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The Intersection of an Epidemic and Pandemic: Smoking, Risk-Taking, and COVID-19

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The Intersection of an Epidemic and Pandemic: Smoking, Risk-Taking, and COVID-19

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OMS 405 B: Irrational Behavior

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I affirm that I have upheld the highest principles of honesty and integrity in my academic work and have not witnessed a violation of the Honor Code.

Abstract

Electronic cigarette use has risen drastically in recent years among teens and young adults. Rates of conventional cigarette use have decreased, while rates of electronic cigarette use are on the rise. Knowledge and perceptions of the risks and benefits of conventional and electronic cigarettes greatly impacts adolescents and young adults' decisions to use these products. Published literature explores the issues of social norms, intertemporal choice, present bias, prospect theory, and hyperbolic discounting as means to explain the way in which young populations perceive risk and risky behavior. Research suggests that children and young adults believe that e-cigarettes are safer, less addictive, less risky, and more socially acceptable than conventional cigarettes. In addition to these findings, this study found that smokers are more likely to engage in risky behavior in general, and throughout the coronavirus pandemic. According to the World Health Organization, individuals who smoke are more likely to experience complications once contracting the coronavirus disease. This study calls for the need to educate frequent smokers, of both electronic and conventional cigarettes, about their individual risk factors in light of the recent pandemic.

Introduction

The recent rise of electronic cigarette (e-cigarette) use among teens and young adults has sparked an epidemic of nicotine addiction in the United States and around the world. The World Health Organization (WHO) states that this epidemic is an "evolving frontier filled with promise and threat for tobacco control (Halabi, 2010)." E-cigarettes were developed with the intention to help wean people off of conventional cigarettes, however we have seen a drastic spike in youth and young adult users in recent years. In 2018, experts estimated that about 4% of adults, 16% of high school students, and between 11 and 25% of college students were using electronic cigarettes (Trumbo, 2018).

Public health experts predict that electronic cigarette use might achieve popularity as high as that of the conventional cigarette in the 1960s, before an awareness of harm became widespread throughout the population (Pisinger, 2014). In 2016, the United States Surgeon General published a report that concluded e-cigarette use among youth and young adults is becoming a major public health concern in the United States of America (Polosa et al., 2017). According to the US National Academies of Science, Engineering and Medicine, there is conclusive evidence that besides nicotine, most e-cigarette products currently on the market emit numerous chemicals that are potentially toxic (The National Academies of Sciences, Engineering, and Medicine, 2018). Electronic cigarette use is a current public health concern, as it has recently been seen in the news as linked to various outbreaks of lung injury and deaths among teens and young adults (National Center for Chronic Disease Prevention and Health Promotion).

Health decision making has become a fundamental part of everyday life. College aged students make decisions frequently in regard to drugs, alcohol, and smoking products. Between

2004 and 2005, the prevalence of conventional cigarette users in the United States declined significantly. This decrease was greatest among young adults aged between 18 and 24 years. Since 2007, the year e-cigarettes hit the market, the use of electronic cigarettes has continued to climb, and the numbers are most clearly seen in youth and young adult populations (Ert et al., 2013). A large body of electronic cigarette and conventional cigarette literature explores reasons for which youth and young adults participate in this behavior. This review provides insight into decision making biases, social norms, marketing, and policies which may be influencing the health behaviors of both youth and young adults.

Electronic Cigarettes

Electronic cigarettes (e-cigarettes) are devices that vaporize a nicotine solution combined with liquid flavors, rather than burning tobacco leaves like conventional cigarettes (Rom et al., 2015). The device produces an aerosol by heating the liquid nicotine solution, which is then inhaled or "vaped" by the user through a mouthpiece. The rapidity of the creation of the aerosol, combined with a method of use that is the same for conventional cigarettes (oral inhalation) results in an experience for the user similar to that of conventional cigarettes. Compared to other forms of nicotine replacement therapy that have been approved by the U.S. Food and Drug Administration (FDA), electronic cigarettes have become extremely popular (Dinakar & O'Connor, 2016). Although aggressively advertised as an alternative to conventional cigarettes, research suggests that electronic cigarettes may be no safer or effective in decreasing individual conventional cigarette use. Bullen et al. tested the effectiveness of e-cigarettes for quitting smoking by randomly assigning conventional cigarette smokers to use e-cigarettes or the nicotine patch, a nicotine replacement method currently approved by the FDA. The study found no statistically significant difference in the tendency to quit smoking among the two randomized

groups at six months (Bullen et al., 2013). Other studies of similar design have found the same results. In summary, although e-cigarettes are advertised as a means to quit smoking, current research does not support that idea.

