape addiction/dependence sumscore greater

than two than participants in their first semester. With those first entering the university from

high school and high school students having one of the highest vaping prevalence rates than any

other US demographic, it was anticipated that that sub-group of students would have a higher

prevalence rate as well (King, et. al., 2020). Not only this, but the product is very strongly

marketed to individuals of this age group which would have explained a higher prevalence rate

(Abbasi, 2020).

Since there were no significant differences between individuals of the different

demographic factors (i.e., females and males, first-semester university status), it can be

concluded that all individuals are vulnerable to becoming regular vapers. To evoke change to the

rising vaping prevalence, health interventions need to be established to combat this upwards

trend. The findings of the study may work to encourage universities to include more information

on the negative health impacts of regularly using vapes and e-cigarettes in any required health

courses. In doing so, this information can reach students of all educational departments and

majors enrolled in a university or college. Including more information on health impacts of

vaping in required high school health courses would also be a way to counteract the rising

prevalence of the health behavior even before an individual enters a college or university. The goal of including this information in required, basic level health courses (such as HLTH 1000) would be to allow students to make more educated health decisions on whether they choose to use vape products.

Limitations

The study utilized survey data from the Qualtrics survey which required students to voluntarily complete the questionnaire on their own time outside of the classroom. While the students were given the incentive of receiving extra credit in their HLTH 1000 course by completing the survey, there still might have been a lack of valuable responses because of this factor which could have allowed for a better representation of the population of interest. Another limitation regarding the survey data is the students not responding honestly despite the results being anonymous either due to rushing through the questions or not feeling comfortable sharing information about their unhealthy habits. Not only this, but the participants might have wrongly self-reported their health behavior data due to recall bias regarding whether they have ever hit a vape in their life. Being that this data was also only collected from students at East Carolina University and there was a disproportionately high number of underclassmen, there may be behavioral differences in students at different colleges and universities and may not generally represent all students enrolled at these types of schools. Despite this, it is important to note because the course is required for all undergraduate students there is a variety of participants from all academic departments and majors which allowed for less bias among the results. Lastly, since this data was collected in the Fall of 2019, the health behaviors of the demographics of

interest might have changed either due to increase in vaping popularity or more information

being available since then which informs about the health concerns associated with vaping.

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IRB Exemption Memo (Appendix A)

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Not Human Subject Research Certification

From: Social/Behavioral IRB
To: Katie Swinson
CC:
            Ryan Martin
Date: 9/9/2020
Re: UMCIRB 20-002025
            Social/Behavioral IRB

On 9/9/20, the IRB Staff reviewed your proposed research and determined that it does not meet the federal definitions of research involving human participants, as applied by East Carolina University.

Therefore, it is with this determination that you may proceed with your research activity and no further action will be required. However, if you should want to modify your research activity, you must submit notification to the IRB before amending or altering this research activity to ensure that the proposed changes do not require additional UMCIRB review.

The UMCIRB appreciates your dedication to the ethical conduct of research. It is your responsibility to ensure that this research is being conducted in accordance with University policies and procedures, the ethical principles set forth in the Belmont Report, and the ethical standards of your profession. If you have questions or require additional information, please feel free to contact the UMCIRB office at 252-744-2914.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418