Purchase College

STATE UNIVERSITY OF NEW YORK

Senior Project in Economics, School of Natural and Social Sciences

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JUULibition

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ABSTRACT

For most daily smokers there is a sense in long term health benefits from switching over to electronic cigarettes. New technological advances in the e-cig field make it for easier, cooler and more respectful public smoking. Vaping systems, e-cigarettes and JUULs are becoming the standard form of healthier decision making. Electronic cigarettes of one form or another are incentivized to use due to is practicality, “safety” and sleek designs. JUULs are the e-cigs of the year as they look like a USB thumb drive, charge on USB power and emit a taste of ones own preference, ranging from strawberry to mint and anything in between. Users prefer using for the taste and how it is more accepted throughout society, but it is putting the user at equal or higher risks. Through the use of empirical data and studies we can infer the use of electronic cigarettes put users at higher risks, yet it is still a growing field with 3.7% of American adult populations “vaping” in 2014. 12.6% of the adult population in America have stated to have tried an e-cigarette at least once in their life. Equating to more than 9 million adults using e-cigarettes regularly in the United States. Electric cigarettes can cause more harm than good due to the incentives they give smokers. The accessibility and ease of use of e-cigs may lead to increased consumption over time. E-cigs are marketed as a healthy alternative to smoking, so consumers are incentivized to smoke more.

INTRODUCTION

This leads to my research questions: are e-cigs and comparable products valuable substitutes for smokers? As well as will users make a decisions on which product to use through neoclassical or behavioral economical theories? Considering the effects e-cigs have on a users, relative to tobacco cigarettes, I hope to find that these e-cigs are a safer substitute, therefore also leading to a behavioral theory.

In order to fully understand why this research question was chosen to be answered, the full understanding of behavioral and neoclassical economics is needed. In an article written on Psychology Today, Dr. Shahram Heshmat does a profound job in breaking both theories down. Dr. Heshmat stated,

> Behavioral economics emerged against the backdrop of the traditional economic approach known as rational choice model. The rational person is assumed to correctly weigh costs and benefits and calculate the best choices for himself. The rational person is expected to know his preferences (both present and future), and never flip-flops between two contradictory desires. He has perfect self-control and can restrain impulses that may prevent him from achieving his long-term goals. Traditional economics use these assumptions to predict real human behavior. The standard policy advice that stems from this way of thinking is to give people as many choices as possible, and let them choose the one they like best (with minimum government action). Because they know their preferences better than government officials do. Individuals are in the best position to know what is best for them.

The previous quote shows how a perfectly rational person acts and follows the supply and demand model in all aspects of life. This same person will try to maximize personal satisfaction and make sure the benefits always outweigh the cost. Dr. Heshmat later compares neoclassical to behavioral economics,

> In contrast, behavioral economics shows that actual human beings do not act that way. People have limited cognitive abilities and a great deal of trouble exercising self-control. People often make choices that bear a mixed relationship to their own preference (happiness). They tend to choose the option that has the greatest immediate appeal at the cost of long-term happiness, such as taking drugs, and overeating. They are profoundly influenced by context, and often have little idea of what they will like next year or even tomorrow. As Daniel Kahneman (2011, p5) put this, “it seems that traditional economics and behavioral economics are describing two different species.” The latter shows that we are exceptionally inconsistent and fallible human being. We choose a goal and then frequently act against it, because self-control problem fails us to implement our goals.

The part where Dr. Heshmat references Daniel Kahneman should be the main point to understanding behavioral economics. Goals are always set forth, whether it be for self-improvement, putting some cash aside for the future, or even carpooling to save some money during tough times. The only thing us humans fail at, is keeping this goal and being constant with it. The person who sets goals for self-improvement is also the person that only goes to the gym before a big family event or holiday event, but not on the other days during the year. Dr. Heshmat finishes out the article by giving us a

conclusion to what behavioral economics truly is by stating, "humans are hard wired to make judgment errors and they need a nudge to make decisions that are in their own best interest. The understanding of where people go wrong can help people go right. This approach complements and enhances the rational choice model." Through the use of scholarly articles, charts and graphs, surveys and empirical data, we will attempt to reach a conclusion on the neoclassical economic decision of users towards e-cigarettes and how they are not the safer substitute.

Users are given a choice on what they decide to smoke, whether it be a traditional tobacco cigarette such as Newport or an electronic cigarette such as JUUL. Although the final decision is up to the end user, the Food and Drug Administration (FDA) and state officials have a way to affect their sole decision. In the state of California, the state governor, Gov. Jerry Brown along side with other state representatives signed law SBX2 5 into effect. This law classifies electronic cigarettes as tobacco products, whether they contain any traces of tobacco or non at all. On May 5th, the very next day, the Food and Drug Administration (FDA) also added electronic cigarettes into the classification of tobacco products. In the California law SBX2 5, the definition of tobacco product was expanded to “an electronic device that delivers nicotine or other vaporized liquids to the person inhaling from the device.” (Forbes) Governor Brown also signed bill SBX2 7 in to action, which rises the age of buying tobacco products from 18 to 21. Meaning adult smokers under the age of 21 will not be able to buy electronic cigarettes, including JUULs, due to the previous addition of SBX2 5.

Silicon Valley, one of the most renounced locations in the world where technologically advanced companies' headquarters reside was under quite some fire recently. JUUL headquarters, also located within Silicon Valley, hadn't been enforcing this ban of "tobacco products" within their own company. On December 11th 2018, CEO Kevin Burns had to send a company wide email, banning use of JUULs and any other electronic cigarette within the work space. CEO Burns included in the email "It may feel nonsensical to prohibit at-work use of the very products we work hard to create and promote, but the bottom line is we need to comply with legal requirements the same as any company." Tying back into the SBX2 7, which prohibits sale of any tobacco products to adults under 21 years of age, JUUL was also caught with this. The FDA did a surprise inspection of their headquarters, where they seized paperwork on their marketing strategies and sales practices. It was founded that JUUL used major social media pages such as; Facebook, Instagram and Twitter to promote their product. All of which many of their subscribers or followers were adults under the age of 21.