Since their emergence in 2004, electronic cigarettes have become widely available, and their use has increased exponentially worldwide. E-cigarettes are aggressively advertised as a healthier, cheaper, and more socially acceptable alternative to conventional cigarettes (Rom et al., 2015). The current research on electronic cigarettes is characterized by several methodological issues including; severe conflicts of interest, relatively few and often small studies, inconsistencies and contradictions in results, and a lack of long-term follow up (Pisinger, 2014). However, a strong consensus across the current research and epidemiologic data indicates that e-cigarette use is growing among minors and young adults (Dinakar & O'Connor, 2016).

A study conducted by McMillen et al. used surveys to obtain a representative, cross sectional sample of US adults over a period of four years from 2010-2013. The study found that there was a rapid growth in ever and current e-cigarette use over the four years of the study. Most notably, the study found that almost one-third of current users are people who never used conventional cigarettes (McMillen et al., 2015). A consumer-based mail study between 2009 and 2010 found that during the study awareness of e-cigarettes doubled, and ever use more than quadrupled from 0.6% to 2.7% (Regan et al., 2013). Furthermore, a web-based study conducted between 2010 and 2011 of United States adults also found increasing trends of awareness and ever-use of e-cigarettes among the study sample (King et al., 2013). Collectively, these studies help to stress the point that prevalence and use has risen so sharply in the United States, specifically among young adults who have never smoked conventional cigarettes before.

The intensive marketing, novelty, and candy-like flavors of the various brands of e-cigarettes appeal to adolescents and young adults all over the world. Of high concern to public health officials is the vast number of young people who have never smoked before who are experimenting with e-cigarettes due to catchy marketing. More specifically, this increase in consumption might undermine the decades of efforts to de-normalize conventional cigarette smoking (Pisinger, 2014). A recent study in Poland found that almost one-third of adolescents are current users of electronic cigarettes, and more than one-fifth are dual users of conventional cigarettes and e-cigarettes. The high reason of concern is due to the spike in use from 24% to 38% in a period of only three years, indicating a renormalization of smoking (Goniewicz et al., 2014). As seen in Poland, the theme of the renormalization of smoking is also occurring in the United States among youth and young adults.

Social Norms and Electronic Cigarettes

Electronic cigarettes entered the United States market in 2007. The affordability, availability, and marketing of these products has drastically increased in recent years. Although federal law has prohibited tobacco advertisements on television and radio since 1972, these venues are now home to advertisements for electronic cigarettes (McMillen et al., 2015). In general, e-cigarettes have faced few marketing restrictions since becoming widely available to the public. Experts believe that restricting marketing could play a substantial role in reducing youth and young adult use. Further, including electronic cigarettes in smoke free laws could reduce opportunities for youth to use e-cigarettes or be exposed to others using these dangerous devices. Reducing youth and young adult use of e-cigarettes is no easy feat. As we see in the current research, social norms play a strong and crucial role across all demographic groups when it comes to making decisions regarding e-cigarette use.

Injunctive norms capture people's beliefs about what others think ought to be done, whereas descriptive norms are perceptions of actual behavior within a specific social group. Social norm theory posits that injunctive and descriptive norms influence behavior in different ways. More specifically, injunctive norms should mediate the effects of descriptive norms on behavior (Lapinski & Rimal, 2005). Numerous cross-sectional studies suggest that more favorable social norms, whether injunctive or descriptive, are associated with both e-cigarette and conventional cigarette use. A study among US college students found that those who use conventional cigarettes and e-cigarettes reported greater social acceptability for e-cigarettes compared to students who do not use either of the products (Noland et al., 2016). Another study found that US high school students who reported to have more family and friends who use e-cigarettes were also more likely to have ever used the products. Further, having a higher percentage of friends who use e-cigarettes was associated with greater frequency of e-cigarette use and dependence (Gorukanti et al., 2017). These studies aid in supporting the ideas of social groups and how they often times can lead to greater social acceptability and use of electronic cigarettes.

