

# **Adolescents' Perceptions of E-Cigarette Use and its Impact on Health**

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THESIS

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## SUMMARY

Electronic cigarettes, or e-cigarettes, emerged originally as smoking cessation aids and promoted as a less-harmful tobacco substitutes. “Vaping” is a term used specifically for e-cigarette use, as they produce aerosol rather than the traditional tobacco smoke seen from combustible cigarettes. However, vaping is not without its consequences as they still produce toxins since the composition of e-liquids often contain volatile organic compounds, carcinogenic chemicals, and heavy metals.

In 2016, the U.S. Surgeon General’s office reported that vaping among high school students increased by 900% between 2011-2015. Among adolescents, the harm perception of vaping has decreased over time, especially when compared to combustible cigarettes. With this decrease in harm perception, a recent outbreak of lung injuries related to e-cigarette use known as e-cigarette or vaping product use-associated lung injury (EVALI) has appeared.

The purpose of this study was to identify whether adolescents who were aware of e-cigarette or vaping product use-associated lung injury (EVALI) were more likely to view e-cigarette use as harmful to their health, and to describe the misconceptions adolescents may have regarding e-cigarette use.

## **LIST OF ABBREVIATIONS**

AAPD	American Academy of Pediatric Dentistry
CBD	Cannabidiol
CDC	Centers for Disease Control
COPD	Chronic Obstructive Pulmonary Disease
EVALI	E-Cigarette, or Vaping, Product Use-Associated Lung Injuries
IRB	Institutional Review Board
PI	Principal Investigator
RNS	Reactive Oxygen Species
ROS	Reactive Nitrogen Species
THC	Tetrahydrocannabinol
UIC	University of Illinois Chicago

# 1. INTRODUCTION

## 1.1 Background

Introduced in the United States in 2007, electronic cigarettes, or e-cigarettes, are battery-operated devices that contain a solution of nicotine, flavorings, solvents (i.e., propylene glycol or glycerin), and other chemicals. “Vaping” is a term used specifically for e-cigarette use, as they do not produce tobacco smoke but rather an aerosol containing fine particles (CDC's Office on Smoking Health, 2020). Vaping is actually a misnomer, as e-cigarettes do not produce a harmless water vapor but a chemical-filled aerosol, caused by the heating of a liquid that commonly consists of solvents like propylene glycol or glycerin.

E-cigarettes have been marketed as a smoking cessation aid but are still considered tobacco products as they commonly contain nicotine, a chemical derived from the tobacco plant. They are often promoted as a less-harmful tobacco substitute since, in addition to not producing smoke, the main ingredients found in the liquid are compounds also found in food, pharmaceuticals, and cosmetics. However, there is a lack of definitive evidence that e-cigarettes are safer than conventional cigarettes or other combusted tobacco products as inhalation exposure and daily use of chemicals found in the vaping liquid is different from dietary intake or topical use of the compounds (Khan, 2019; Royal College of Physicians and Tobacco Advisory Group, 2016). Furthermore, while e-cigarettes may contain and generate lower levels of toxins when compared to conventional cigarettes, they are not healthy or harmless, as they still contain volatile organic compounds, carcinogenic chemicals, and heavy metals such as nickel, tin, and



lead (CDC's Office on Smoking and Health, 2017), which can have serious implications for the developing brain.

There exists a diverse array of e-cigarette designs and solutions, with most of the devices containing a mouthpiece, a heating coil activating system, a battery, a heating coil or atomizer, and a reservoir or tank of the solution. Initially, e-cigarettes were designed to mimic the look, feel, and taste of conventional cigarettes with glowing tips during inhalation. As designs have evolved over the years, e-cigarettes can now resemble everyday items such as pens or USB flash drives with LED lights that change colors with each inhalation, characteristics that appeal to youth due to their sleek designs and concealability.

## **1.2 Trends in E-Cigarette Use**

E-cigarettes have skyrocketed in popularity in the United States, especially among adolescents and young adults. According to a 2016 report by the US Surgeon General's office, vaping among high school students increased by 900% between 2011-2015. In 2018, 42.2% of American adolescents in grades 9-12 had tried an e-cigarette, estimated at approximately 1.3 million students (Singh et al., 2020). Among high school students, e-cigarette use, defined by use on at least one day in the past 30 days, almost doubled from 11.7% to 20.8% between 2017 and 2018, reflecting the largest annual increase ever recorded for any adolescent substance use (Monitoring the Future National Survey Results on Drug Use, 1975-2016; CDC's Office on Smoking and Health, 2020). Additionally, the proportion of high school students reporting e-cigarette use for 20 days or more in the past 30-day period increased from 20% to 27.7% between 2017 and 2018.

Since then, according to the 2019 National Youth Tobacco Survey, more than 5 million middle and high school students reported that they had used e-cigarettes in the prior 30-day period and almost one million students reported daily use (CDC'S Office on Smoking and Health, 2020). E-cigarette use is soaring at an alarming rate among adolescents, and vaping now places second only to alcohol in use by adolescents (National Institute on Drug Abuse, 2020).

### **1.3 Health Consequences of E-Cigarettes Use**

Because e-cigarette products are fairly new to the market, long-term consequences from chronic e-cigarette use are not well known. However, it is known that when the user inhales aerosolized liquid, the vapor diffuses into pulmonary blood vessels, transporting the chemicals in the vaping liquid both centrally to the brain and systemically to the peripheral organs (Kitzen et al., 2019). While studies definitively concluding long-term outcomes from e-cigarette use are not yet sufficient and limited in scope, there is sufficient evidence that e-cigarette use is associated with oxidative stress, a condition that results from an altered reduction-oxidation state involving mitochondria dysfunction, the excessive generation of reactive oxygen species (ROS) or reactive nitrogen species (RNS), and the dysfunction of the ROS/RNS scavenging antioxidant system. Oxidative stress is responsible for the alteration and dysfunction of the DNA repair system, which subsequently contributes to the development of various respiratory, metabolic, psychiatric, and neurodegenerative diseases (Song and Zou, 2015). The human brain develops well beyond the teenage years and does not reach full maturity until the age of 25, leaving the adolescent brain especially susceptible to oxidative damage due to its high

oxygen consumption, large percentage of sensitive immature cells, poor antioxidants capacity, and elevated levels of metals catalyzing free radical formation and unsaturated fatty acids (Leslie, 2010; Ikonomidou and Kaindl, 2011). Moreover, e-cigarette use and the associated increased oxidative stress have been implicated in increased odds of depression, suicide, sleep impairment, cognitive impairment, attention deficits, and aggressive and impulsive behavior, all of which may detrimentally contribute to poor health outcomes and social well-being in adolescents and young adults (Tobore, 2019).

#### **1.4 Nicotine in E-Cigarettes**

One primary ingredient found across the majority of e-cigarettes is nicotine, a highly addictive chemical that binds to nicotinic cholinergic receptors in the brain and raises levels of dopamine that produces feelings of pleasure and reward (Benowitz, 2009). The plastic nature of the adolescent brain predisposes them to be more vulnerable to the effects of nicotine, as the neurochemical response to nicotine in adolescents differs from those in adults, with the adolescent response resulting in a permanent alteration of the serotonin response system. Furthermore, chronic exposure to nicotine is found to have detrimental effects on the brain development in the pre-frontal cortex, affecting cognition and behavior with reduced attention span and greater impulsivity, as well as enhanced anxiety and fear (Leslie, 2020; Theron et al., 2019; McKelvey et al., 2018; Yuan et al., 2015). Beyond neurochemical changes, prolonged exposure to nicotine places adolescents at risk for nicotine sickness, also referred to as “nic-sick”, with symptoms including abdominal pain, nausea or vomiting, breathing difficulties, cardiac arrest, and respiratory failure (American Lung Association, 2021). Unlike a traditional cigarette where there is a

tangible stopping point at the end of each smoking session, vaping is particularly dangerous for adolescents because there is no concrete stop point that indicates that their vaping session is complete, leaving youth to inhale high concentrations of nicotine for prolonged periods of time (Singh et al., 2020). However, in the face of these adverse health consequences of nicotine in e-cigarettes, adolescents often have limited knowledge about whether their e-cigarettes even contain nicotine. In the case of a JUUL pod, each e-cigarette liquid pod contains approximately 1 pack of cigarettes' worth of nicotine, yet most youth are unaware of the nicotine content in JUULs. Even with regulatory efforts mandating nicotine labels on e-cigarettes, many adolescents are falsely misled to believe that "5% strength" of nicotine correlates to a low nicotine concentration in each pod (Morean et al., 2019). Further contributing to the misinformation is that many adolescents inaccurately view nicotine as artificial rather than being made from tobacco, and this imprecise knowledge can cause adolescents to think that nicotine is "safe" (East et al., 2018; Pepper et al., 2018). Additionally, studies have shown that an earlier use of nicotine is highly predictive of future nicotine use. With the rising prevalence of e-cigarette use among adolescents and young adults, concerns arise surrounding early nicotine exposure and its potential to act as a gateway drug for conventional cigarettes, cannabis, and cocaine use (Fadus et al., 2019).

## **1.5 Role of Advertisements**

Adolescents and young adults often have limited knowledge and report misconceptions about e-cigarettes, with both use and overall positive beliefs rising. A major force contributing to positive beliefs of e-cigarettes can be attributed to

advertisements that have been targeted specifically towards youth and young adults. Commercials promoting e-cigarettes on televisions increased by 256% from 2011 and 2013, with advertisements targeting minors as young as 12-year-olds (Wagoner et al., 2019). In 2014, 68.9% of middle and high school students reported exposure to e-cigarette marketing from retail stores, Internet, television, movies, newspapers, and magazines, many of which highlighted that e-cigarettes do not generate ash or combustible smoke, do not contain tobacco and tar, and are healthier and safer alternatives to conventional cigarettes. E-cigarette companies have also sponsored or have directly provided samples at sporting events including NASCAR rallies and football games, as well as utilized endorsements from celebrities whom adolescents may see as role models (Phua et al., 2018). More recently, e-cigarettes have been heavily promoted on social media outlets such as Facebook, Twitter, Instagram, and YouTube, implying that e-cigarettes are often enjoyed in social settings by young adults. Studies have shown that advertisements have a significant impact on the decrease of harm perception of e-cigarettes by promoting them as fashionable, socially enhancing, and safer alternatives to cigarettes (Kim et al., 2019; Pokhrel et al., 2019).

## **1.6 Artificial Flavorings in E-Cigarettes**

Another factor contributing to the rise of e-cigarette use in adolescents is the addition of artificial flavorings in e-cigarette liquid pods. Research has shown that availability of appealing flavors such as fruit, candy, or dessert is one of the top reasons for e-cigarette curiosity and experimentation among youth (Cooper et al., 2016).

