Young Adult Perceptions and Choice of Vaping: 
Do Regulation and Health Education Improve Outcomes?

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Abstract  This quantitative study assessed the effects of nicotine vaporizers (flavored e-cigarettes) as substitutes for traditional tobacco products and the effects of regulatory governance and health education on young adults’ (aged 18–34 years) preferences for vaping products. Restrictions on vaping likely will require involvement from stakeholders (e.g., researchers, policy makers, public and private healthcare, media, and consumers). We reviewed the theoretical and academic research summarizing the harmful effects of vaping and the role of public governance and education in preventing use among young people. The participants in the study were age 18-34 years, of whom used e-cigarettes daily for 1–3 years, to elicit their opinions about access to vaping products and regulation. The results show that although knowledge of health risks was not a deterrent to usage, the respondents strongly agreed that public and nonprofit organizations have roles in regulation and education related to the harmful effects of vaping.

Keywords: tobacco, vaping regulation, public health

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1. Introduction

This quantitative study assessed the effects of nicotine vaporizers (flavored e-cigarettes) as substitutes for traditional tobacco products and the effects of regulatory governance and health education on young adults’ (aged 18–34 years) preferences for vaping products. Restrictions on vaping likely will require involvement from stakeholders (e.g., researchers, policy makers, public and private healthcare, media, and consumers). We reviewed the theoretical and academic research summarizing the harmful effects of vaping and the role of public governance and education in preventing use among young people. The participants in the study were age 18-34 years, of whom used e-cigarettes daily for 1-3 years, to elicit their opinions about access to vaping products and regulation. The results show that although knowledge of health risks was not a deterrent to usage, the respondents strongly agreed that public and nonprofit organizations have roles in regulation and education related to the harmful effects of vaping.

Ongoing discussions are about what works, either education or regulation, to influence young adults choice to use vaporizers or traditional tobacco products. In 2019, Consumer Advocates for Smoke Free Alternatives wrote that since the 1930s the incessant effort to find a marketable and functional electronic cigarette (e-cigarette) has had commercialized results in the early 2000s (e.g. flavored e-cigarettes). By heating a flavored tobacco in the e-cigarette pen the liquid until it is aerosol is easier to inhale through the specialized devices. Sales of these products continue to increase, despite efforts to manage advertising aimed at young adults aged 18-34 years. Vaping is associated with several health issues, including cavities, shortness of breath, and lung disorders [1]. The CDC [2,3,4] reports that vaping can injure the lungs of young adults, a condition called e-cigarette or vaping product use associated lung injury (EVALI). Nevertheless, vaping is still considered trendy by young adults [5,6], who prefer the variety of flavors and low cost of e-cigarettes [7] and who perceive vaping as less harmful than traditional tobacco and nicotine products, such as cigarettes and chewing tobacco [8,9,10].

Many public and nonprofit institutions collaborate with organizations from the private sector to promote public general and social welfare [11] through information gathering, risk assessment, and collaborative governance [12]. For example, public bans on vaping and traditional smoking can reduce the use and thus the adverse effects of these products [4]. Most EVALI-related injuries and deaths occur among young people, making this issue an important health target for governments, nonprofits, and businesses.

From 2014 to 2016, 74% of adult cigarette smokers reported using multiple methods to quit [13], including vaping. Yet, vaping is associated with lung inflammation and irritation, which can cause breathing difficulties, especially among users with asthma. Other symptoms
include coughing, shortness of breath, chest pain, nausea, vomiting, diarrhea, fever, fatigue, and weight loss [14]. Some vaping-related fatalities are associated with acute and severe respiratory distress, though the exact relationship to vaping is unclear. According to the online advocacy group vapedanger.com, vaping may slow brain development by interfering with memory and attention processing. The Centers for Disease Control and Prevention reports adverse effects on brain and lung development resulting from the use of e-cigarettes, or vaping, products [9]. Young adults who vape may have difficulty concentrating and controlling impulses. Cardiac effects associated with vaping include increased blood pressure, heart rate, and respiration, as well as increased adrenaline due to stimulation of the central nervous system. Recent studies also have linked nicotine vaping to heart attack, stroke, and coronary artery disease, which is particularly dangerous for people with underlying heart disease [15,16]. Such product safety concerns have led to federal and state-level bans on flavored e-cigarette products [17]. Finally, an important factor influencing the decision to use vaping products is a pragmatic decision-making process, or “bounded rationality,” wherein the best choice is the one that delivers the most satisfaction with the least effort. Based on this background, we formulate the following hypotheses to assess vaping-related decisions among young people and the role of governance in this public health issue:

Hypothesis 1: There is a relationship between the choice to use vaporizers and epidemiological (health) education.

Hypothesis 2: Young adults believe that vaping is healthier than smoking traditional cigarettes.

Hypothesis 3: Bounded rationality affects vaping decision-making.

Hypothesis 4: Public governance is required to regulate vaping and traditional tobacco products among young adults.

2. Literature Review

2.1. History of Tobacco and Vaping Governance

In 1901, sales of cigarettes totaled nearly $4 billion [18]. In the 1950s, US adults smoked approximately 4,200 cigarettes annually [19]. However, between 2002 and 2015, cigarette consumption decreased from 400 billion cigarettes to 267 billion cigarettes [15,19]. Ample evidence has demonstrated the negative public health effects tobacco use [15,20]. This evidence has led to the implementation and expansion of national prevention programs, such as Drug Abuse Resistance Education (DARE). DARE began in 1983 to reduce substance abuse among teens via school-based education about the effects of tobacco and other addictive gateway drugs. West and O’Neal [21] conducted a meta-analysis to measure the program’s effects on decisions to use tobacco products among ethnic minority youths, and they found that those who participated in the program were no less likely to use these substances.

Many state and local governments around the world have implemented regulations and legislation to promote smoking cessation, with varying effects. A comparative study of vaping norms found that respondents in England, Canada, and the United States were more likely to report frequent public exposure to vaping (83.1%, 57.3%, and 48.3%, respectively) than those in in Australia (19.8%), which has some of the strictest regulation [22]. In 2014, the U.S. Food and Drug Administration began to post anti-vaping messages about the harmful effects of e-cigarettes and vaping [23]. In California, administrative agencies have increased efforts to reduce vaping, especially among young people, by banning flavored tobacco except in hookah, pipe, and cigar products (Redmond, 2020, para 3). These efforts aim to change the perception among many young adults that vaping is a healthier alternative to smoking [24].

Government and nonprofit organizations at the national, state, and local levels have collaborated to address the health risks, epidemiological concerns, and attitudes regarding vaping. As White [25] states, accomplishing real-world change and providing the essentials of a democratic society requires a process of administration. Stakeholders, such as the World Health Organization’s Framework Convention on Tobacco Control, U.S. government agencies (e.g., Food and Drug Administration, Department of Health and Human Services, National Institute of Health) and nonprofit organizations (e.g., American Cancer Society, American Lung Association, Campaign for Tobacco-Free Kids, Parents Against Vaping E-cigarettes), can work together to promote social change using empirical research and epidemiological evidence that focuses on managing risk [22,26,27].

The literature refers to an institutional mind, or broad agreement of governments and agencies to control behaviors in public spaces (e.g., alcohol prohibition, cigarette bans, criminalization of illicit drug use, vaping restrictions). These efforts include national laws, such as the Youth Vaping Prevention Act (2019), which restricts youth access to flavored tobacco products, and education campaigns, such as truth initiative® (https://www.truthinitiative.org/) and Consumer Advocates for Smoke Free Alternative Association (http://www.casaa.org/). All 50 states have enacted laws forbidding the sale of tobacco products (including e-cigarettes) to minors (U.S. Public Law Center) [28]. For example, Senate Bill 793 sponsored by Senator Jerry Hill of Santa Clara County in California specifically prohibits advertising aromatic, flavored tobacco vaping products in vending machines. However, around the country, the minimum age varies from 18 years (e.g., Arizona, Florida, Nevada, and most southern states) to 21 years (e.g., California, Texas, and New York). The definition of tobacco products also varies by state, including laws regarding product packaging, sales, advertising, and youth access to vaping products at retailers.