In essence, social norms have two basic parts: perceived prevalence and perceived acceptability. Due to objectively measured group prevalence, certain e-cigarette use behaviors may not actually be common or acceptable, despite the strong beliefs of popularity. As a result, this overestimation of peers use strongly predicts a person's own susceptibility and/or use. For both electronic and conventional cigarettes, overestimation is strongly associated with curiosity, susceptibility, ever use, and current use of these products. This overestimation of one's peer's e-cigarette use is also associated with e-cigarette smoking curiosity and susceptibility, which are the early markers of renormalization and social acceptance (Agaku et al., 2019).

Trumbo (2018) argues that the hallmark of the reduction in tobacco use has been the shift in social norms concerning smoking in public. Electronic cigarette use in public spaces can expose bystanders to harmful and potentially harmful chemicals, complicate smoke-free policy enforcement, and may renormalize tobacco use (US Department of Health and Human Services, 2016). As of 2020, only nine US states prohibit e-cigarette use in workplaces, restaurants, and bars (Centers for Disease Control and Prevention, 2018). A 2014 study revealed that majority (59.5%) of US adults who currently smoke e-cigarettes had used their devices in a designated smoke-free public environment. Further, only 2.5% of those individuals reported receiving negative reactions from other people present, suggesting social acceptance or confusion about what tobacco products are covered under existing smoke free laws (Shi et al., 2017). Another study conducted in 2017 found that 52.5% of US adult e-cigarette users reported recent use in an area which they were not actually allowed to smoke in. Places of which include airports, movie theatres, and grocery stores (Agaku et al., 2020). Although a slight decrease in the numbers found in the 2014 study, both studies show a significant number of adults who are using their electronic cigarette devices in places they should not be. As a result, the normalizing of e-cigarette use in public areas could help to explain the rise in use among teens and young adults.

Trumbo (2018) poses the theory that norms drive views on the acceptability of public electronic cigarette use. These studies found similar results of the studies mentioned above, however these study samples are young adults and adolescents. Trumbo's study methods included an online survey of undergraduate students at a Western university. The results found that "cognitive assessment of e-cigarette risk and perception of addictiveness had a suppressing effect on perceived acceptability of public vaping, while greater exposure to social cues exerted a countervailing effect (2018)". Another study, The National Youth Tobacco Survey (NYTS), a

nationally representative school-based survey of US students in grades six to twelve found that exposure in public places was associated with lower perceived risks (Agaku et al., 2020). In conclusion, this change in social norms has led youth and young adults to believe that smoking electronic cigarettes is more socially acceptable than smoking conventional cigarettes. As a result, we see a trend in the renormalization of smoking due to these biases which are present in decision making of individuals based on changing social norms.

Health Policy and Health Decision Making

Examination of the health consequences of electronic cigarettes include potential effects on the body, as well as those on cognitive processes and the socioecological environment that influence risky behavior (US Department of Health and Human Services, 2016). Perception of harm can be influenced by many factors, for example the social norms in your environment. In other cases, a person's perception of harm may be influenced by the presence or absence of policies designed to limit e-cigarette or tobacco product exposure. These absent public health protections may discount certain risks, especially if exposure is in public areas (Agaku et al., 2020). A theme of the lack of intervention of officials in weaved throughout the literature. More than 8 out of 10 current youth users use flavored e-cigarettes. Common flavors include different fruit, mint, candy, and menthol. According to a 2013-2014 survey, 81 percent of current youth e-cigarette users cited the availability of appealing flavors as the primary reason for use (The Food and Drug Administration). In September of 2019, news that the government would ban flavored e-cigarettes was circulating. However, no legislation was ever passed. Using this case as an example, it is clear that the absence of clear public health policy and guidance can contribute to lower perceptions of harm among teens and young adults.

The marketing of these products can greater alter perceptions held by teens and young adults. A study completed by Biener and Albers (2004) examined young adults smoking patterns and receptivity to cigarette advertising to asses vulnerability to tobacco marketing strategies. A telephone survey of 12,072 adults in Massachusetts found that older adults were more receptive to cigarette marketing. However, more research is needed here because young adult smokers are often experiencing transition in their lives and are vulnerable targets to marketing of this kind in the near future. Biener and Albers urge for intervention, stating that "if unimpeded by regulation, tobacco promotion in bars and clubs is likely to lead to increased adult smoking prevalence." In each of the articles cited above, researchers are urging for public health interventions from governments and organizations to help diminish the re-normalization of smoking in our global society.