Adolescents and young adults have strong preferences for sweet tastes, as the

consumption of sugar releases opioids and dopamine. By incorporating such flavorings, e-cigarettes can be vaped in a more enjoyable manner for the users due to sensory similarities between sugary foods and sweet artificial flavorings (Chen-Sankey et al., 2019). Laboratory experiments have shown that flavors that produce sensory perceptions of sweetness, in comparison to menthol and tobacco flavors, generate greater appeal that contribute to youths' willingness to use e-cigarettes again. Research has shown that artificial flavorings may "mask" and diminish harm perceptions of e-cigarette use, and adolescents who vape flavored e-cigarettes are more likely to continue vaping and take more inhalations per vaping when compared to those who exclusively vape non-flavored e-cigarettes (Leventhal et al., 2019). Furthermore, the addition of artificial flavorings significantly diminishes the perceived addictiveness of e-cigarettes and facilitates the social acceptance norm of vaping, further lowering barriers to e-cigarette use (Chen-Sankey et al., 2019).

## **1.7 Social Acceptance of E-Cigarette Use**

Social influence from peers and friends is a significant factor that affects the initiation of e-cigarette use in adolescents and young adults, as individual behavior and actions are often swayed by their peers and groups to which they are connected through social networks. Advertisements featuring e-cigarette use in social settings convey the message that vaping is a fun and social activity that "cool" people engage in (Pokhrel et al., 2018). Previous research has identified that e-cigarette use is highly influenced by social enhancement expectancies, suggesting that participating in vaping would result in being more popular, being liked by others, and appearing fashionable (Pokhrel et al.,

2018; Pokhrel et al., 2015). Furthermore, e-cigarette usage is viewed as a lifestyle, considered a trend that tastes good, and seen as fun to use, rather than as a risk (Romijnders et al., 2019). Adolescents also often document and share their vaping experiences on their social media accounts, perpetuating the gradually cavalier attitudes towards e-cigarette use (Kong et al., 2019; Barrington-Trimis et al., 2016). The result is a social normalization of vaping, which subsequently lowers psychological barriers that might otherwise identify e-cigarette use as a deviant and harmful behavior (Hwang and Park, 2016).

### **1.8 E-Cigarette or Vaping Product Use-Associated Lung Injury (EVALI)**

As the product landscape of e-cigarettes has evolved from disposable ciga-likes to rechargeable pens, mods, and USB flash drives, newer generations of e-cigarettes have expanded to deliver not just nicotine, but also marijuana, specifically tetrahydrocannabinol (THC), the main psychoactive component found in cannabis, and cannabidiol (CBD), a non-psychoactive chemical in cannabis with anxiolytic effects (Muthumalage et al., 2020). With an increasing number of U.S. states legalizing marijuana use, in conjunction with a shift in decreased perception of harm in e-cigarette use and the accessibility of a wide range of e-cigarette products in the marketplace, there has been a recent outbreak of lung injuries related to e-cigarette use among young people. Termed e-cigarette or vaping product use-associated lung injury (EVALI), the condition refers to a serious respiratory illness that results from an inflammatory response in the lungs triggered by the inhaled substances. While the exact pathogenesis of EVALI is not known, it is an acute condition characterized by respiratory symptoms including dyspnea,

coughing, and chest pain, as well as gastrointestinal and constitutional symptoms. It is thought that the alveolar damage caused by vaping strongly contributes to lung diseases, such as asthma and chronic obstructive pulmonary disease (COPD). In severe cases, patients with EVALI may present with symptoms that closely resemble pneumonia with sepsis and, in the most extreme cases, death from respiratory failure (Aldy et al., 2020). As of February 18, 2020 (prior to the Centers for Disease Control & Prevention (CDC) switching focus to the COVID-19 pandemic), there were a total of 2,807 hospitalizations or deaths reported to the CDC from all 50 states of United States, the District of Columbia, Puerto Rico, and U.S. Virgin Islands (CDC'S Office on Smoking and Health, 2020). Findings released by the CDC indicate that vitamin E acetate, a thickening agent in THC-containing e-cigarettes, were strongly associated with the sharp rises in EVALI cases in August and September 2019, but this has not been determined as a singular cause of the illness as EVALI cases have been observed from non-THC containing e-cigarette use as well (Krishnasamy et al., 2020). Furthermore, other chemicals found in e-cigarettes, such as acetaldehyde, acrolein, and formaldehyde, are known to cause lung disease as well as cardiovascular disease (Ogunwale et al., 2017). The declines in the number of EVALI cases since its peak in fall 2019 has been encouraging news to public health, but given the uncertainty elucidating exactly which chemicals in e-cigarettes definitively contribute to pathophysiology of EVALI and the lack of long-term follow-up on the health consequences from EVALI, among other health risks, vaping remains a significant public health threat among adolescents and young adults.



## **1.9 Study Objectives**

Studies investigating the impact of e-cigarette use on health have suggested the harmful effects of e-cigarette use. However, few studies have investigated adolescents' perceptions of e-cigarettes in regard to their health. Specifically, it is unknown whether adolescents who recognize that e-cigarettes contain nicotine are more likely to view them as harmful. With the recent number of e-cigarette, or vaping, product use-associated lung injuries (EVALI) cases that have caused deaths, it is unclear whether adolescents who are aware of these events are more likely to view e-cigarette use as harmful to their health.

The objectives of the study were:

- To identify whether adolescents who are aware of e-cigarette or vaping product use-associated lung injury (EVALI) are more likely to view e-cigarette use as harmful to their health.
- To describe the misconceptions adolescents may have regarding e-cigarette use.

## **1.10 Hypothesis**

- Adolescents who are aware of e-cigarette or vaping product use-associated lung injury (EVALI) are more likely to view e-cigarette use as harmful to their health.
- Adolescents who recognize that e-cigarettes contain nicotine are more likely to view them as harmful to their health.

## **2. MATERIALS AND METHODS**

### **2.1 Study Approval**

This study was approved by the Institutional Review Board (IRB) of the University of Illinois Chicago (IRB #2020-0564), Chicago, IL (Appendix A). No funding was required for this project.

### **2.2 Study Criteria**

#### **Participants**

Adolescent pediatric dental patients aged 13-19 years were recruited for the study across 3 recruitment sites. Patients were deemed eligible for the study if they were adolescent pediatric dental patients (13 to 19 years old) being seen in the Pediatric Dentistry Clinic at the University of Illinois Chicago College of Dentistry, Apple Dental Care, and Family Dental Care. Eligibility was determined by the PI upon recruitment in the Pediatric Dentistry Clinic at the University of Illinois Chicago (UIC) College of Dentistry, Apple Dental Care, and Family Dental Care.

#### Inclusion Criteria:

- Adolescents (ages 13-19) being treated at the UIC Pediatric Dentistry Clinic, Apple Dental Care, and Family Dental Care.
- Adolescents (ages 13-19) who were proficient in English or Spanish.

#### Exclusion Criteria:

- Adolescents who were not able to read, write, or comprehend English or Spanish.

### Excluded or Vulnerable Populations:

- Minors (ages 13-17) were recruited for this study with the consent of their parent or legal guardian. They were excluded if informed consent from their parent or legal guardian was not obtained.
- Most adolescents and their parents attending the various clinics were able to speak and comprehend English or Spanish. Considering this, the recruitment script, the questionnaire, and assent/consent documents were developed in both languages. Those who were not proficient in either of these languages were excluded by default.

## **2.3 Recruitment Process**

Eligible patients were identified using a printout of the clinic's daily schedule. The electronic health records of the eligible patients were not accessed as the age of the patient was visible when viewing the clinic schedule. There was no advertising or adjunct recruiting material, and the Principal Investigator (PI) directly approached the eligible adolescents and their parent or legal guardian in the waiting area. Adolescents aged 13-17 and their parent or legal guardian were provided with written and verbal information stating that the research study was completely voluntary and that their decision to participate or not to participate had no impact on the clinical care of the adolescent (Appendix B and Appendix C). Adolescents and their parent or legal guardian were asked to participate, and if they chose not to participate in the study, they were not approached again. The same process took place for adolescents aged 18-19 without parental permission or separate assent as they were able to consent for themselves (Appendix D).

For all patients that were approached, whether they participated or declined to participate, a sticky note was placed over names with a deactivation date set for 01/01/2021 in the electronic health record to ensure they were not approached again. Patient recruitment, written parental consent and adolescent assent for minor subjects, and written consent for adult subjects were completed by the PI.

## **2.4 Survey Tool**

All surveys (Appendix E) were completed by adolescents using the software Qualtrics on a secure iPad. All surveys were anonymous and no personal identifiers were collected. The survey questionnaire was developed by the PI and contained 25 questions, with six questions adopted from the National Youth Tobacco Survey (CDC'S Office on Smoking and Health, 2020). Seven questions aimed to obtain information about adolescents' history, personal experience, and frequency of e-cigarette or tobacco containing product usage. Seven questions aimed to obtain adolescents' knowledge, perceptions, attitudes, and opinions about e-cigarettes and how e-cigarette use related to their health. Five questions aimed to obtain information about adolescents' exposure to social media and surrounding peers influencing their opinions on e-cigarettes. The remaining six questions aimed to obtain basic demographic information about the adolescents.

## **2.5 Statistical Analysis**

From the responses collected, all data was analyzed by examining descriptive statistics and frequencies. Hypotheses were tested using chi square, Fisher's Exact, and

Mann-Whitney U tests. Statistical analysis was completed using SPSS (Version 22.0, IBM SPSS Statistics, Armonk, NY, USA). Statistical significance was set with 95% confidence intervals and  $p < 0.05$ .

### **3. RESULTS**

#### **3.1 Data Collection**

This study was a cross-sectional assessment of adolescents' perceptions of e-cigarette use and its subsequent impact on health. A total of 87 patients, who met the inclusion criteria, were approached for the study between August 2020 and December 2020. Sixty-three minors (aged 13-17) assented for the study, with their parent or legal guardian also consenting, and 3 adults aged 18-19 consented for the study. Therefore, with a response rate of 75.9% (66/87), 66 total participants were enrolled in the study.

#### **3.2 Demographic Information**

The demographic information of the adolescents enrolled in the study is presented in Table I. The demographic information includes the age, birth assigned sex, gender identity, and race of the adolescents. The mean age of adolescents enrolled in study was 14.1 years old, with 87.9% of participants being between ages 13-15 years old.