JUUL being the lead market share holder within the electronic cigarette field at 74% market share, and rising leads to how popular JUULs are but also electronic cigarettes. JUUL, a business that started with as little as 200 employees in 2017, now predicts to reach $3.4 billion in revenue in 2019, nearly triple its 2018 earnings. Even through FDA bans, where the sale of fruit flavored JUUL pods such as mango, cucumber, crème brulee and fruit medley had to be removed from shelfs to online only after an age verification through the use of social security. The FDA also pushed states to raise their buying age of these products from 18 to 21, as read previously

California's state as a whole, prohibits the sale to adults under 21. "JUUL has experienced explosive growth in recent years—from $200 million in 2017 to $1.3 billion in revenue last year (and a $12.4 million profit). And, despite the new restrictions, it is expecting sales growth of 160 percent, with 26 percent of sales taking place outside of the United States." (Robb Report)

JUUL, a product used for smoking cessation, became an instagram phenomenon as JUUL promoted on social media with celebrities, parties, concerts and anything else that may appeal to teenagers and young adults. "According to the National Youth Tobacco Survey, the number of high school students in the United States who reported using e-cigarettes, including JUUL, increased by 78% in just one year (2017-2018)." (Colorado Springs Independent) At the same time, middle school users increased by 48%. (fig.1) "The CDC (Center for Disease Control and Prevention) report attributes this dramatic rise in vaping to the popularity of JUULs and other e-cigarettes shaped like a USB flash drive. They are easy to hide, have a high nicotine content, and come in fruit, candy, and other flavors that appeal to youth." (American Cancer Society) The CDC also found that "the proportion who reported use of e-cigarettes on more than 20 of the past 30 days increased from 20% in 2017 to 27.7% in 2018."

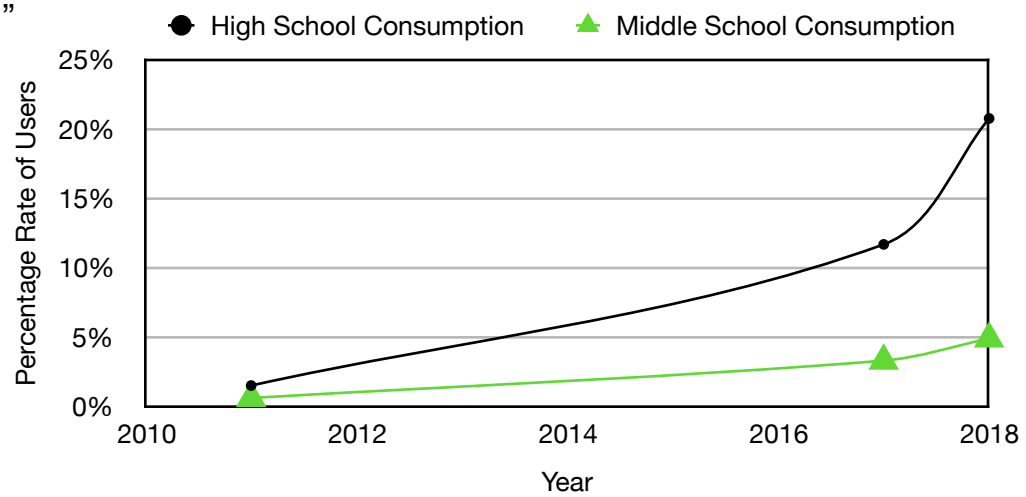


Fig 1. Increased consumption within high school and middle school students (data based on American Cancer Society)

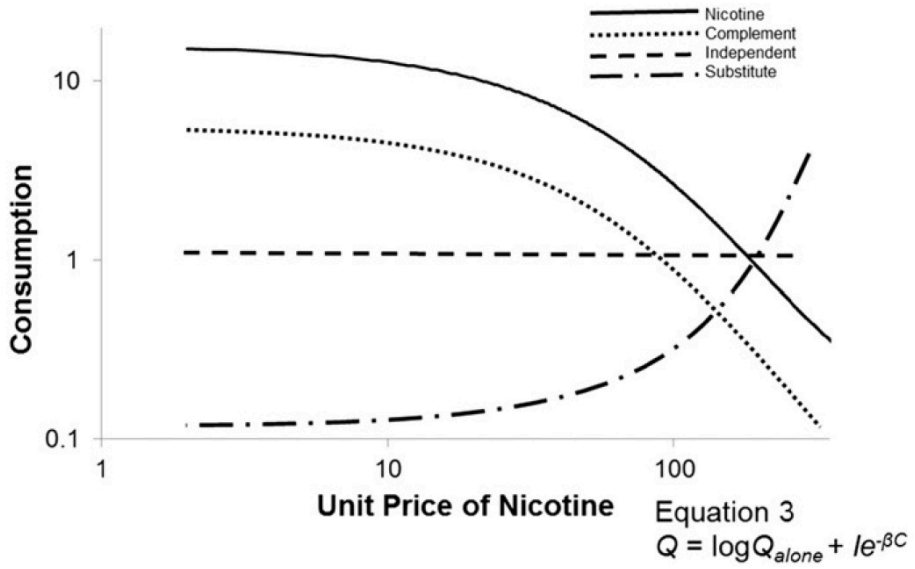
Just within high school students nationwide, whom cannot buy the product themselves, has increased 78%. FDA Commissioner Scott Gottlieb said, “E-cigs have become an almost ubiquitous - and dangerous - trend among teens. The disturbing and accelerating trajectory of use we’re seeing in youth, and the resulting path to addiction, must end.” Within a year from 2017 to 2018 JUULs surged 600% in sales, and took over 74% of the electronic cigarette market share. JUUL is a new and upcoming business where it uses strategic marketing to promote its product, but through new regulations and laws, the FDA and states are independently cracking down on JUULs and other electronic cigarette users.

EVIDENCE

Chapter 1: Nicotine Reduction

Nicotine reduction through the use of electronic cigarettes, comparable substitutes or even taxation can demonstrate how end users will react. If the end users decide to find a substitute or a way for them to receive the same amount of nicotine as before, we can infer a behavioral economical view. As though the user will now look for the greatest immediate appeal although they know nicotine addiction can influence intake of other harmful toxins. In a scholarly article written for the journal “Preventive Medicine” looks into the behavioral economical approach of *Nicotine Reduction as an Increase in the Unit Price of Cigarettes.* A brief introduction to the article states “The Family Smoking Prevention and Tobacco Control Act gives the FDA the authority to regulate cigarettes (US Congress, 2009).” Ultimately, the FDA has all the power to either cut down on the nicotine within cigarettes or look for better alternatives. Alternatives can be those that introduce a reinforcer, such as manipulations on price.