Empirical studies generate ideas, models, and strategies to improve practice. In government, this evidence is useful to promote an “ideal” bureaucracy [29,30] wherein public agencies work with legislative bodies to analyze research and create public policy through coordinated planning, organizing, staffing, coordinating, reporting, and budgeting [31]. Sound decision making about vaping and solutions to problems requires intellect and data. Public administration scholar Simon [32,33] argues that such
decision-making is a key function of governments and public health organizations, which are rational entities. For example, using the evidence for smoking restriction policies such as emphasis on harmful effects and beliefs that bans are more effective than increasing public knowledge. The prohibition of alcohol in the 1920s and 1930s and the War on Drugs in the 1960s and 1970s led to distrust of government, and remains today a possible barrier to epidemiological solutions to vaping.

The philosopher David Hume (1711-1776) asserted a relationship between moral ethics and reasoning, arguing that reason alone is insufficient to make decisions [34]. In this way, Hume veers away from bounded rationality and toward regulatory decisions that emphasize trust, responsibility, and consumer welfare. One study assessing how smoking education affects individual decisions to stop smoking shows positive outcomes of both education and regulation [35]. Other theological belief systems similarly encourage behavior that helps and protects others, particularly the poor, vulnerable, and young, to promote justice and the public good [36]. For example, Naziata [37] uses a biblical standard to argue that freedom of choice does not excuse dangerous or immoral behavior: “I have the right to do anything, you say, but not everything is beneficial. ‘I have the right to do anything,’ but I will not be mastered by anything” (1 Corinthians 6:12). Although the Apostle Paul was writing about sexuality immorality, the concept is applicable to authorities allowing smoking or vaping and individual adults deciding to vape when products can be harmful. Moral behaviors guided by spiritual principles and biblical precepts can help with discernment when making decisions about using smoking and vaping products harmful to our health. Public administrations regulating products and epidemiological education of harmful effects on the body requires collaboration. A common theme across these theories is that collaborative alliances can promote positive social change. Collaborative governance is foundational to efforts to create healthy cities around the world, including in Europe [38] and the United States [23].

2.2. Vaping as a Healthier Alternative to Traditional Tobacco

Bruines and Humphries [24] elaborate on the misperception that vaping is a healthier alternative to traditional tobacco products:

In some ways, the original promise behind e-cigarettes echoes a wider cultural impulse among American consumers trying to battle pleasurable but unhealthy ways, observers say. With an oft-noted faith in technology, Americans saw certain butter-replacing margarines as a way to battle cholesterol and heart disease, and synthetic sweeteners to battle obesity, as well as hosts of other products that claim similar escape routes. All would allow Americans proverbial ways to (literally) have their cake and eat it, too.

Unfortunately, the data do not support this notion that vaping is less risky. In 2019, the American Heart Association [39] highlighted three risks for using e-cigarettes as an alternative to conventional tobacco products: 1) scientific evidence has not shown that e-cigarettes are associated with fewer health problems; 2) vaping can lead to dual use of vaping and smoking in young adults; and 3) vaping delivers nicotine and volatile organic compounds, which are highly addictive. Often the e-cigarettes contain flavoring agents, such as diacetyl that are associated with bronchiolitis obliterans (i.e., popcorn lung), a condition causing scarring and obstruction of the small airways in the lungs [40].

Figure 1. Drivers of and Obstacles to Harm Reduction among Vape Users Aged 18–24 Years
Force field analysis has long been used to evaluate factors related to public health. Ellis et al. [41] used it to assess how tobacco control affects a low-income minority community. As shown in Figure 1, regarding influences on vaping choice among predominantly female (63%) 18-24 year-olds (33%) and 25–34 year-olds (42%) in California, 22% believed that vaping helped them to stop using tobacco, 44% believed that it allowed them to smoke in areas where traditional smoking is banned, and 15% believed vaping is safer than nicotine products. Factors influencing the decision to stop using vaporizers and tobacco products overwhelmingly involved government intervention (e.g., education, enforcement against retailers and marketers) and had little to do with health concerns (e.g., EVALI).