**TABLE I**  
**DEMOGRAPHIC INFORMATION OF ADOLESCENTS ENROLLED IN THE STUDY**

		<b>N (%)</b>	<b>Total N (%)</b>
<b>Age</b>	13	26 (39.4%)	66 (100.0%)
	14	20 (30.3%)	
	15	12 (18.2%)	
	16	5 (7.6%)	
	17	0 (0.0%)	
	18	3 (4.5%)	
	19	0 (0.0%)	
<b>Birth Assigned Sex</b>	Male	34 (51.5%)	66 (100.0%)
	Female	32 (48.5%)	
	Intersex	0 (0.0%)	
<b>Gender Identity</b>	Male	32 (48.5%)	66 (100.0%)
	Female	33 (50.0%)	
	Trans Male	0 (0.0%)	
	Trans Female	0 (0.0%)	
	Non-Binary	1 (1.5%)	
<b>Race</b>	American Indian or Alaskan Native	6 (9.1%)	66 (100.0%)
	Asian	4 (6.1%)	
	Black or African American	15 (22.7%)	
	Native Hawaiian or Other Pacific Islander	3 (4.5%)	
	White	26 (39.4%)	
	One or More	1 (1.5%)	
	Not Answered	11 (16.7%)	
<b>Ethnicity</b>	Not Hispanic, Latino, Latina, or Spanish	21 (31.8%)	66 (100.0%)
	Mexican, Mexican American, Chicano, or Chicana	19 (28.8%)	
	Puerto Rican	7 (10.6%)	
	Cuban	0 (0.0%)	
	One or More	3 (4.5%)	
	Other	12 (18.2%)	
	Not Answered	4 (6.1%)	
<b>Clinic Where Patient was Seen</b>	UIC Pediatric Dentistry	54 (81.8%)	66 (100.0%)
	Apple Dental Care	10 (15.2%)	
	Family Dental Care	2 (3.0%)	

### **3.3 Survey Results**

The results from the survey regarding adolescents' personal experiences with e-cigarettes and tobacco use are outlined in Table II. The majority of adolescents who participated in the study indicated that they had heard of e-cigarettes (71.2%), but that they had not used e-cigarettes (90.9%). However, discrepancies were noted as 5 adolescents admitted having used e-cigarettes, yet 7 subjects indicated that their first e-cigarette was flavored. The majority of adolescents also indicated that they had not tried other tobacco products such as cigarettes, marijuana, or hookah (90.9%).



**TABLE II**  
**ADOLESCENTS' PERSONAL EXPERIENCES WITH E-CIGARETTE AND TOBACCO USE**

		<b>N (%)</b>	<b>Total N (%)</b>
<b>Ever Heard of E-Cigarettes</b>	Yes	47 (71.2%)	66 (100.0%)
	No	19 (28.8%)	
<b>Ever Used E-Cigarettes</b>	Yes	5 (7.6%)	66 (100.0%)
	No	60 (90.9%)	
	Not Answered	1 (1.5%)	
<b>Total Days of E-Cigarette Use</b>	Never	58 (87.9%)	66 (100.0%)
	1 Day	5 (7.6%)	
	2 to 10 Days	2 (3.0%)	
	11 to 20 Days	0 (0.0%)	
	21 to 50 Days	1 (1.5%)	
	51 to 100 Days	0 (0.0%)	
	Over 100 Days	0 (0.0%)	
<b>Used E-Cigarettes in the Past 30 Days</b>	Yes	1 (1.5%)	66 (100.0%)
	No	16 (24.2%)	
	Never Used	49 (74.2%)	
<b>If Used E-Cigarette, First E-Cigarette was Flavored</b>	Yes	7 (10.6%)	66 (100.0%)
	No	4 (6.1%)	
	Never Used	54 (81.8%)	
	Not Answered	1 (1.5%)	
<b>Ever Used Other Tobacco Products (Ex: Cigarettes, Marijuana, Hookah)</b>	Yes	6 (9.1%)	66 (100.0%)
	No	60 (90.9%)	
<b>Total Days of Other Tobacco Products</b>	Never	59 (89.4%)	66 (100.0%)
	1 Day	4 (6.1%)	
	2 to 10 Days	2 (3.0%)	
	11 to 20 Days	0 (0.0%)	
	21 to 50 Days	0 (0.0%)	
	51 to 100 Days	0 (0.0%)	
	Over 100 Days	1 (1.5%)	

Adolescents also responded to questions about their knowledge, perceptions, attitudes, and opinions about e-cigarettes in relation to their health. The results, outlined in Table III, revealed that 60.6% of adolescents recognized that most or all e-cigarettes contain nicotine and 68.1% of adolescents recognized that e-cigarettes are addictive. A chi square analysis, outlined in Table IV, revealed a significant association between adolescents aware of nicotine content in e-cigarettes and those who viewed that e-cigarettes are safer than other tobacco products ( $p=0.012$ ).

**TABLE III**  
**ADOLESCENTS' KNOWLEDGE, PERCEPTIONS, AND OPINIONS OF E-CIGARETTES**

		<b>N (%)</b>	<b>Total N (%)</b>
<b>Think E-Cigarettes Contain Nicotine</b>	All of Them	25 (37.9%)	66 (100.0%)
	Most of Them	15 (22.7%)	
	Few of Them	7 (10.6%)	
	None of Them	3 (4.5%)	
	Don't Know or Unsure	16 (24.2%)	
<b>Think E-Cigarettes are Safe</b>	Very Safe	1 (1.5%)	66 (100.0%)
	Somewhat Safe	3 (4.5%)	
	Neither Safe or Unsafe	6 (9.1%)	
	Not Very Safe	16 (24.2%)	
	Not Safe at All	40 (60.6%)	
<b>Think E-Cigarettes are Safer than Other Tobacco Products</b>	Very Safe	0 (0.0%)	66 (100.0%)
	Somewhat Safe	9 (13.6%)	
	Neither Safe or Unsafe	12 (18.2%)	
	Not Very Safe	18 (27.3%)	
	Not Safe at All	27 (40.9%)	
<b>Heard News Stories About EVALI</b>	Yes	49 (74.2%)	66 (100.0%)
	No	17 (25.8%)	
<b>Think E-Cigarettes can Cause Lung Damage or Problems Breathing</b>	Yes	55 (83.3%)	66 (100.0%)
	No	2 (3.0%)	
	Only if Used Incorrectly	2 (3.0%)	
	Don't Know	7 (10.6%)	
<b>Think E-Cigarettes are Addictive</b>	Definitely Yes	23 (34.8%)	66 (100.0%)
	Probably Yes	22 (33.3%)	
	Unsure or Maybe	10 (15.2%)	
	Probably Not	3 (4.5%)	
	Definitely Not	8 (12.1%)	

**TABLE IV**

CHI SQUARE TEST: ASSOCIATION BETWEEN AWARENESS OF NICOTINE CONTENT IN E-CIGARETTES AND ADOLESCENTS' PERCEPTION THAT E-CIGARETTES ARE SAFER THAN OTHER TOBACCO PRODUCTS

		Think E-Cigarettes are Safer than Other Tobacco Products					P-Value
		Very Safe	Somewhat Safe	Neither Safe or Unsafe	Not Very Safe	Not Safe at All	
<b>Think E-Cigarettes Contain Nicotine</b>	All of Them	0 (0.0%)	3 (4.5%)	5 (7.6%)	4 (6.1%)	13 (19.7%)	0.012*
	Most of Them	0 (0.0%)	5 (7.6%)	5 (7.6%)	5 (7.6%)	0 (0.0%)	
	Few of Them	0 (0.0%)	1 (1.5%)	2 (3.0%)	1 (1.5%)	3 (4.5%)	
	None of Them	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (3.0%)	1 (1.5%)	
	Don't Know or Unsure	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (9.1%)	10 (15.2%)	
<b>Total</b>		0 (0.0%)	9 (13.6%)	12 (18.2%)	18 (27.3%)	27 (40.9%)	66 (100.0%)

A Mann-Whitney U test (Table V) revealed no difference in association between those who have used and those who have not used e-cigarettes and adolescents who indicated that they viewed e-cigarettes as safe, but there was a statistically significant association between adolescents who indicated that their first e-cigarette used was flavored and those who viewed e-cigarettes safer than other tobacco products ( $p=0.039$ ). Additionally, there was a statistically significant association between adolescents who were tobacco users and adolescents who viewed e-cigarettes as safe ( $p=0.040$ ). Furthermore, both e-cigarette users and tobacco users were more likely to think e-cigarettes were safer than other tobacco products ( $p=0.016$  for e-cigarette users,  $p=0.002$  for tobacco users).

**TABLE V**

MANN-WHITNEY U ANALYSIS: ADOLESCENTS' PERSONAL EXPERIENCES  
WITH E-CIGARETTE AND TOBACCO USE AND THEIR HARM PERCEPTIONS  
OF E-CIGARETTES

			Think E-Cigarettes are Safe	Think E-Cigarettes are Safer than Other Tobacco Products
			P-Value	P-Value
<b>First E-Cigarette Used was Flavored</b>	Yes	7 (10.6%)	0.919	0.039*
	No	4 (6.1%)		
	Not Answered	55 (83.3%)		
	Total	66 (100.0%)		
<b>Ever Used E- Cigarettes</b>	Yes	5 (7.6%)	0.067	0.016*
	No	60 (90.9%)		
	Not Answered	1 (1.5%)		
	Total	66 (100.0%)		
<b>Ever Used Other Tobacco Products</b>	Yes	6 (9.1%)	0.040*	0.002*
	No	60 (90.9%)		
	Total	66 (100.0%)		

The majority of adolescents indicated that they had heard news stories regarding EVALI (74.2%). A Mann-Whitney U test revealed that there was an association between adolescents with knowledge of EVALI and an increased awareness of possible lung damage from e-cigarettes ( $p=0.001$ ), as well as an increased awareness of nicotine content in e-cigarettes ( $p=0.049$ ). These results are shown in Table VI.

**TABLE VI**

MANN-WHITNEY U ANALYSIS: ADOLESCENTS' AWARENESS OF EVALI AND  
HARM PERCEPTIONS OF E-CIGARETTES

			Think E-Cigarettes Can Cause Lung Damage	Think E-Cigarettes Contain Nicotine
			P-Value	P-Value
<b>Heard News Stories About EVALI</b>	Yes	49 (74.2%)	0.001*	0.049*
	No	17 (25.8%)		
	Total	66 (100.0%)		



Results regarding adolescents' social media exposure and peer influence surrounding e-cigarette use are outlined in Table VII. Chi square analysis revealed that there was a statistically significant association between e-cigarette users and adolescents who reported that friends' choices affected subject's decision to use e-cigarettes ( $p=0.007$ ). There was also a statistically significant association between adolescents who reported that friends' choices affect subject's decision to use e-cigarettes and those who thought e-cigarettes were overall safe ( $p=0.002$ ) and also safer than other tobacco products ( $p=0.031$ ). These results are outlined in Table VIII.