Such form can be taxation on cigarettes, which throughout studies demonstrate how effective taxation is on consumers. Consumers will react quickly on drastic price changes. In the article the researchers stated “if the price of a pack of cigarettes is doubled, the change in cigarette consumption should be the same as if the number of cigarettes in a pack was cut in half, because the price per cigarette (i.e., unit price) has been changed in the same way.” (fig.2) This meaning less income from sale of cigarettes, a true decrease in demand. This article fully understands that a majority of smokers only truly smoke for the nicotine within the cigarettes, therefore this study looks into the reduction of nicotine within cigarettes causing a rise in unit cost. More users will be willing to pay more to get the same amount of nicotine as before.



source: “Nicotine Reduction as an Increase in the Unit Price of Cigarettes: A Behavioral Economics Approach.” *Preventive Medicine* fig. 2

This hypothetical demand curve, shows the unit price of nicotine increasing as nicotine consumption drastically decreases. Users are not consuming as much nicotine due to an increase in unit price. A true demonstration of the law of demand. As seen in the

graph, substitutes rise where nicotine decreases. Users were able to find a substitute with as much nicotine as before, or more nicotine per unit price in accordance to regular tobacco cigarettes. In conclusion, the article states,

> Nicotine consumption is likely to be related to unit price through an exponential function, meaning that smokers will compensate for decreases in nicotine content across a range of contents, reach a peak level of compensation, and further reductions in nicotine will reduce smoking behavior. Demand curves can be used to make predictions regarding the exact range of contents that will produce compensation, and the content that is likely to suppress nicotine consumption to zero.

This research touches upon the reduction in nicotine as a form to get end users to think twice about paying more per unit, for the decrease in nicotine. This study does a great job, but did not take in account substitutes being used as a complement. The end user will pay for the reduced nicotine cigarettes but will spend more money buying other products such as nicotine patches, chewing tobacco, nicotine chewing gum or anything else high in nicotine, and will either consume both at once or more within a time window.

Nicotine reduction is proven to help sway users away from consumption, but is there truly any reduction? In comparable substitutes such as JUULs there is no nicotine reduction, in fact there is nicotine addition. On JUUL's webpage, under the frequently asked questions (FAQ) tab, it shows the nicotine content per JUUL flavored pod. One JUUL pod is equivalent to 200 puffs of cigarettes or in other words, a whole pack. Each pod also contains 0.7mL of 5% nicotine by weight. JUUL pods are sold to

you in a pack of 4, therefore the equivalence of 800 puffs or 4 cigarette packs. JUUL also claims its salt formulation within the pods increase the delivery of nicotine into the bloodstream. At least 2.7 times faster than other comparable electronic cigarettes.

Facing lawsuits, regulations and backlash, JUUL has decided to create nicotine reduced JUUL pods at .023mL of 3% nicotine by weight. Proven by fig.2, where consumer consumption decreases in relation to an increase in unit price of nicotine, JUUL should expect a decrease in demand. JUUL is battling this perfect example of the law of demand, by introducing a quicker way of nicotine absorption. (New York Times, Shiela Kaplan) Another way to continue with an increase in demand, JUUL plans on following European regulations and bringing down the nicotine content even more to .02mL of 3% nicotine by weight. This will bring them into a new market place, with new and more consumers.

Chapter 2: Ways to Reduce Sales of Nicotine or Tobacco Products

Under a general assumption that users want to reduce their purchasing of certain products, statewide tax increases may help affect these decisions. In a study conducted primarily on addictive behaviors, the researchers looked at the *Behavioral Change in Response to a Statewide Tobacco Tax Increase and Differences Across Socioeconomic Status.* The researchers concluded the following,

> Smokers report a range of behavioral changes in response to cigarette taxes, with differences across SES (Socioeconomic Status). The majority of smokers, and particularly low-SES smokers, report behavioral steps toward quitting or achieving sustained tobacco cessation in response to cigarette taxes.

Complementary population-based programs geared toward assisting individuals, especially low-SES individuals, to achieve continuous tobacco cessation could increase the reach and effectiveness of cigarette taxes.

The researchers were able to reach this conclusion by examining surveys on the affects of a statewide taxation on tobacco. This data was collected from the 2014 Minnesota Adult Tobacco Survey, which used descriptive analysis to pinpoint the impact of taxation. Table 6-4 taken from the Minnesota Adult Tobacco Survey (MATS) shows the reaction to taxation increases among cigarettes.

Table 6-4. Smoking-related reactions to the Minnesota tax increase among current and former smokers (who quit within the last year), by selected demographic characteristics and smoking status

Characteristics	Reactions			
	Thought about quitting	Cut down on cigarettes	Made a quit attempt	Maintained a quit attempt
	%	%	%	%
Overall	**60.8** ± 3.4	**48.1** ± 3.5	**44.2** ± 3.5	**18.8** ± 2.7
Age				
18 to 24	**66.8** ± 9.8	**56.1** ± 10.8	**56.6** ± 10.6	**29.0** ± 9.7
25 to 44	**63.6** ± 5.2	**46.7** ± 5.4	**47.8** ± 5.5	**17.2** ± 4.0
45 to 64	**58.0** ± 5.4	**49.1** ± 5.5	**35.9** ± 5.1	**17.3** ± 4.1
65 or older	**45.8** ± 10.2	**37.8** ± 9.4	**39.1** ± 9.8	**18.7** ± 8.1
Gender				
Female	**65.1** ± 4.8	**55.2** ± 5.2	**47.9** ± 5.2	**18.0** ± 4.0
Male	**57.6** ± 4.6	**42.9** ± 4.6	**41.3** ± 4.6	**19.5** ± 3.6
Education				
Less than high school	**63.8** ± 10.6	**56.5** ± 11.0	**44.6** ± 11.0	**17.0** ± 8.3
High school graduate/GED	**61.3** ± 5.6	**48.2** ± 5.8	**42.4** ± 5.8	**19.1** ± 4.6
Some college or technical school	**61.9** ± 5.3	**47.8** ± 5.6	**47.0** ± 5.6	**19.1** ± 4.4
College graduate or beyond	**53.4** ± 8.1	**40.9** ± 7.7	**40.7** ± 7.7	**19.1** ± 5.9
Household income				
$35,000 or less	**62.3** ± 5.3	**55.6** ± 5.5	**46.3** ± 5.4	**18.4** ± 4.0
$35,001 to $50,000	**58.7** ± 9.2	**48.4** ± 9.0	**39.7** ± 8.9	**17.5** ± 6.7
$50,001 to $75,000	**58.0** ± 8.3	**38.2** ± 8.2	**42.9** ± 8.6	**22.6** ± 7.5
$75,001 or more	**63.2** ± 7.2	**45.8** ± 7.5	**46.7** ± 7.4	**18.8** ± 5.5
Smoking Status				
Current Smokers	**59.3** ± 3.7	**48.3** ± 3.8	**40.7** ± 3.8	**10.7** ± 2.4
Former Smokers	**69.3** ± 7.6	**47.0** ± 8.2	**62.8** ± 8.1	**62.7** ± 8.1