Vaping has caused several injuries, some of which have been fatal, including broken jaws [42]; facial, oral, and head injuries [43,44,45,46]; and poisoning [47] the long-term side effects remain unclear. Deaths have occurred in California, Illinois, Indiana, Minnesota, Oregon, and Kansas, and the CDC [15] reported more than 450 possible cases of severe lung injury likely caused by vaping of nicotine or cannabis products.

2.3. Advertising Effects on Young Adults

A longitudinal study of teens and young adults (ages 18-25 years) shows that they are vulnerable to vaping advertisements and likely to try a product within six months of exposure to marketing [5]. Sociodemographic data about vaping does not reveal any change in vaping among genders; a 2019 study by The Substance Abuse and Mental Health Services Administration (SAMHSA) revealed no differences for vaping by gender [48]. To guide national health promotion and disease prevention efforts, the CDC launched the Healthy People 2020 initiative (CDC, 2020), which tracks approximately 1,200 objectives organized into 42 topic areas, including several goals for reducing tobacco and e-cigarette use among young adults:

- Understand how beliefs related to using tobacco and nicotine products affect attitudes and usage behaviors.
- Effectively communicate the advantages and disadvantages of anti-tobacco influences.
- Provide policy makers, healthcare providers, and public and private industries with knowledge about the effects of advertising and marketing on young adult choices to use tobacco products.

Related to this effort, the Federal Trade Commission [49] is investigating the marketing practices of several electronic cigarette manufacturers, including Juul Labs, Inc., R.J. Reynolds Vapor Company, Fontem US, Inc., Logic Technology Development LLC, Nu Mark LLC, and NJoy, LLC. The investigation includes a review of advertising data from 2015–2018, such as sales, promotions, giveaways, annual spending, platforms and methods, celebrity endorsements, social media influence, and product placement [50]. Juul is a leading manufacturer of e-cigarettes and has been under attack for targeting teenagers with flavors such as crème brûlée, cucumber, and mint.

3. Methods

This research examined is in the public domain and a quantitative survey of the targeted population to address the hypothesis that there is a relationship between access to vaping products and regulation and health education among US adults aged 18-34 years. The choice to use flavored vaporizers instead of traditional nicotine products is an issue on the minds of policy makers, healthcare professionals and the public. The computerized data collection method, Survey Monkey, was cost-efficient. Commonplace are national surveys of 18-34 year-olds about vaping and harmful effects is a popular way to reach them and explore and explain drivers of vaping, moral and ethical dilemmas and perceptions of health dangers [51,52]. Our goal was replicating the study survey approach to assess the topic and pervasiveness of electronic cigarettes and awareness among the sample population; as well as discover influences on “choice” such as ethical discernment, regulatory and educational interventions. Purdue University’s Global Institutional Research Board approved the study.

A 22-item survey of closed-ended questions were created based on experiences with young adults and the topic (college settings, workplace) and studies listed in the literature review. Computerized data collection for the pilot survey with a random selection of participants from our professional networks enable testing of some questions. The participants feedback was instructive to modify questions for clarity and adding relevant new questions; the final survey was 22 questions total on the survey. The survey relied on standards of validity and reliability to gain understanding of issues related to advertising of flavored oral vaporizing products to young adults, as well as the regulatory public policy decisions that influence their choices to vape rather than use traditional tobacco products. We distributed the survey via Survey Monkey (https://www.surveymonkey.com/) to minimize bias and ensure anonymity and privacy.