**TABLE VII**  
**SOCIAL MEDIA EXPOSURE AND PEER INFLUENCE SURROUNDING**  
**ADOLESCENTS' USE OF E-CIGARETTES**

		<b>N (%)</b>	<b>Total N (%)</b>
<b>Have Seen Advertisements for E-Cigarettes on Social Media</b>	Frequently	9 (13.6%)	66 (100.0%)
	Sometimes	28 (42.4%)	
	Rarely	12 (18.2%)	
	Never	11 (16.7%)	
	Don't Know or Haven't Noticed	4 (6.1%)	
	Don't Use Social Media	2 (3.0%)	
<b>Number of Friends Using E-Cigarettes</b>	1 to 3	20 (30.3%)	66 (100.0%)
	5 to 10	3 (4.5%)	
	More than 10	5 (7.6%)	
	None	38 (57.6%)	
<b>Friends' Choices Affect Subject's Decision to Use E-Cigarettes</b>	Definitely Yes	3 (4.5%)	66 (100.0%)
	Probably Yes	1 (1.5%)	
	Probably Not	8 (12.1%)	
	Definitely Not	5 (7.6%)	
	Not Answered	49 (74.2%)	
<b>Feel Pressured by Friends to Use E-Cigarettes</b>	Frequently	0 (0.0%)	66 (100.0%)
	Sometimes	7 (10.6%)	
	Never	58 (87.9%)	
	Not Answered	1 (1.5%)	
<b>Think Smoking E-Cigarettes Makes Subjects Cool or Popular</b>	Definitely Yes	0 (0.0%)	66 (100.0%)
	Probably Yes	8 (12.1%)	
	Probably Not	7 (10.6%)	
	Definitely Not	51 (77.3%)	

**TABLE VIII**

**CHI SQUARE TEST: ASSOCIATIONS WITH ADOLESCENTS REPORTING THAT FRIENDS' CHOICES AFFECT SUBJECT'S CHOICES**

		<b>Adolescents Reporting Friends' Choices Affect Subject's Choices</b>					<b>P-Value</b>
		Definitely Yes	Probably Yes	Probably Not	Definitely No	Not Answered	
<b>Ever Used E-Cigarettes</b>	Yes	0 (0.0%)	1 (1.5%)	0 (0.0%)	1 (1.5%)	3 (4.5%)	0.007*
	No	2 (3.0%)	0 (0.0%)	8 (12.1%)	5 (7.6%)	46 (69.7%)	
<b>Total</b>		2 (3.0%)	1 (1.5%)	8 (12.1%)	6 (9.1%)	49 (74.2%)	66 (100.0%)
<b>Think E-Cigarettes are Safe</b>	Very Safe	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	0 (0.0%)	0.002*
	Somewhat Safe	1 (1.5%)	0 (0.0%)	1 (1.5%)	1 (1.5%)	0 (0.0%)	
	Neither Safe nor Unsafe	0 (0.0%)	0 (0.0%)	1 (1.5%)	2 (3.0%)	3 (4.5%)	
	Not Very Safe	1 (1.5%)	1 (1.5%)	2 (3.0%)	0 (0.0%)	12 (18.2%)	
	Not Safe at All	1 (1.5%)	0 (0.0%)	4 (6.1%)	1 (1.5%)	34 (51.5%)	
	<b>Total</b>	3 (4.5%)	1 (1.5%)	8 (12.1%)	5 (7.6%)	49 (74.2%)	66 (100.0%)
<b>Think E-Cigarettes are Safer than Other Tobacco Products</b>	Somewhat Safe	2 (3.0%)	1 (1.5%)	1 (1.5%)	2 (3.0%)	3 (4.5%)	0.031*
	Neither Safe nor Unsafe	0 (0.0%)	0 (0.0%)	3 (4.5%)	1 (1.5%)	8 (12.1%)	
	Not Very Safe	1 (1.5%)	0 (0.0%)	2 (3.0%)	1 (1.5%)	14 (21.2%)	
	Not Safe at All	0 (0.0%)	0 (0.0%)	2 (3.0%)	1 (1.5%)	24 (36.4%)	
	<b>Total</b>	3 (4.5%)	1 (1.5%)	8 (12.1%)	5 (7.6%)	49 (74.2%)	66 (100.0%)

Lastly, the impact of e-cigarette advertisements on social media was observed, with 56.0% adolescents in the study indicating that they had moderate to frequent exposure to e-cigarette advertisements on social media. There was a statistically significant association between e-cigarette advertisement exposure and adolescents who indicated that they thought e-cigarettes were safe ( $p=0.000$ ). These results are outlined in Table IX.

**TABLE IX**

CHI SQUARE TEST: ASSOCIATION BETWEEN ADOLESCENTS WHO HAVE SEEN ADVERTISEMENTS FOR E-CIGARETTES ON SOCIAL MEDIA AND HARM PERCEPTIONS OF E-CIGARETTES

		Adolescents Who Have Seen Advertisements for E-Cigarettes on Social Media						P-Value
		Frequent -ly	Some- times	Rarely	Never	Don't Know or Haven't Noticed	Don't Use Social Media	
<b>Think E- Cigarettes Are Safe</b>	Very Safe	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	0.000*
	Somewhat Safe	1 (1.5%)	2 (3.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Neither Safe or Unsafe	2 (3.0%)	4 (6.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Not Very Safe	2 (3.0%)	10 (15.2%)	2 (3.0%)	2 (3.0%)	0 (0.0%)	0 (0.0%)	
	Not Safe at All	4 (6.1%)	12 (18.2%)	10 (15.2%)	9 (13.6%)	4 (6.1%)	1 (1.5%)	
<b>Total</b>		9 (13.6%)	28 (42.4%)	12 (18.2%)	11 (16.7%)	4 (6.1%)	2 (3.0%)	66 (100.0%)

## **4. DISCUSSION**

### **4.1 Strength and Limitations of the Study**

While there have been published data on adolescents' perceptions of e-cigarettes, this study investigates more in depth the details of adolescents' knowledge about e-cigarettes and the associated harm factors. Specifically, this study investigated whether adolescents who recognize that e-cigarettes contain nicotine are more likely to view them as harmful. Furthermore, this study assessed whether adolescents who were aware of EVALI were more likely to view e-cigarette use as harmful to their health.

A limitation of this study was the demographic make-up of the patient population. Although the patient recruitment took place at three sites, the majority of patients (81.8%) were recruited at UIC Pediatric Dentistry clinic, where the patient base is made up primarily of underserved and under-represented minorities. As such, there was an unequal representation of adolescents from all racial and ethnic groups across different populations. Furthermore, the majority of the patient base at UIC Pediatric Dentistry clinic is made up primarily of patients from lower socioeconomic groups, 97% of whom are covered by public aid insurance. One cross-sectional study by Simon et al., 2018 observed that while lower socioeconomic status is associated with greater cigarette use among youth, the opposite is true for e-cigarette use due to greater exposure to e-cigarette advertising, and subsequently, a greater frequency of use in higher socioeconomic status groups (Simon et al., 2018). Therefore, the reported use of e-cigarettes from the patient base may not accurately reflect adolescent e-cigarette use across the general population.

Another limitation of the study is the young average age of the adolescents, with a mean age of 14.1 years old. The UIC Pediatric Dentistry clinic sees children up to 16 years old before they are transferred to the general clinic. To address this, additional recruitment sites were added; however, there were no 17 year old or 19 year old adolescents enrolled in the study. According to the CDC, in 2020, 19.6% of high school students reported current e-cigarette use compared to 4.7% of middle school students reporting current e-cigarette use. Because the majority of the adolescents enrolled in the study were between 13-15 years old (87.9%), the study may underrepresent e-cigarette use among adolescents across the general population.

Lastly, we noted discrepancies across answers reported by the adolescents. In particular, in one question, 5 adolescents admitted to having used e-cigarettes, yet in a different question, 7 adolescents indicated that their first e-cigarette used was flavored. This suggests that there may be some social desirability bias as some of the questions asked about e-cigarette use and other substance use and adolescents may have felt uncomfortable with the nature of the sensitive questions. While all surveys were anonymous, a number of adolescents completed their surveys next to their parents or guardians in the waiting room, and this may have influenced their answers especially if their e-cigarette use was unknown to the parent or guardian.

## **4.2 Misconceptions Surrounding E-Cigarettes**

Our results highlight common misconceptions surrounding e-cigarettes, with 60.6% of adolescents recognizing that most or all e-cigarettes contain nicotine and 68.1% of adolescents recognizing that e-cigarettes are addictive. Although e-cigarettes were

developed as nicotine delivery systems to aid in smoking cessation, our findings suggest that up to 40% adolescents are unaware that e-cigarettes even contain nicotine, which is known to cause long-term neurochemical changes in the adolescent brain. This is consistent with a previous study by Morean et al., 2019 that investigated adolescents' awareness of nicotine strength in e-cigarettes, in which 10.5% adolescents reported that e-cigarettes contain only low levels of nicotine and 31.4% of adolescents reported that they were unaware of the nicotine content in e-cigarettes (Morean et al., 2019). Further analysis showed a correlation between adolescents who are current e-cigarette and/or tobacco users and those who believe that e-cigarettes are both safe and safer than other tobacco products, suggesting that current users may not be aware of the harmful ingredients in e-cigarettes and long-term consequences of e-cigarette use.

One association to note is the correlation between adolescents who indicated that their first e-cigarette used was flavored and those who viewed e-cigarettes safer than other tobacco products, suggesting that flavorings play an important role in lessening harm perception. A key concern in sweet flavorings in e-liquids and their role in causing dental caries. The sweet flavorings are often combined with vegetable glycerin, and while the glycerin itself is not metabolized cariogenic bacteria, it is thought that the combination of vegetable glycerin and flavorings may produce a two-fold increase in biofilm formation and a four-fold increase in microbial adhesion to enamel (Froum and Neymark, 2019). Moreover, the humectants used in the e-liquids are also associated with dry mouth as their hygroscopic properties attract water to keep the vapor warm and moist. As a result, the most common symptom reported by e-cigarette users is a dry mouth and reduced buffering capacity of the saliva, which further predisposes the teeth



for dental caries. To the best of our knowledge, there are no long-term studies identifying the association between vaping and dental caries, but it is worth noting that such changes in the oral environment render teeth susceptible to further bacterial insult, leaving adolescents at risk for increased dental caries.