Source: Minnesota Adult Tobacco Survey, 2014

source: “Minnesota Adult Tobacco Survey (MATS) 2014.” *ClearWay Minnesota* table 6-4

These results showed drastic changes in how current smokers, on average, handled the taxation. 59.3% of current smokers thought about quitting, 48.3% cut down on cigarettes, 40.7% made an attempt to quit and 10.7% sustained the attempt and quit! The table above only shows the success of taxation among the behavior of smokers in Minnesota, but could be used to further enhance future research throughout different states and ultimately nationwide.

Cigarettes, whether electronic or traditional, have an abundance of risks past nicotine. Traditional cigarettes contain an absurd amount of other chemicals found in all stage of development. From growing, to manufacturing and to using. During the growing stage, the actual tobacco plant contains nicotine, which is used as a pesticide towards animals. The soil in which tobacco is grown, often contains chemicals located all over the periodic table and especially within heavy metals such as; Cadmium (Cd), and Lead (Pb). The fertilizers used on the soil also contain nitrates, such as Sodium (Na), and Potassium (K). All these chemicals are released once the cigarette is burned, and inhaled. During the manufacturing stage, the tobacco is left to cure after harvest season. During this curing process, chemicals called “Tobacco Specific Nitrosamines” (TSNA) are formed. These chemicals are shown to cause cancer within the lungs and esophagus. Continuing on in the process, when tobacco is shipped to the cigarette manufacturer, more chemicals are added to not only enhance flavor, but control moisture. These chemicals also add harm to a user, at this stage manufactures add Ammonia (NH_3) which controls how quickly nicotine can be absorbed into the body, sometimes add sugar which can ultimately lead to the creation of Acetaldehyde (C_2H_4O) which are proven to cause cancer and make nicotine even more addictive.

This is some of the “natural” contaminants inside a cigarette. Another great way to add more toxic chemicals to cigarettes are done by lighting it. When a cigarette burns, new chemicals arise that were not within any of the other processes. Carbon Monoxide (CO) is an off gas of lighting the cigarette which not only affects the user, but also causes second hand smoking, which leads to heart disease. Also 1,3 Butadiene (C4H6), which affects the reproductive system, and Benzene which affects fertility. Acrolein (C3H4O) which causes irreversible lung damage, and more than 70 cancer causing chemicals.

Electronic cigarettes were created to reduce some of the chemicals found during the three stages of development of a cigarette. Unfortunately, e-cigs, vapes, hookahs and other type of electronic cigarettes, contain more than just nicotine. They contain harmful ingredients such as ultra fine particles that can be inhaled deeply into the lungs, chemicals within the flavor such as Diacetyl which is linked to serious lung disease, organic compounds, and heavy metals similar to cigarettes. These heavy metals include; nickel, tin and lead. In a study conducted by GASP of Colorado (Group to Alleviate Smoking Pollution), it was founded that 42 different chemicals are inside an electronic cigarette. JUUL themselves has stated they use nicotine salt formulation to aide in faster absorption of nicotine.

Forty-Two Chemicals Identified in Electronic Cigarettes

✔= exposure can be especially harmful to the health. Chemicals in red are emitted in secondhand smoke.

2-butanone (MEK)	Butyl hydroxyl toluene	Limonene	Potassium
2-furaldehyde	Cadmium ✔	m,p-Xyelen	Propanal ✔
Acetaldehyde ✔	Chromium ✔	Magnesium	Propylene Glycol ✔
Acetic acid	Copper	Manganese	Sulfur
Acetone ✔	Crotonaldehyde	Nickel ✔	Tin ✔
Acrolein ✔	Diethylene Glycol ✔	Nicotine ✔	Toluene ✔
Aluminum	Formaldehyde ✔	N-Nitrosonornicotine ✔	Valeraldehyde
Barium	Glyoxal	o-Methylbenzaldehyde ✔	Zinc
Benzene ✔	Iron	p,m-Xylene	Zirconium
Boron	Isoprene ✔	Phenol ✔	
Butanal	Lead ✔	Polycyclic Aromatic Hydrocarbons ✔	

source: “Harmful Chemicals in Electronic Cigarettes.” *GASP of Colorado pg 1*

This so called, “healthier alternative” turns out to not be as healthy as portrayed to users, but through studies it is shown to hold less of an impact on chemicals in comparison to nicotine replacement products, smokeless tobacco (chewing tobacco) and cigarettes. In a study conducted by Michael S Orr, on *Electronic cigarettes in the USA: a summary of available toxicology data and suggestions for the future* does a splendid job in showing the chemical levels in all different tobacco-specific products, as shown below in “Table 1.”