Our final sample comprised 146 respondents aged 18 to 34 years. Participants did not receive compensation and random selection was by invitation using Survey Monkey. Confidentiality and privacy policy assurances by the third-party data collection agency, and access to participants’ personal information (e.g., IP addresses) was restricted in that neither researcher had access to the information. To compile the quantitative data on vaping trends in the United States (e.g. state-level policies), including product types, and flavor preferences (e.g., mint, citrus), as well as national health reports and information from Monitoring the Future 2019 Survey Results: Vaping [53]. In addition, we consulted the National Youth Tobacco Survey [54], and the Clean Air Act [55] as well as relevant literature and policy documents on public administration or regulatory governance for harm reduction among 18-34 year-olds (e.g., [42]; https://tobaccofreeca.com/, and Public Health Law Center). To conduct statistical analyses, we used Excel to construct and visualize causal relationships. Adjustments to the method of using a focus group to compare the survey responses was prohibited by the Covid-19 requirements.
4. Results

Some questions were answered by 126 respondents (20 respondents did not complete the entire survey) and calculated appropriately. The results address the four hypotheses guiding this present study. Among respondents, 40% used tobacco or nicotine products before vaping or using e-cigarette products, compared with 60% who did not try vaping first (Figure 2).

Some 20% of respondents reported that vaping helps to stop the use of other tobacco products, and 30% of respondents reported to vape to conceal the smell of tobacco.

Fifty-four percent reported vaping to conceal using tobacco smoking in places that prohibited it use. Regarding flavors 29% of respondents reporting also liking the different vaping flavors. Other reasons for vaping or trying vaping products are persuasion by friends or family as reported by 14% of the respondents and persuasion by advertising and marketing, which is the case for 5% of the participants. Many respondents 58/146 (40%) indicated that access to vaping products was very easy or easy for consumers younger than 21 years, even though most national and state government regulations prohibit access to this age group. Regarding using vaporizers instead of tobacco/nicotine products, 20% responded yes to choosing to vape to help quit smoking; 18% no and 62% were neutral or declined to state. Out of 126 respondents 58 (46%) indicated that vaping products are safer and 54% indicated that they are not safer than traditional tobacco and nicotine products (item 12).

Respondents had mixed reactions to the regulatory efforts of the Food and Drug Administration to remove fruity e-cigarettes from the marketplace: 40% felt the agency was doing enough, and 24% did not (Figure 3).

Regarding an essential role of public administration, specifically government, in regulating vaping products, most of the 87 of 126 (69%) respondents felt such regulatory action is necessary.

Regarding familiarity with vaping policies, 39/126 (31%), respondents had no familiarity (Figure 4).
Of the 126 responses to the item regarding the role of government regulation of sales and marketing of vaping products to young adults, 17% strongly agree and 35% agree that there is a role for administrative action (Figure 6).
The sample data mean, median (73.5), and standard deviation (11.9) indicate an empirical, bell shape of the data (X-bar 2.18) with a Pearson index of skewness of -1.47 below the mean. The coefficient of variation (5.46%) indicates variability relating the standard deviation and the arithmetic mean. The mean ages of use by 18-24 year-old respondents was 3.4, and 25-34 year-old respondents (x-bar 2.8) indicate that the outcomes of the study are likely to apply to a larger, representative population of vaping users. The 126 respondents answering questions indicated the following: 67% indicated using e-cigarette products because they did not prefer traditional tobacco and nicotine, and 14% believed vaping products to be safer. The majority, however, indicated using e-cigarettes to help them to stop smoking tobacco, and more than half (54%) were introduced to vaping products by someone else. The perception results indicate accessibility is not a problem. Many (68%) preferred vaping because it is easier to conceal (p=.68), and 53% vaped 3–4 times per day. Most respondents (83%) were aware of the harmful effects of vaping, such as EVALI and other lung ailments. Perceptions about governance were mixed, with many neither agreeing nor disagreeing about the efficacy of FDA intervention to influence vaping is, p=.396 (126 responses). The perceptions of a consistent role of administrative regulators to reduce advertising is moderate (p=0.52).