#### **4.3 Awareness of Nicotine Content in E-Cigarettes on Adolescent Perceptions of E-Cigarettes**

With the majority of adolescents recognizing that e-cigarettes contain nicotine, those who do are more likely to view e-cigarettes as harmful to their health, but many also believe that e-cigarettes are healthier than other tobacco products. Though e-cigarettes may be the healthier alternative for those who already use combustible tobacco products, e-cigarettes are being used by developing adolescents who would never have smoke cigarettes. These findings indicate that increasing efforts to educate adolescents on e-cigarette use is needed to effectively raise awareness about the harm potential in e-cigarettes. Furthermore, this turns our attention to increasing regulatory efforts to be more transparent about nicotine content in packaging. While efforts mandating nicotine labels on e-cigarettes have been successful, many adolescents do not necessarily interpret the numbers on the labels in a meaningful way. More stringent requirements on labeling can decrease misleading labels and properly inform consumers about the hazards of chronic nicotine use in e-cigarettes.

#### **4.4 Awareness of EVALI on Adolescent Perceptions of E-Cigarettes**

Those EVALI cases decreased after their peak in August and September 2019, the concerns surrounding e-cigarette use remain a public health threat. By observing the relationship between those who were exposed to news stories regarding EVALI and e-cigarette use patterns in adolescents, our results indicated that there is a significant association between those who were aware of EVALI and those who had increased awareness of possible lung damage from e-cigarettes, as well as increased awareness of nicotine content in e-cigarettes. The findings suggest that the alertness of events surrounding EVALI and the vaping epidemic is correlated with adolescents' increased knowledge of health risks associated with e-cigarette use.

#### **4.5 Impact of Advertisements and Peer Influence Surrounding E-Cigarette Use**

Unsurprisingly, peer influence was a substantial factor in adolescents' perceptions surrounding e-cigarette use, with a significant association between adolescents who reported that their friends' choices affect their decision to e-cigarette use and those who indicated that e-cigarettes were overall safe and also safer than other tobacco products. Furthermore, our results indicate that more than half of our study population had moderate to significant exposure to e-cigarette advertisements, and that there was a significant association between advertisement exposure and those who indicated that they believed e-cigarettes were safe. As reported in the literature, advertisements are significant influencers in diminishing the harm perceptions of e-cigarette use, and our findings reinforce the belief that advertisements are effective at implying that the use of e-cigarettes is safe and a socially acceptable activity. Though it is the chemical addiction

to nicotine that stimulates each craving, adolescents are ultimately susceptible to the “cool” factor surrounding e-cigarettes, especially if reinforced by peer influence and celebrity endorsements, making it more difficult for them to give up the social status that comes with vaping. While peer pressure is an environmental factor that is not possible to control, regulation efforts to reduce advertisements targeted to youth may be effective at decreasing the social normalization of e-cigarette use.

#### **4.6 Role of Oral Health Providers**

In a policy statement from the American Academy of Pediatric Dentistry (AAPD), the AAPD “recognizes the potential hazards associated with the use of electronic nicotine delivery system” and “encourages all members to educate patients, parents, and guardians on the health consequences of e-cigarettes and other forms of nicotine delivery systems” (American Academy of Pediatric Dentistry, 2020). As oral health providers, we are in a key position to open dialogue about e-cigarette use with adolescents. For those who adhere to 6 month recalls or those who come back for multiple operative visits, oral health providers can potentially see them more frequently than primary care providers, which opens the opportunity to address e-cigarette prevention as part of anticipatory guidance. Oral health providers can use motivational interviewing strategies to encourage healthy habits and speak to adolescents about quitting if they are current users and follow-up with them on a periodic basis.

#### **4.7 Future Studies**

This study adds to the growing body of research around adolescent e-cigarette use; however, several limitations exist. This study was limited exclusively to dental clinics primarily in a university setting that largely serves population from lower socioeconomic groups. While the overall prices of e-cigarettes have seen a downward trend, the cost of e-cigarettes may be prohibitive to lower socioeconomic groups. For instance, the price of a JUUL starter kit can range from \$10 to \$16 (JUUL, 2021), but this does not include the vaping case, cleaning products, or cartridge replacements, which is an ongoing expense to continue the vaping experience. Future studies could focus on examining adolescents outside a university-based setting where there is a more diverse population in age, race and ethnicity, insurance type, and socioeconomic status to more accurately reflect the general population. A study that investigates adolescent comfort when discussing smoking and vaping habits with their medical or dental provider may also shed light on factors influencing adolescent use and attitudes towards e-cigarettes.

Future studies examining habits of e-cigarette users may give us valuable information about the initiation of other products. Previous studies have examined the effects of nicotine as a potential gateway substance for conventional cigarettes and other illicit drugs (Fadus et al., 2019), implying that e-cigarettes may have the same effects since many contain nicotine. A cross-sectional study by Grant et al., 2019 investigated e-cigarette use in university students and found that those who reported use of e-cigarettes had significantly higher rates of substance drug use and higher impulsive scores (Grant et al., 2019). This suggests that e-cigarettes may play a role in impulsive and risk-taking behavior that leads to illicit drug use in adolescents and young adults.

Lastly, as there have been limited studies investigating long-term health outcomes of chronic e-cigarette given the relatively short period of time e-cigarettes have been on the market, a longitudinal study that examines the long-term health outcomes may help clinicians on managing patient care. This can be expanded to include adolescents exposed to secondhand vaping as long-term effects of secondhand e-cigarette use are largely unknown at this point in time.

## **5. CONCLUSIONS**

Adolescents who had previous knowledge of EVALI cases had increased awareness of lung damage resulting from e-cigarette use and were more likely to view e-cigarette use as harmful to their health. Furthermore, those who were aware of EVALI cases were more likely to recognize that e-cigarettes contain nicotine, which are known to be addictive and can cause long-term neurochemical changes in the brain. Negative health impacts were not universally known; therefore, targeted interventions to increase awareness regarding the harmful effects of e-cigarettes on health are needed to better address e-cigarette use in adolescents.

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## **APPENDICES**

## APPENDIX A



### Approval Notice Initial Review – Expedited Review

May 21, 2020  
Eun Jung Cho  
Pediatric Dentistry

RE: **Protocol # 2020-0564**  
**“Adolescents’ Perceptions of E-Cigarette Use and its Impact on Health”**

Dear Dr. Cho:

Members of Institutional Review Board (IRB) #2 reviewed and approved your research protocol under expedited review procedures [45 CFR 46.110(b)(1)] on May 21, 2020. You may now begin your research.

Your research meets the criteria for approval under expedited review procedures [45 CFR 46.110] Categories: 5, 7

Please note the following information about your approved research protocol:

Consistent with institutional mandates regarding COVID-19 precautions, an administrative hold has been placed on all UIC human subject research meeting the following criteria:  
The research is not designed for therapeutic benefit; and  
The research involves in-person interactions between investigators and participants

**Although your research has been approved, please remember that no in-person research activities may take place until normal operations resume at UIC. Investigators may conduct activities that can be completed remotely (i.e., by phone or online), as appropriate to the research.**

For further updates, please refer to the following sources:

UIC Coronavirus Update page:

[https://today.uic.edu/coronavirus?utm\\_source=homepage&utm\\_medium=website&utm\\_campaign=covid-19](https://today.uic.edu/coronavirus?utm_source=homepage&utm_medium=website&utm_campaign=covid-19)

UIC OPRS Homepage: <https://research.uic.edu/human-subjects-irbs/>

Please direct questions regarding the administrative hold to OPRS: [uicirb@uic.edu](mailto:uicirb@uic.edu)

**Please note that Shahrbanoo Fadavi has not been approved as research personnel as their training expired on 31 March 2020 and they do not have CITI Information Privacy and Security (IPS) training on file at UIC. CITI IPS training has been required since October 2019 and GCP training is not a substitute for CITI IPS training. Kindly remember to add Shahrbanoo Fadavi via an amendment application prior to their involvement in this research.**



**Please remember to submit translations of all data collection instruments and recruitment/consent documents that will be used with participants whose primary language is not English prior to administering them in the field.** Translations are usually submitted after English-language documents have been approved (but may be submitted with the response to this letter) and, if submitted after approval has been granted by the UIC OPRS/IRB, must be accompanied by an Amendment form with the translations and a letter attesting to the qualifications of the translator.

**Please note that the investigator's response packet to the conditions required by the Board did not include a response letter, as directed in the instructions. In future, kindly note that a response letter to the Board's conditions must be included in the response packet or the response packet will be returned to the investigator without review.**

**Please note that as per the revised Federal Regulations (2018 Common Rule) and OPRS policies your research no longer requires a Continuing Review; therefore, the approved documents are stamped only with an approval date.** Although your research no longer requires a Continuing Review, you will receive annual reminder notices regarding your investigator responsibilities (i.e., submission of amendments, final reports, and prompt reports), and will be asked to complete an Institutional Status Report which will be sent to you via email every 3 years. If you fail to submit an Institutional Status Report, your research study will be administratively closed by the IRB. For more information regarding Continuing Review and Administrative Closure of Research visit: <http://research.uic.edu/node/735>.

**Protocol Approval Date:** May 21, 2020  
**Approved Subject Enrollment #:** 300  
**Performance Site:** UIC  
**Sponsor:** None  
**Research Protocol:**

a) Adolescents' Perceptions of E-Cigarette Use and Its Impact on Health;05/20/2020

**Documents that require an approval stamp or separate signature can be accessed via [OPRS Live](#). The documents will be located in the specific protocol workspace. You must access and use only the approved documents to recruit and enroll subjects into this research project.**

**Recruitment Materials:**

- a) Recruitment Script Ages 18-19; Version 1.1; 05/20/2020
- b) Recruitment Script Ages 13-17; Version 1.1; 05/20/2020

**Informed Consents:**

- a) Consent Document Ages 18-19; Version 1.1; 05/20/2020
- b) Electronic consent for this research has been granted under 45 CFR 46.117(c) (minimal risk; assent/consent/permission obtained via iPad using documents containing all of the required elements of consent)

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- c) Exceptions to informed consent for the identification, recruitment, and eligibility screening of prospective participants has been noted under 45 CFR 46.116(g)

**Assent:**

- a) Assent Ages 13-17; Version 1.1; 05/20/2020

**Parental Permission:**

- a) Parental Permission Document; Version 1.1; 05/20/2020

**HIPAA Authorization:**

- a) Access to medical/clinic records preparatory to research for the purposes of identifying prospective participants only has been noted under HIPAA

- **Additional Determinations for Research Involving Minors:** *45 CFR 46.404 (no greater than minimal risk to minors is presented and the IRB finds that adequate provisions are made for soliciting the assent of the children and the permission of their parents or guardians). Further, according to 45 CFR 46.408, one parent must sign the permission document, as one parent's signature is sufficient, and age appropriate assent will be obtained from each minor.*

Please remember to:

→ Use only the IRB-approved and stamped consent documents when enrolling new subjects.