Table 1 Comparison of tobacco-specific nitrosamine levels from nicotine replacement products and tobacco products (ng/g of product wet weight), except for nicotine gum (ng/piece), nicotine patch (ng/patch), e-Cigarette (ng per 16 mg cartridge))

Product Type	Product Brand	NNN	NNK	NAT	NAB	Total
Nicotine replacement product	Nicorette gum (4 mg)[4]	2.00	ND	ND	ND	2.00
	NicoDerm CQ patch (4 mg)[4]	ND	8.00	ND	ND	8.00
E-cigarette	Ruyan (16 mg cartridge)[3]	3.87	1.46	2.16	0.69	8.18
Smokeless tobacco	Ariva hard snuff [4]	19	37	120	8	184
	Stonewall hard snuff[4]	56	43	170	7	276
	Revel packets (wintergreen)[4]	640	32	310	17	999
	Swedish snus[4]	980	180	790	60	2010
	Kodiak (wintergreen)[4]	2200	410	1800	150	4560
	Copenhagen snuff[4]	2200	750	1800	120	4870
	Skoal (long cut straight)[4]	4500	470	4100	220	9290
Cigarette	Quest 1 low-nicotine	930	170	310	13	1423
	cigarette[4]	2200	580	560	25	3365
	Winston cigarette (full)[4]	1100	830	1900	55	3885
	Newport cigarette (full)[4]	2900	750	1100	58	4808
	Marlboro cigarette (ultra	2800	770	1200	55	4825
	light)[4]	2500	900	1700	91	5191
	Camel cigarette (ultra light)[4]	2900	960	2300	100	6260
	Camel cigarette (full)[4]					
	Marlboro cigarette (full)[4]					

NAB: N′-nitrosoanabasine; NAT: N′-nitrosoanatabine; NNK: N′-nitrosonornicotine; NNN: 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone.
ND, not detected.

source: “Electronic Cigarettes in the USA: A Summary of Available Toxicology Data and Suggestions for the Future” pg 3

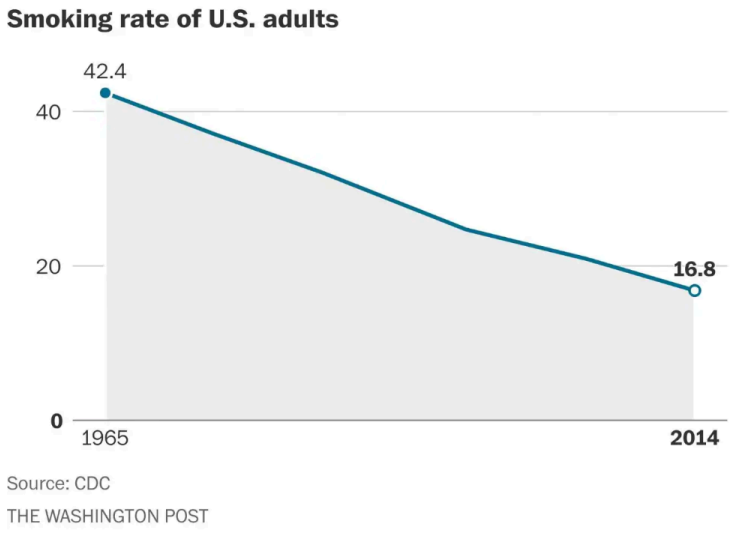
To conclude this study, the researcher states,

> Very few studies have involved complete analytical chemistry analyses of the compounds in ecigarette aerosols and compared this list to compounds in cigarette smoke. A thorough comparison of the chemical constituent levels found in different e-cigarettes would be very informative and improve future toxicological evaluations. Understanding e-cigarette toxicity profiles would allow scientists and regulators to confirm the toxicological liabilities associated with e-

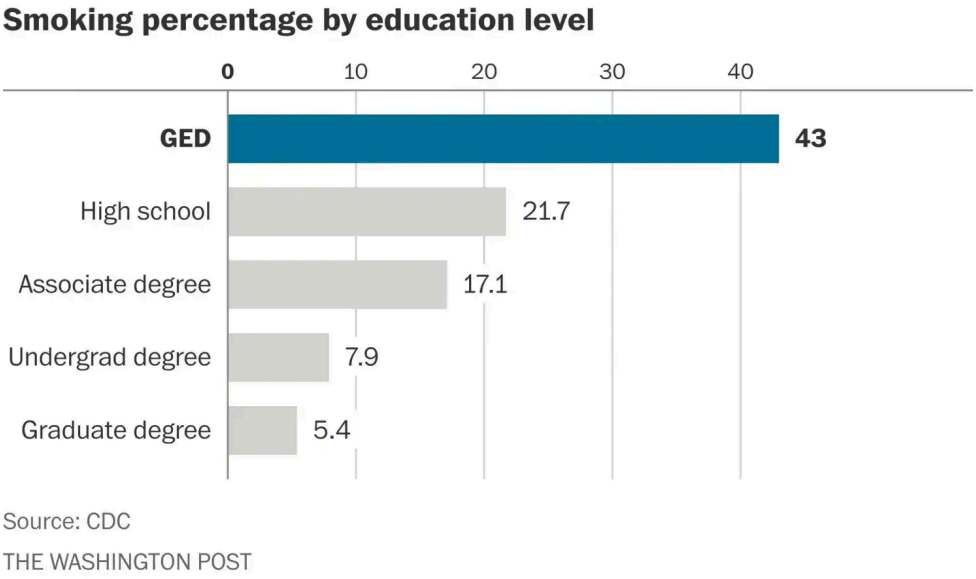
> cigarettes. E-cigarette toxicity profiles may fluctuate due to design features in the delivery device, type and source of ingredients used in the product, and the manufacturing and quality control measures employed by the manufacturer. Since the toxicity profile is dependent on e-cigarette design, it is necessary to identify the key design features that affect the production and levels of aerosol toxicants.

The most important take away from this conclusion is the fact that e-cigarettes have not been out long enough for a more in-depth and extensive research to be able to compare to other substitutes or tobacco cigarettes. It also states, every other electronic cigarette has a different method of delivery. Whether its JUUL using its salt formulation, or Blu's Propylene glycol to aide in flavor, smoke density but also delivery of nicotine. (Blu FAQs)

A decrease of smokers has been going on since 1965, when the United States peaked at the most amount of smokers. The graph below shows the decrease of smokers from 1965 to 2014, according to the Center for Disease Control and Prevention. (The Washington Post)



This decrease in smokers doesn't necessarily imply a taxation, a rise in cost, nor an increase of substitutes, but instead an increase within users on knowledge of toxicology or even increased levels in education. As you gain more education and receive higher degrees, users tend to decrease.