5. Discussion

We examined the perceptions about vaping and e-cigarettes and the role of public health governance in reducing the harm associated with vaping among young adults. We found that 36% of respondents lacked awareness of vaping regulations. Combined with our findings from the literature review, the results of this survey indicate that a bounded rationality perspective may explain the appeal of vaping. Although 88% of respondents were aware of harmful effects of e-cigarettes and traditional tobacco, this knowledge was not enough to convince them to stop using the products. From a public health and epidemiological perspective, government agencies, nonprofits, and businesses must work together to influence public policy in this regard. For instance, smoking and vaping bans and initiatives to educate young people about the harmful effects of conventional tobacco products have resulted in a steady decline in use. The decline and accompanying increase in alternative flavored e-cigarette smoking products is disconcerting. Agencies and governments must therefore collaborate on effective ways to combat vaping, such as restrictions on product advertisements.

Achieving harm-reduction goals through education and regulatory programs and policies requires combined efforts from government agencies (FDA, state substance abuse agencies regulating tobacco and e-cigarette products), and nonprofits (e.g., Parents against Vaping E-cigarettes and Steered Straight) [56]. Our results confirm that vaping regulations are significant in shaping attitudes about e-cigarettes: respondents indicated their support for a strong public administration role in intervention (p=0.52).

Regarding the safety benefits of using vaping products versus traditional tobacco, the survey respondents believed that vaping is a safer alternative to nicotine products. To address this misperception, regulating behaviors is an option. For example, Printz (2020) finds that federal regulations of e-cigarettes products may not be strong enough to induce desired behavioral outcomes [30,57,58]. Regulating choice to use (or not) vaporizes is associated with evidence to show young adults the harmful effects of nicotine products such as stages of palliative care, and to use risk-aversion thinking than skepticism. For instance, in our study, 42% felt that access to vaping products was very easy or easy even for those under 21 in states with prohibitions against underage
vaping. Additionally, 62% were aware of the harmful effects of vaping, and 23% strongly disagreed that the federal government is doing enough to protect young adults from vaping sales and advertisements. Our study indicates that for teens (< 18 years) that in the United States that many believe that e-cigarette regulations should be more restrictive until the dangers of vaping in young adults are better understood.

The survey participants’ unawareness of specific public policies banning cigarette smoking and vaping product alternatives is surprising considering the media attention; however, they recognize flavored vaporizers are available through media coverage (e.g., social, news, radio). Advertising is an important source of information and influence for these products. Public policies should therefore target advertising to help minimize its influence on young people. These policies must be sensitive to the needs and perceptions of the target audiences, however. As Wes and O’Neal [21] indicate, popular anti-drug programs (e.g., DARE) have had no effect on teens’ use of tobacco and nicotine products (or other drugs).

A limitation of our study is the lack of focus on demographics, such as ethnicity and race. Wes and O’Neal [21] report findings for both minorities and young adults about the role of social and familial indicators in their choices to use nicotine and vaping products, and their education and social environments (e.g., teachers, parents, and peers) influence these choices. As shown in our study, 55% of respondents were aware of public policies and education materials about the harmful effects of vaping. Future research should explore this area further.

6. Conclusion

We sought to understand young people’s perceptions of government regulations and policies regarding vaping. We found that 23% indicated strong dissatisfaction with the federal government’s ban of e-cigarette marketing to young adults and most agreed that regulation could help reduce vaping among 18–25 year-olds. Increasing public governance to further reduce the access (marketing, sales, sharing with friends and family) vaporizers to young adults, is strongly recommended. Inadequate research, contradictory goals, poor incentives, and weak cooperation and trust can impede these efforts, however. For this reason, some argue that laws and regulations should follow a bounded rationality, which is a type of decision-making that combines cognition (intellect) and research (data) to derive a satisfactory, rather than ideal, solution. We suggest that health care providers promote education initiatives that spread awareness about the harmful effects of vaping and e-cigarette use. In conclusion, public health policy efforts should focus on at-risk communities, especially youths. These efforts also must include targeted interventions to regulate the marketing and advertising of these products.
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