→ Use your **research protocol number** (2020-0564) on any documents or correspondence with the IRB concerning your research protocol.

→ Review and comply with the [policies](#) of the UIC Human Subjects Protection Program (HSPP) and the guidance [Investigator Responsibilities](#).

**Please note that the UIC IRB has the right to ask further questions, seek additional information, or monitor the conduct of your research and the consent process.**

**Please be aware that if the [scope of work](#) in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.**

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 996-2014. Please send any correspondence about this protocol to OPRS via [OPRS Live](#).

Sincerely,

Sandra Costello  
Assistant Director, IRB # 2  
Office for the Protection of Research Subjects

cc: Brittaney Hill (faculty advisor), Pediatric Dentistry, M/C 850  
Marcio Da. Fonseca, Pediatric Dentistry, M/C 850

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**Approval Notice  
Amendment – Expedited Review  
UIC Amendment # 2**

August 11, 2020

Eun Jung Cho, DDS  
Pediatric Dentistry

RE: **Protocol # 2020-0564**  
**“Adolescents’ Perceptions of E-Cigarette Use and its Impact on Health”**

Dear Dr. Cho:

Your application was reviewed and approved on August 10, 2020. The amendment to your research may now be implemented.

Please note the following information about your approved amendment:

**PIs who wish to begin or resume research involving activities that have been placed on temporary hold by the University due to the COVID-19 pandemic (i.e., non-therapeutic, in-person research) must complete a COVID-19 Human Subjects Research Restart Worksheet for an assessment of their studies prior to resuming or initiating the research.**

<https://uic.infoready4.com/#applicationForms/1817478>

**Please refer to the Human Subjects Research Restart page on the OVCR website for additional information.**

<https://research.uic.edu/news-stories/human-subjects-research-restart>

**The research restart is being managed by the Office of the Vice Chancellor for Research (OVCR) and the UIC Center for Clinical and Translational Sciences (CCTS). Questions about the campus research restart may be directed to [research@uic.edu](mailto:research@uic.edu).**

**Amendment Approval Date:** August 10, 2020

**Amendment:**

Summary: UIC Amendment # 2 dated and received via OPRSLive on July 27, 2020, is an investigator-initiated amendment to revise the wording of some of the questions on the survey questionnaire for consistency (e.g., using the word "e-cigarettes" instead of interchanging them with terms such as "vaping" and "JUULs"), edit and add questions to clarify birth-assigned sex vs. gender-identity using validated questions, revise the protocol background section and update the number of questions (from 22 to 24) on the protocol to reflect the changes made on

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the survey questionnaire (RP, v2, 07/27/20; IR, 8/11/20; revised Survey).

**Approved Subject Enrollment #:** 300

**Performance Sites:** UIC

**Sponsor:** none

**Research Protocol(s):**

a) Adolescents' Perceptions of E-Cigarette Use and its Impact on Health; 08/11/2020

Please be sure to:

- **Use only the IRB-approved and stamped consent document(s) and/or HIPAA Authorization form(s) when enrolling subjects.**
- Use your research protocol number (2020-0564) on any documents or correspondence with the IRB concerning your research protocol.
- Review and comply with the [policies](#) of the UIC Human Subjects Protection Program (HSPP) and the guidance [Investigator Responsibilities](#).

**Please note that the IRB has the right to ask further questions, seek additional information, or monitor the conduct of your research and the consent process.**

**Please be aware that if the [scope of work](#) in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.**

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS at (312) 996-1711 or me at (312) 996-9299. Please send any correspondence about this protocol to OPRS via [OPRS Live](#).

Sincerely,

Allison Brown, PhD  
IRB Coordinator, IRB # 2  
Office for the Protection of Research Subjects

cc: Brittany Hill, Pediatric Dentistry, M/C 850  
Marcio Da. Fonseca, Pediatric Dentistry, M/C 850

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**Approval Notice  
Amendment – Expedited Review  
UIC Amendment # 3**

November 13, 2020

Eun Jung Cho  
Pediatric Dentistry

RE: **Protocol # 2020-0564**  
**“Adolescents’ Perceptions of E-Cigarette Use and its Impact on Health”**

Dear Dr. Cho:

Your application was reviewed and approved on November 13, 2020. The amendment to your research may now be implemented.

Please note the following information about your approved amendment:

**Please note that any use and/or disclosure of protected health information (PHI) from the non-UIC clinics for research purposes must be consistent with applicable HIPAA regulations and each site's Notice of Privacy Practices.**

**PIs who wish to begin or resume research involving activities that have been placed on temporary hold by the University due to the COVID-19 pandemic (i.e., non-therapeutic, in-person research) must complete a COVID-19 Human Subjects Research Restart Worksheet for an assessment of their studies prior to resuming or initiating the research.**  
<https://uic.infoready4.com/#applicationForms/1817478>

**Please refer to the Human Subjects Research Restart page on the OVCR website for additional information.**

<https://research.uic.edu/news-stories/human-subjects-research-restart>

**The research restart is being managed by the Office of the Vice Chancellor for Research (OVCR) and the UIC Center for Clinical and Translational Sciences (CCTS). Questions about the campus research restart may be directed to [research@uic.edu](mailto:research@uic.edu).**

**Amendment Approval Date:** November 13, 2020

**Amendment:**

Summary: UIC Amendment #3 (Response to Conditions) dated and received via OPRSLive on November 02, 2020, is an investigator-initiated amendment to:

- a) add Spanish and English back-translated versions of parental informed consent and recruitment script in order to gain consent from Spanish speaking parents (IR, 11/02/2020; RP, v4, 11/02/2020; revised Survey Questionnaire, no footer; Recruitment

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Script Ages 18-19 (Spanish), Version 1.1, 11/02/2020; Recruitment Script Ages 18-19 (Backtranslated), Version 1.1, 11/02/2020; Recruitment Script Ages 13-17 (Spanish), Version 1.1, 11/02/2020; Recruitment Script Ages 13-17 (Backtranslated), Version 1.1, 11/02/2020; Parental Permission Form (Spanish), 11/02/2020; Parental Permission Form, (Backtranslated), 11/02/2020);

- b) add two non-UIC sites (Apple Dental Care, Family Dental Care) for recruitment so that we can expand our recruitment pool (Appendix K; Family Dental Care letter, 09/24/20; Apple Dental Care letter, 09/23/20); and,
- c) add Anthony Lee, Justin Baik, Nouf AlAjaji, Briana Moody, Dhvani Patel, Vidhee Shah, Chad Silver as key research personnel (Appendix P)

**Approved Subject Enrollment #:** 300

**Performance Sites:** UIC, Family Dental Care, Apple Dental Care

**Sponsor:** None

**Research Protocol(s):**

- a) Adolescents' Perceptions of E-Cigarette Use and its Impact on Health (IR); 11/02/2020
- b) Adolescents' Perceptions of E-Cigarette Use and its Impact on Health (RP); Version 4; 11/02/2020

Documents that require an approval stamp or separate signature can be accessed via [OPRS Live](#). The documents will be located in the specific protocol workspace. You must access and use only the approved documents to recruit and enroll subjects into this research project.

**Recruiting Material(s):**

- a) Recruitment Script Ages 13-17 (Spanish); Version 1.1; 11/02/2020
- b) Recruitment Script Ages 18-19 (Spanish); Version 1.1; 11/02/2020

**Parental Permission(s):**

- a) Parental Permission Form (Spanish); 11/02/2020

Please be sure to:

- Use only the IRB-approved and stamped consent document(s) and/or HIPAA Authorization form(s) when enrolling subjects.
- Use your research protocol number (2020-0564) on any documents or correspondence with the IRB concerning your research protocol.
- Review and comply with the [policies](#) of the UIC Human Subjects Protection Program (HSPP) and the guidance [Investigator Responsibilities](#).

**Please note that the IRB has the right to ask further questions, seek additional information,**

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**or monitor the conduct of your research and the consent process.**

**Please be aware that if the [scope of work](#) in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.**

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS at (312) 996-1711 or me at (312) 996-9299. Please send any correspondence about this protocol to OPRS via [OPRS Live](#).

Sincerely,

Allison A. Brown, PhD  
IRB Coordinator, IRB # 2  
Office for the Protection of Research Subjects

cc: Brittaney Hill (Faculty Sponsor), Pediatric Dentistry, M/C 850  
Marcio Da. Fonseca, Pediatric Dentistry, M/C 850

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## APPENDIX B



**University of Illinois at Chicago (UIC)  
Research Information, Parental Permission Document, and Authorization for Participation  
in Social, Behavioral, or Educational Research**

**Adolescents' Perception of E-Cigarette Use and its Impact on Health**

**Principal Investigator/Researcher Name and Title:** Eun Jung Cho, DDS, Pediatric Dentistry Resident

**Faculty Advisor Name and Title:** Brittany Hill, DDS, MS, MPH, Clinical Assistant Professor

**Department and Institution:** Department of Pediatric Dentistry, University of Illinois at Chicago College of Dentistry (UIC COD)

**Address and Contact Information:** 801 South Paulina Street (MC 850), Chicago, IL 60612

**About this research study**

Your child is being asked to participate in a research study. Research studies answer important questions that might help change or improve the way we do things in the future.

**Taking part in this study is voluntary**

Your child's participation in this research study is voluntary. You may choose to not allow your child to take part in this study or may choose to have them leave the study at any time. Deciding not to participate, or deciding to leave the study later, will not result in any penalty or loss of benefits to which your child is entitled and will not affect your relationship with the University of Illinois Hospital and Health Sciences System (UI Health) and/or University of Illinois at Chicago (UIC).

This consent form will give you information about the research study to help you decide whether you want your child to participate. Please read this form and ask any questions you have before agreeing to be in the study.

Your child is being asked to participate in this research study because your child is an adolescent seeking care at the UIC COD.

Approximately 300 subjects will be enrolled in this research study.

UIC IRB Social, Behavioral, and Educational  
Research Informed Consent Template: 11/01/19  
Do NOT Change This Field – IRB Use ONLY

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Adolescents' Perception of E-  
Cigarette Use and Impact on Health  
Version 1.1, 05/20/2020

**Important Information**

This information gives you an overview of the research. More information about these topics may be found in the pages that follow.