Under the assumption that users want to smoke less, or even quit there are multiple forms to do so. It can be assisted through statewide taxation, FDA regulations or even by the user themselves, gaining more knowledge on toxicology or even schooling.

Chapter 3: How Much Harm Could Electronic Cigarettes Cause?

It is known that traditional tobacco cigarettes have nicotine which leads to increased and continuous consumption within users, but other toxins that have been shown to cause cancer or blockage of arteries leading to heart complications such as heart attacks, strokes or even death. In a *Science Daily* article, "a new study finds that

e-cigarette use could do more harm than good by substantially increasing the number of adolescents and young adults who eventually become cigarette smokers and marginally decreasing the number of adult cigarette smokers who quit." This meaning, that JUULs and other comparable substances, do not necessarily cause more harm by absorption of toxins, but that nicotine attracts users to want more. Causing the end user to then pick up a tobacco cigarette as a substitutable substance. Electronic cigarettes are seen as been used as a gateway to other products.

Similarly, in another study conducted by *Truth Initiative* in 2015, it demonstrated that nearly 65% of electronic cigarette users reported using another tobacco products within the past 30 days of use, whether it was the classic cigarette or chewing tobacco. Users are picking up electronic cigarettes as substitutes to quit or refrain from using tobacco products but far often rebound to tobacco, as users find they cannot receive the same "kick." Evidence shows that electronic cigarettes do in fact help with the quitting or cutting down of tobacco products, but they do an even better job at encouraging non smokers to smoke! "Specifically, the researchers estimated that smoking e-cigs in 2014 led about 2,070 current smokers to quit the following year, but that 168,000 people ages 12 to 29 who'd never smoked before, to start smoking cigarettes and become daily users between the ages of 35 and 39." (Tonic) The increased consumption of electronic cigarettes by non smokers is still on the rise, especially on college campuses across the nation. E-cigarettes are highly responsible for a dramatic rise in new traditional cigarette smokers. Posted in the Journal of Psychosocial Nursing & Mental Health Services, the article *E-Cigarettes: A Rising Trend Among Youths,* used data determined by the Center for Disease Control and

Prevention (CDC) to determine this rise. Stated in the article, “especially troubling is that 76.3% of study participants admitted they had smoked conventional cigarettes as well, something they would not have done prior to using these electronic devices (CDC 2013a,b).” (Nancy R. Ahern, E-Cigarettes: A Rising Trend Among Youths)

A study conducted by Proceedings of National Academy of Sciences of the United States of America (PNAS) discovered DNA damage within mice when absorbing electronic cigarette smoke (ECS) delivering nicotine through its “smoke.” The DNA damage was founded within the mouse’s lung, bladder and heart. The researcher’s stated, “nicotine and its nitrosation product 4-(methylnitrosamine)-1-(3-pyridyl)-1-butanone can cause the same effects as ECS and enhance mutations and tumorigenic cell transformation in cultured human lung and bladder cells. These results indicate that nicotine nitrosation occurs in the lung, bladder, and heart, and that its products are further metabolized into DNA damaging agents.” (PNAS) Although e-cigs are still considered less addictive and not as harmful, they cause DNA damage and can ultimately cause death. The researchers state, “E-cigarettes are promoted as safe and have gained significant popularity. In this study, instead of detecting nitrosamines, we directly measured DNA damage induced by nitrosamines in different organs of E-cigarette smoke-exposed mice.” (PNAS)

Electronic cigarettes cause harm by not actually decreasing your chances of quitting, due to nicotine, but also an introduction to other chemicals absorbed, even if significantly lower compared to traditional cigarettes. An interesting study brought up focused on the chemicals absorbed by smoking an electronic cigarette. In a British Study funded by Cancer Research UK and published in the *Annals of Internal Medicine*

researchers compared traditional cigarette only users, former smokers with at least 6 or more months of not smoking, e-cigarette only or nicotine replacement therapy (NRT) users, and long-term traditional combustible cigarette and e-cigarette or traditional cigarette and NRT users. (Annals of Internal Medicine) The researchers found “that while nicotine levels were about the same in all groups, the amount of toxic chemicals and carcinogens that were detected were significantly lower in the vapers and the nicotine replacement folks. The smokers, not surprisingly, were still filled with toxic goo and tar and other carcinogens.” (Men’s Journal) In conclusion it was founded that “former smokers with long-term e-cigarette–only or NRT-only use may obtain roughly similar levels of nicotine compared with smokers of combustible cigarettes only” (Annals of Internal Medicine) This study demonstrated how users will substitute cigarettes for electronic cigarettes but still receive as much if not more nicotine, therefore keeping the user addicted.

In an article and study conducted by Dr. Maria Mironidou-Tzouveleki, and her two students Evanthia Tzitzi, and Panagiotis Tzitzis, they looked into the background and creation of electronic cigarettes. The article, *Electronic Cigarette (E-Cig) As a Way of Smoking Cessation: Benefits and Potential Harms*, asks the question of “are electronic cigarettes necessarily the safer option?” In order for the question to be answered, the researchers basically break apart an electronic cigarette (e-cig) and speak about the contents and design. The researchers spend time informing readers about the red LED light on the tip of the e-cig that simulates a burning cigarette tip, which at some point brings harm to the user. E-cigs also run off rechargeable batteries which are used to turn the e-liquid into a vapor. E-liquids are also the flavoring for the

e-cigs which contain nicotine and other traces of toxic and dangerous substances. The main part of the e-cig that seems the most unhealthiest and unsafest is the lithium battery. Cheap lithium batteries overheat and explode or catch on fire, which doesn't seem like an advantage to having one in your mouth. These batteries also require surplus amounts of water to be put out. In 2009, the Food and Drug Administration (FDA) took over and decided to set rules, regulations and standards for e-cigs. As stated in the article,

> The FDA classifies them in the category of pharmaceutical products as drug delivery devices. Therefore, they are regulated by the Food, Drug and Cosmetic Act (FDCA). This categorization changed by court decision in January 2010 when the Federal District Court Judge Richard J. Leon decided ENDs join the same rules relating to tobacco products unless placed on the market for proven therapeutic reasons and so regulated as drugs or devices. [42, 43] Currently, e-cigarettes that are marketed for therapeutic purposes are regulated by the FDA Center for Drug Evaluation and Research (FDA. (2012). [44] In April 2014 the FDA released a draft of the deeming rule. According to this the electronic cigarettes' manufacturers should:
>
> 1) Register in FDA and report components
>
> 2) Require childproof caps on ENDS liquids
>
> 3) include warning labels on products and their advertisements
>
> 4) Promote to the market only products that have been reviewed by the FDA and prohibit youth-oriented marketing and sales
>
> 5) Do not distribute free samples

6) Limit the sale of e-cigs strictly to adults (18 and older)

7) Prohibit the use of e-cigs in places where cigarette smoke is prohibited

Ultimately, the FDA regulates through factual knowledge and understanding, playing a role in the regulation and rules for electronic cigarettes should spark a view in users' eyes, yet they are still being bought and sales are dramatically increasing. The actual materials put together to build an electronic cigarette may be harmful to the end user by causing burns, unknown off-gassing toxins from materials possibly used to solder the wires to the battery, to the led, and to the charging port.

Chapter 4: Electronic Cigarettes as a Smoking Cessation

Ultimately, to consider if users will follow the behavioral or neoclassical theory path, we must look into how e-cigarettes can ultimately work as a form of cessation. In the same article previously referenced, *Electronic Cigarette (E-Cig) As a Way of Smoking Cessation: Benefits and Potential Harms,* demonstrates how users may benefit from electronic cigarettes. Through a study conducted, scientist and researchers were able to obtain a clear view of how electronic cigarettes can help in comparison to traditional tobacco cigarettes. Researchers stated, "the smoke of conventional tobacco cigarettes contains 40 known carcinogenic and 10,000 chemicals. Almost none of which has been found in more than small quantities in the liquids or in the vapor of electronic cigarettes." (Electronic Cigarette (E-Cig) As a Way of Smoking Cessation: Benefits and Potential Harms) This is a huge breakthrough as now users are getting a healthier alternative to make their final decision on. Through the same study, Dr. Michael Siegal, a Boston University professor and tobacco

researcher stated that “e-cig is much safer than the conventional and emits lower levels of harmful toxins with carcinogenic levels being 1000 times lower than in tobacco cigarettes.” (Electronic Cigarette (E-Cig) As a Way of Smoking Cessation: Benefits and Potential Harms) Dr. Siegal’s study also stated that a large number of participants (66%) within his study, reported smoking less traditional cigarettes. 48% of the participants also reported abstaining from smoking for a period of time. Dr. Siegal states “those respondents using e-cigarettes more than 20 times per day had a quit rate of 70.0%.” Electronic cigarettes work for the end user depending on what their goal is, a behavioral economical way of thinking. Users will decide to quit in the long run as long as they have a goal, such as overall health. Another survey conducted at Harvard University looked into how users react with electronic cigarettes when used for quitting purposes. The survey concluded,

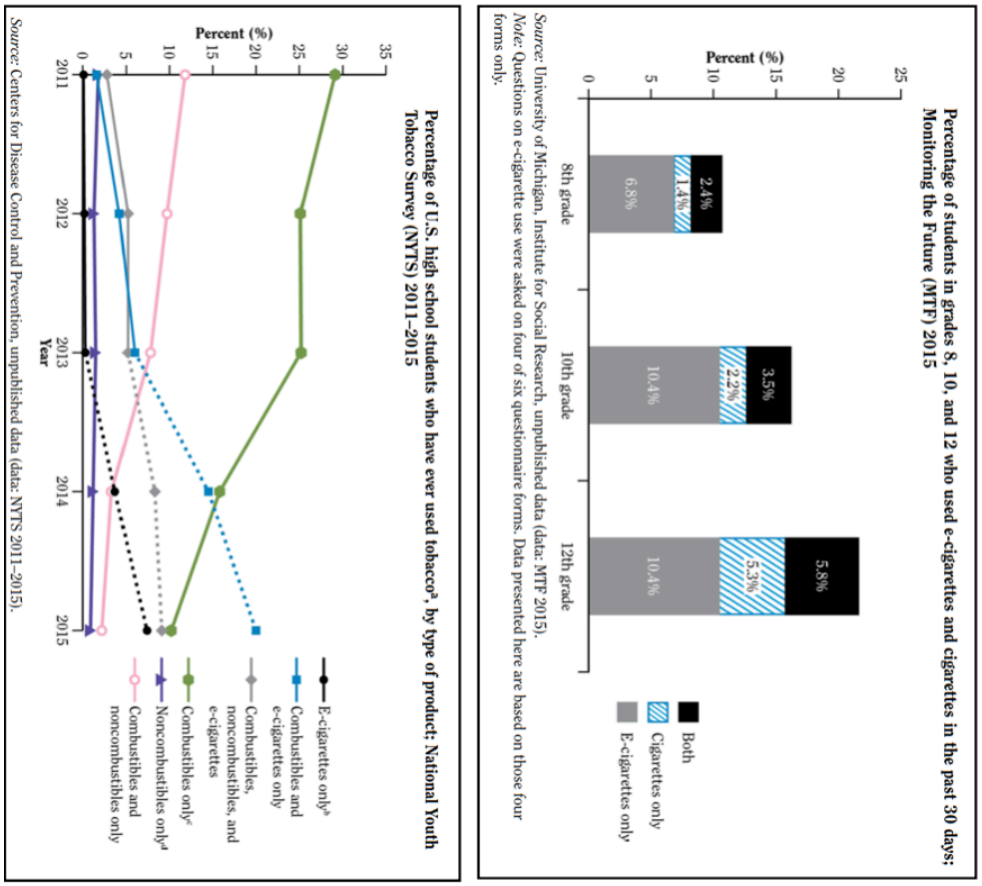
> e-cig helps quit smoking because ten puffs of e-cig reduce the craving for tobacco in 10 minutes in correlation with the same puffs of the conventional cigarette. Further, many vapers claim that by using lower nicotine concentrations over the time they plan to minimize the amount of nicotine and finally use free nicotine liquids. Some of them also described comfortably waiting for long periods without vaping, which they could not do when smoking. For example, when a smoker forgot his packet of cigarettes he felt anxious and needed to buy a new one. This does not happen with a vaper who had no trouble working all morning when he accidentally left his e-cig at home.