<b>WHY IS THIS STUDY BEING DONE?</b>	We want to find out more information about the perceptions and attitudes of adolescents toward e-cigarette use and evaluate how e-cigarette use relates to their health.
<b>WHAT WILL I BE ASKED TO DO DURING THE STUDY?</b>	Your child will be asked to complete a survey about his or her perceptions and attitudes toward e-cigarette use, followed by a brief demographics survey. Your child's survey responses will be collected electronically using a secure program on an iPad.
<b>HOW MUCH TIME WILL I SPEND ON THE STUDY?</b>	The questionnaire will take approximately 10 minutes to complete. There is no follow-up needed for this study after the questionnaire is completed.
<b>ARE THERE ANY BENEFITS TO TAKING PART IN THE STUDY?</b>	Taking part in this research study will not benefit your child directly, but we hope that his or her participation in the study may benefit other people in the future by helping us learn more identify perceptions and misconceptions teenagers may have towards e-cigarette use.
<b>WHAT ARE THE MAIN RISKS OF THE STUDY?</b>	<p>The primary risks presented by this research study are breaches of privacy (others outside of the study may find out your child is a subject) and/or confidentiality (others outside of the study may find out what your child did, said, or information that was collected about you during the study).</p> <p>Your child may be uncomfortable with some of the questions he or she may be asked in the survey. This survey includes some items about e-cigarette use and other substance use. Your child can skip and/or not respond to any questions that may make him or her uncomfortable.</p> <p>Another risk includes being inconvenienced due to the time required to complete this survey.</p>
<b>DO I HAVE OTHER OPTIONS BESIDES TAKING PART IN THE STUDY?</b>	This research study is not designed to provide treatment or therapy, and you have the option to decide not to allow your child to participate in this study at any time without any consequences.
<b>QUESTIONS ABOUT THE STUDY?</b>	For questions, concerns, or complaints about the study, please contact Dr. Eun Jung Cho, Pediatric Dentistry Resident, (312) 996-

UIC IRB Social, Behavioral, and Educational  
Research Informed Consent Template: 11/01/19  
Do NOT Change This Field – IRB Use ONLY

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Adolescents' Perception of E-  
Cigarette Use and Impact on Health  
Version 1.1, 05/20/2020



	<p>7532 or email at <a href="mailto:echo34@uic.edu">echo34@uic.edu</a>. You may also contact Dr. Brittaney Hill, Clinical Assistant Professor, at (312) 413-5686 or email at <a href="mailto:bhill10@uic.edu">bhill10@uic.edu</a>.</p> <p>If you have questions about your child's rights as a study subject; including questions, concerns, complaints, or if you feel you or your child have not been treated according to the description in this form; or to offer input you may call the UIC Office for the Protection of Research Subjects (OPRS) at 312-996-1711 or 1-866-789-6215 (toll-free) or e-mail OPRS at <a href="mailto:uicirb@uic.edu">uicirb@uic.edu</a>.</p>
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**Please review the rest of this document for details about these topics and additional things you should know before making a decision about whether to participate in this research. Please also feel free to ask the researchers questions at any time.**

**What about privacy and confidentiality?**

Efforts will be made to keep your child's personal information confidential; however, we cannot guarantee absolute confidentiality. In general, information about your child, or provided by him or her, during the research study, will not be disclosed to others without your written permission. However, laws and state university rules might require us to tell certain people about your child. For example, study information which identifies your child and the consent form signed by you may be looked at and/or copied for quality assurance and data analysis by:

- Representatives of the university committee and office that reviews and approves research studies, the Institutional Review Board (IRB) and Office for the Protection of Research Subjects.
- Other representatives of the State and University responsible for ethical, regulatory, or financial oversight of research.
- Government Regulatory Agencies, such as the Office for Human Research Protections (OHRP).

A possible risk of the study is that your child's participation in the study or information about him or her might become known to individuals outside the study. Your child's survey responses will be collected using a secure program on an iPad. The data from the survey will then be transferred to an Excel spreadsheet on the Principal Investigator's password encrypted computer in a locked office to prevent access by unauthorized personnel.

Your child's individual data will not contain any personal identifying information at any point. Your child will be assigned a survey number, but there will not be any personal identifiers associated with a survey number.

When the results of the study are published or discussed in conferences, no one will know that your child was in the study.

**What are the costs for participating in this research?**

There are no costs to your child for participating in this research.

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Adolescents' Perception of E-  
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**Will I be reimbursed for any of my expenses or paid for my participation in this research?**

Your child will not be offered payment for being in this study.

**Can I withdraw or be removed from the study?**

If you decide to allow your child to participate, you have the right to withdraw your consent for your child and leave the study at any time without penalty. This research is completely optional and the decision to participate or not to participate will have no impact on your child's dental care. If your child completes the survey, we will not be able to destroy your child's data as we will not be able to identify the data in order to destroy it.

**Remember:**

Your child's participation in this research is voluntary. Your decision whether or not to allow your child to participate will not affect his or her current or future relations with the University. If you decide to allow your child to participate, you are free to withdraw your child at any time without affecting that relationship.

**Signature of Parent/Guardian/Legal Representative**

I have read the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I agree to allow my child to participate in this research. I will be given a copy of this form.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Printed Name of Minor

\_\_\_\_\_  
Signature of Parent, Guardian, Legal Representative

\_\_\_\_\_  
Date of Signature

\_\_\_\_\_  
Printed Name of Parent, Guardian, Legal Representative

Describe relationship to subject including the legal authority this individual has to act on behalf of the subject. (Check one below)

- ☐ Parent
- ☐ Medical Power of attorney/representative
- ☐ Legal guardian
- ☐ Health care surrogate
- ☐ Other; specify

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date (must be same as subject's)

\_\_\_\_\_  
Printed Name of Person Obtaining Consent



## APPENDIX C



University of Illinois at Chicago  
**ASSENT TO PARTICIPATE IN RESEARCH**

### Adolescents' Perception of E-Cigarette Use and its Impact on Health

1. My name is Dr. Eun Jung Cho.
2. We are asking you to take part in a research study because we are trying to learn more about your attitudes towards e-cigarettes and whether you think they are harmful or not.
3. If you agree to be in this study we will ask you to fill out a short survey on the iPad.
4. To the best of our knowledge, there are minimal risks associated with this study. You may be inconvenienced due to the time you will spend completing the survey, which will take about 10 minutes.
5. We hope that your participation in the study may help other people in the future by helping us learn more about knowledge and perceptions adolescents may have about e-cigarette use.
6. Please talk this over with your parent before you decide whether or not to participate. We will also ask your parent to give his or her permission for you to take part in this study. But even if your parent says "yes" you can still decide not to do this.
7. If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to participate or even if you change your mind later and want to stop.
8. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me at (312) 996-7532 or email at [echo34@uic.edu](mailto:echo34@uic.edu). You can also contact Dr. Brittaney Hill, Clinical Assistant Professor, at (312) 413-5686 or email at [bhill10@uic.edu](mailto:bhill10@uic.edu).
9. If you have questions about your rights as a study subject; including questions, concerns, complaints, or if you feel you have not been treated according to the description in this form; or to offer input you may call the UIC Office for the Protection of Research Subjects (OPRS) at 312-996-1711 or 1-866-789-6215 (toll-free) or e-mail OPRS at [uicirb@uic.edu](mailto:uicirb@uic.edu).
10. Signing your name at the bottom means that you agree to be in this study. You and your parents will be given a copy of this form after you have signed it.

\_\_\_\_\_  
Name of Subject

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Age

\_\_\_\_\_  
Grade in School

## APPENDIX D



**University of Illinois at Chicago (UIC)  
Research Information, Parental Permission Document, and Authorization for Participation  
in Social, Behavioral, or Educational Research**

**Adolescents' Perception of E-Cigarette Use and its Impact on Health**

**Principal Investigator/Researcher Name and Title:** Eun Jung Cho, DDS, Pediatric Dentistry Resident

**Faculty Advisor Name and Title:** Brittaney Hill, DDS, MS, MPH, Clinical Assistant Professor  
**Department and Institution:** Department of Pediatric Dentistry, University of Illinois at Chicago College of Dentistry (UIC COD)

**Address and Contact Information:** 801 South Paulina Street (MC 850), Chicago, IL 60612

**About this research study**

You are being asked to participate in a research study. Research studies answer important questions that might help change or improve the way we do things in the future.

**Taking part in this study is voluntary**

Your participation in this research study is voluntary. You may choose not to take part in this study or may choose to leave the study at any time. Deciding not to participate, or deciding to leave the study later, will not result in any penalty or loss of benefits to which you are entitled and will not affect your relationship with the University of Illinois Hospital and Health Sciences System (UI Health) and/or University of Illinois at Chicago (UIC).

This consent form will give you information about the research study to help you decide whether you want to participate. Please read this form and ask any questions you have before agreeing to be in the study.

You are being asked to participate in this research study because you are an adolescent seeking care at the UIC COD.

Approximately 300 subjects will be enrolled in this research study.

**Important Information**

This information gives you an overview of the research. More information about these topics may be found in the pages that follow.

<b>WHY IS THIS STUDY BEING DONE?</b>	We want to find out more information about the perceptions and attitudes of adolescents toward e-cigarette use and evaluate how e-cigarette use relates to their health.
<b>WHAT WILL I BE ASKED TO DO DURING THE STUDY?</b>	You will be asked to complete a survey about your perceptions and attitudes toward e-cigarette use, followed by a brief demographics survey. Your survey responses will be collected electronically using a secure program on an iPad.
<b>HOW MUCH TIME WILL I SPEND ON THE STUDY?</b>	The questionnaire will take approximately 10 minutes to complete. There is no follow-up needed for this study after the questionnaire is completed.
<b>ARE THERE ANY BENEFITS TO TAKING PART IN THE STUDY?</b>	Taking part in this research study will not benefit you directly, but we hope that your participation in the study may benefit other people in the future by helping us learn more identify perceptions and misconceptions teenagers may have towards e-cigarette use.
<b>WHAT ARE THE MAIN RISKS OF THE STUDY?</b>	<p>The primary risks presented by this research study are breaches of privacy (others outside of the study may find out you are a subject) and/or confidentiality (others outside of the study may find out what you did, said, or information that was collected about you during the study).</p> <p>You may be uncomfortable with some of the questions you may be asked in the survey. This survey includes some items about e-cigarette use and other substance use. You can skip and/or not respond to any questions that may make you uncomfortable.</p> <p>Another risk includes being inconvenienced due to the time required to complete this survey.</p>
<b>DO I HAVE OTHER OPTIONS BESIDES TAKING PART IN THE STUDY?</b>	This research study is not designed to provide treatment or therapy, and you have the option to decide not participate in this study at any time without any consequences.

<b>QUESTIONS ABOUT THE STUDY?</b>	<p>For questions, concerns, or complaints about the study, please contact Dr. Eun Jung Cho, Pediatric Dentistry Resident, at (312) 996-7532 or email at <a href="mailto:echo34@uic.edu">echo34@uic.edu</a>. You may also contact Dr. Brittaney Hill, Clinical Assistant Professor, at (312) 413-5686 or email at <a href="mailto:bhill10@uic.edu">bhill10@uic.edu</a>.</p> <p>If you have questions about your rights as a study subject; including questions, concerns, complaints, or if you feel you have not been treated according to the description in this form; or to offer input you may call the UIC Office for the Protection of Research Subjects (OPRS) at 312-996-1711 or 1-866-789-6215 (toll-free) or e-mail OPRS at <a href="mailto:uicirb@uic.edu">uicirb@uic.edu</a>.</p>
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**Please review the rest of this document for details about these topics and additional things you should know before making a decision about whether to participate in this research. Please also feel free to ask the researchers questions at any time.**

**What about privacy and confidentiality?**

Efforts will be made to keep your personal information confidential; however, we cannot guarantee absolute confidentiality. In general, information about you, or provided by you, during the research study, will not be disclosed to others without your written permission. However, laws and state university rules might require us to tell certain people about you. For example, study information which identifies you and the consent form signed by you may be looked at and/or copied for quality assurance and data analysis by:

- Representatives of the university committee and office that reviews and approves research studies, the Institutional Review Board (IRB) and Office for the Protection of Research Subjects.
- Other representatives of the State and University responsible for ethical, regulatory, or financial oversight of research.
- Government Regulatory Agencies, such as the Office for Human Research Protections (OHRP).

A possible risk of the study is that your participation in the study or information about you might become known to individuals outside the study. Your survey responses will be collected using a secure program on an iPad. The data from the survey will then be transferred to an Excel spreadsheet on the Principal Investigator's password encrypted computer in a locked office to prevent access by unauthorized personnel.

Your individual data will be not contain any personal identifying information at any point. You will be assigned a survey number, but there will not be any personal identifiers associated with a survey number.

When the results of the study are published or discussed in conferences, no one will know that you were in the study.

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Page 3 of 5

Adolescents' Perception of E-  
Cigarette Use and Impact on Health  
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**What are the costs for participating in this research?**

There are no costs to you for participating in this research.

**Will I be reimbursed for any of my expenses or paid for my participation in this research?**

You will not be offered payment for being in this study.

**Can I withdraw or be removed from the study?**

If you decide to participate, you have the right to withdraw your consent and leave the study at any time without penalty. This research is completely optional and the decision to participate or not to participate will have no impact on your dental care. If you complete the survey, we will not be able to destroy your data as we will not be able to identify the data in order to destroy it.

**Remember:**

Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

**Signature of Subject**

I have read the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I agree to participate in this research. I will be given a copy of this form.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date (must be same as subject's)

\_\_\_\_\_  
Printed Name of Person Obtaining Consent

## APPENDIX E

### Survey Questionnaire

1. Have you ever heard of e-cigarettes? Some brand examples include JUUL, Vuse, MarkTen, and blu.
  - a. Yes
  - b. No
2. Have you **ever used** an e-cigarette, even once or twice?
  - a. Yes
  - b. No
3. In total, on how many days have you used e-cigarettes in your entire life?
  - a. Never
  - b. 1 day
  - c. 2 to 10 days
  - d. 11 to 20 days
  - e. 21 to 50 days
  - f. 51 to 100 days
  - g. Over 100 days
4. If you have used an e-cigarette before, have you used e-cigarettes in the past 30 days?
  - a. Yes
  - b. No
  - c. I've never used an e-cigarette before
5. If you have used an e-cigarette before, was the first e-cigarette you used flavored (examples of flavors include fruit or mint)?
  - a. Yes
  - b. No
  - c. I've never used an e-cigarette before
6. Have you ever tried smoking anything other than e-cigarettes (such as cigarettes, marijuana, or hookah)?
  - a. Yes
  - b. No
7. During your entire life, about how many days have you smoked anything other than e-cigarettes (such as cigarettes, marijuana, or hookah)?
  - a. Never
  - b. 1 day
  - c. 2 to 10 days
  - d. 11 to 20 days
  - e. 21 to 50 days
  - f. 51 to 100 days
  - g. Over 100 days
8. Do you think e-cigarette liquid/pods contain nicotine?
  - a. All of them
  - b. Most of them
  - c. Few of them

- d. None of them
  - e. Don't know or unsure
9. Have you ever seen advertisements for e-cigarettes on social media (such Instagram, Facebook, Twitter)?
- a. Frequently
  - b. Sometimes
  - c. Rarely
  - d. Never
  - e. Don't know or haven't noticed
  - f. I don't use social media
10. In your opinion, do you think that e-cigarettes are safe?
- a. Very safe
  - b. Somewhat safe
  - c. Neither safe or unsafe
  - d. Not very safe
  - e. Not safe at all
11. In your opinion, do you think that e-cigarettes are safer than other tobacco containing products such as cigarettes?
- a. Very safe
  - b. Somewhat safe
  - c. Neither safe or unsafe
  - d. Not very safe
  - e. Not safe at all
12. Do you think that e-cigarettes can cause damage to your lungs or cause problems breathing?
- a. Yes
  - b. No
  - c. Only if used incorrectly
  - d. I don't know
13. Have you seen or heard of news stories about lung injuries caused by e-cigarettes in the past year?
- e. Yes
  - f. No
14. Have you ever heard about any of the following from using e-cigarettes? (Select all that apply)
- a. People being hospitalized from damaging their lungs
  - b. People being hospitalized from burns and/or exploding e-cigarettes
  - c. I have never heard of anyone being hospitalized from e-cigarettes
15. Are you ever pressured by your friends/peers to use e-cigarettes?
- a. Frequently
  - b. Sometimes
  - c. Never
16. Do you believe that smoking e-cigarettes makes you or your friends/peers cool or popular?



- a. Definitely yes
  - b. Probably yes
  - c. Probably not
  - d. Definitely not
17. To your knowledge, how many of your peers/friends have used e-cigarettes?
- a. 1-3
  - b. 5-10
  - c. More than 10
  - d. None
18. Do your peers/friends decisions to use e-cigarettes impact your decision to use these products?
- a. Definitely yes
  - b. Probably yes
  - c. Probably not
  - d. Definitely not
19. In your opinion, do you believe that e-cigarettes are addictive?
- a. Definitely yes
  - b. Probably yes
  - c. Unsure or maybe
  - d. Probably not
  - e. Definitely not
20. What is your birth-assigned sex?
- a. Male
  - b. Female
  - c. Intersex
21. What is your gender?
- a. Male
  - b. Female
  - c. Transmale
  - d. Transfemale
  - e. Non-binary
  - f. Other: \_\_\_\_\_
22. How old are you?
- a. 13 years old
  - b. 14 years old
  - c. 15 years old
  - d. 16 years old
  - e. 17 years old
  - f. 18 years old
  - g. 19 years old
23. What race or races do you consider yourself to be? (Select one or more)
- a. American Indian or Alaskan Native
  - b. Asian
  - c. Black or African-American



- d. Native Hawaiian or Other Pacific Islander
  - e. White
24. Are you Hispanic, Latino, Latina, or of Spanish origin? (Select one or more)
- a. No, not of Hispanic, Latino, Latina, or of Spanish origin → [EXCLUSIVE]
  - b. Yes, Mexican, Mexican American, Chicano, or Chicana
  - c. Yes, Puerto Rican
  - d. Yes, Cuban
  - e. Yes, Another Hispanic, Latino, Latina, or Spanish origin
25. Which location are you being seen at today?
- a. UIC Pediatric Dentistry Clinic
  - b. Apple Dental Care
  - c. Family Dental Care

## VITA

NAME: Eun Jung Cho, DDS

EDUCATION: B.A., Chemistry  
Washington University in St. Louis  
St. Louis, Missouri, 2012

D.D.S., Dentistry  
State University of New York at Buffalo School of Dental  
Medicine  
Buffalo, New York, 2019

TRAINING: Certificate in Pediatric Dentistry  
University of Illinois Chicago College of Dentistry and University  
of Illinois Hospital  
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HONORS: Omicron Kappa Upsilon, The National Dental Honor Society  
State University of New York at Buffalo School of Dental  
Medicine  
Buffalo, New York, 2019

American Academy of Esthetic Dentistry Student Award of Merit  
State University of New York at Buffalo School of Dental  
Medicine  
Buffalo, New York, 2019

James Collord Memorial Award  
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PROFESSIONAL MEMBERSHIP: American Academy of Pediatric Dentistry  
American Dental Association  
California Society of Pediatric Dentistry  
Chicago Dental Society  
Illinois State Dental Society  
Illinois Society of Pediatric Dentists

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Adolescents' Perceptions of E-Cigarette Use and its Impact on  
Health. Poster presented at the University of Illinois Chicago  
Clinic and Research Day, March 5, 2019, Chicago, Illinois.

**Cho E**, Niles E, Vedururu S, Wilding G, Bairam L & Andreana S. A retrospective study of effects of corticosteroid use on dental implant failure rates. Poster presented at the International Association for Dental Research/Pan European Regional General Session, July 26, 2018 (Abstract #2961422, Poster #0969), London, United Kingdom.

**Cho E**, Niles E, Vedururu S, Wilding G, Bairam L & Andreana S. A retrospective study of effects of corticosteroid use on dental implant failure rates. Poster presented at the State University of New York at Buffalo School of Dental Medicine, Student Research Day, March 1, 2018, Buffalo, New York.

Niles E, **Cho E**, Vedururu S, Wilding G, Bairam L & Andreana S. Retrospective study of selective serotonin reuptake inhibitors on implant failure. Poster presented at the American Association for Dental Research/Canadian Association for Dental Research Annual Meeting, March 22, 2018, Fort Lauderdale, Florida.

Vedururu S, Niles E, **Cho E**, Bairam L & Andreana S. Role of vitamin D supplementation in dental implant survival: a retrospective study. Poster presented at the American Association for Dental Research/Canadian Association for Dental Research Annual Meeting, March 22, 2018, Fort Lauderdale, Florida.

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Shoushtari AN, Qin L, Kuk D, Magnan HD, Modak S, Wolden SL, **Cho E**, Pallos V, Grubman O, Viny AD, Carvajal RD, Chi P, D'Angelo SP, Dickson MA, Keohan ML, Tap WD, La Quaglia MP & Gounder MM. Predictors of overall survival in patients diagnosed with desmoplastic small round cell tumor (DSRCT). *Journal of Clinical Oncology* 32:15 Suppl., 10582, 2014.

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