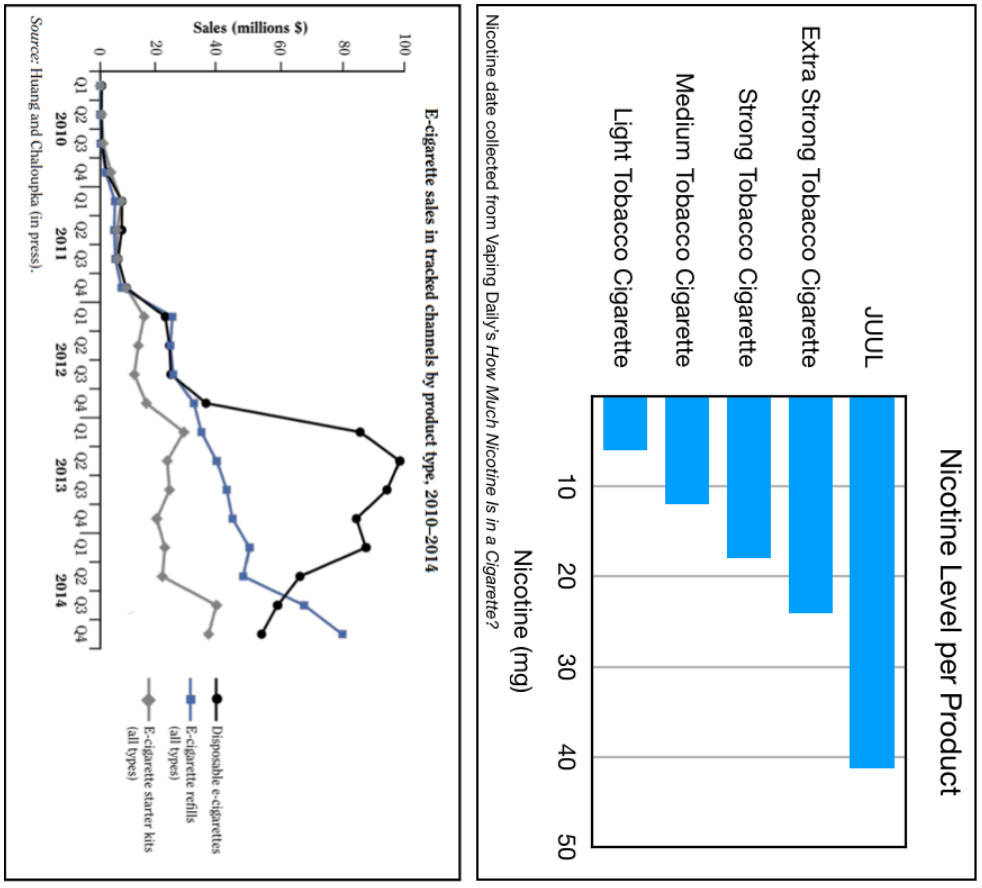
E-cigarettes again have proven to help users quit or reduce their nicotine intake, which furthermore results in a decreased desire for traditional tobacco cigarettes. Electronic

cigarettes as a form of smoking cessation have been shown to assist users who's end goal is to quit for their own personal reasoning.

CONCLUSION

To conclude, through research of studies, surveys and empirical data; electronic cigarettes as a valuable substitute can aide in the reduction or quitting of smoking traditional tobacco products. Although Californian laws SBX2 5 and SBX2 7 are ways that affect the users end decision, which defers users from being goal oriented, JUULs and other electronic cigarettes are proven to have assisted users in the reduction of traditional cigarette smoking. These two laws aren't beneficial to users under 21 years of age looking to quit, as the laws classify electronic cigarette as tobacco products and set an age restriction to purchasing. The removal of the SBX2 7, restricting sales to anyone under 21, could further assist young adults in quitting or reducing intake of tobacco products. Besides those two laws and FDA regulations, users will make a decisions based on which to smoke in the moment depending on what they believe is best for them. For example, if a user knows they want to quit smoking traditional tobacco cigarettes in the following months or years, users will then resort to electronic cigarettes or other comparable substitutes, knowing it will be beneficial to their goal. Although electronic cigarettes still include harmful chemicals, they still aren't as dangerous as traditional tobacco cigarettes and can assist in giving the end user the nicotine kick they are searching for. The smoker who shifts over to electronic cigarettes is not mindful of maximizing personal satisfaction, but instead of reaching the end goal of quitting, therefore resorting to a behavioral economists way of thought.


Percentage of students in grades 8, 10, and 12 who used e-cigarettes and cigarettes in the past 30 days: Monitoring the Future (MTF) 2015
Percent (%)
25
20
15
10
5
0
2.4%
1.4%
6.8%
3.5%
2.2%
10.4%
5.8%
5.3%
10.4%
8th grade
10th grade
12th grade
Both
Cigarettes only
E-cigarettes only
Source: University of Michigan, Institute for Social Research, unpublished data (data: MTF 2015).
Note: Questions on e-cigarette use were asked on four of six questionnaire forms. Data presented here are based on those four forms only.


Nicotine Level per Product
JUUL
Extra Strong Tobacco Cigarette
Strong Tobacco Cigarette
Medium Tobacco Cigarette
Light Tobacco Cigarette
10
20
30
40
50
Nicotine (mg)
Nicotine date collected from Vaping Daily's How Much Nicotine Is in a Cigarette?

Percentage of U.S. high school students who have ever used tobacco[a], by type of product: National Youth Tobacco Survey (NYTS) 2011–2015
Percent (%)
35
30
25
20
15
10
5
0
2011
2012
2013
2014
2015
Year
E-cigarettes only[b]
Combustibles and e-cigarettes only
Combustibles, noncombustibles, and e-cigarettes
Combustibles only[c]
Noncombustibles only[d]
Combustibles and noncombustibles only
Source: Centers for Disease Control and Prevention, unpublished data (data: NYTS 2011–2015).

E-cigarette sales in tracked channels by product type, 2010–2014
Sales (millions $)
100
80
60
40
20
0
Q1 Q2 Q3 Q4
2010
2011
2012
2013
2014
Disposable e-cigarettes
E-cigarette refills (all types)
E-cigarette starter kits (all types)
Source: Huang and Chaloupka (in press).

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