Intertemporal Choice, Present Bias and Hyperbolic Discounting

Intertemporal choices are decisions with consequences that play out over time. These choices range from basic decisions, such as how much food to eat in a meal, to life changing decisions about education, marriage, fertility, health behaviors, and savings. Time discounting is one of the most frequently studied aspects of intertemporal choice. Time discounting results from the interaction of two systems. The first of which is capable of anticipating and caring about the distant future, and the second is more oriented toward the present (Berns et al., 2007). In regard to smoking, it is established that smoking is harmful – so why do people do it? It could be a change in social norms as mentioned above. However, an explanation originating in behavioral economics suggests a role for time-discounting, which in this case describes how the value of a reward, such as better health, decreases with delay to its recipient. A systematic review of current literature of time-discounting and smoking found consistent evidence that high time-discounting

is a risk factor for smoking and unsuccessful cessation (Barlow et al., 2013). As a result, a potential reason for why people smoke is that they devalue, or "discount" future rewards.

Hyperbolic discounting models have been designed to capture time inconsistencies and have been applied in numerous contexts, including smoking and addiction. Under present bias, individuals exhibit a high discount rate in the short run, but a relatively low discount rate in the long run (Barlow et al., 2013). In other words, this is the tendency to settle for a rather smaller present reward, than to wait for a larger reward in the future. In terms of smoking electronic cigarettes, many teenagers and young adults value the immediate reward of a flavored, cool-looking smoke, while putting less worth into the long-term health consequences that may result from smoking (Wang & Sloan, 2018). A significant gap in the literature of electronic cigarettes is the long-term health effects. Doctors and public health experts know a significant amount about nicotine; however, the CDC is working tirelessly to determine the effects of the other chemicals on the human body.

The Effect of Rare Events in Risky Choice and Prospect Theory

Many teenagers and young adults would argue that the instances such as lung failure and death from electronic cigarettes in the news are simply rare cases, and probably would never happen to themselves. When teenagers and young adults are given information regarding the harms of electronic cigarettes, they have the ability to make decisions from the given description. When teenagers are not given this information, or find it themselves say on the CDC website, they tend to make decisions based on their own experiences. As described by the prospect theory, people make decisions from description and given information as if they overweight the probability of rare events. On the contrary, when people make decisions from experience, they underweight the probability of rare events, and rely on anecdotal evidence to reach their

conclusions (Hertwig et al., 2004). When teenagers and young adults read about death from electronic cigarettes in the news, they may not have the descriptive information on why it occurred, and thus will rely on experience to determine that it was a rare case and the same event will not happen to themselves. The recency effect further exemplifies this point, stating that when making decisions from experience, respondents must update their impression of the options attractiveness by coupling newly sampled outcomes with their knowledge from previous draws. This updating process can bring about a recency effect. In summary, this means that judgements in which recently sampled outcomes receive greater weights than previously samples ones (Hertwig et al., 2004).

In the last few years, the medical community has encountered increasing episodes of burn injuries from e-cigarette battery explosions. A BBC article illustrates the story of Tallmadge D'Elia, a man who died at his home in Florida when his electronic cigarette device blew up and projected fragments into his skull. Doctors say that he suffered burns on over 80% of his body (Ives, 2018). Due to the relatively new instances of serious and deadly injuries from electronic cigarettes, there is a gap in the literature on how rare events influence perceptions of risk and harms. It is extremely important that youth and young adults do not make decisions on e-cigarettes and other issues simply from experience. Reliance on small samples of experience not only plays a key role in making decisions, but subsequentially contributes to the perception that the world is less variable than it actually is. Similarly, underestimating the variance of a population is equivalent to underweighting a rare event. As we will see in the next section, how people receive and interpret health information plays a key role in their perceptions of risks, harms, and addictiveness of electronic cigarettes.

Smokers Decision Making; Perceptions of Risks, Harms, and Addictiveness

Recent research has shown a notable consensus that adolescents believe e-cigarettes are safer and less addictive than conventional cigarettes. A study conducted in the spring of 2013 included a sample size of 10,000 students from two universities in the Southeastern United States. Researchers collected data on the student's perceptions of health risks, addictiveness, and social acceptability of cigarettes and electronic cigarettes. Across all demographic groups, students perceived electronic cigarettes to be safer, and less addictive than conventional cigarettes (Berg et al., 2015). Another study completed in 2017 found that adolescents are aware of some of the risks of e-cigarettes, although many harbor misinterpretations and hold more favorable attitudes towards e-cigarettes, than conventional cigarettes (Gorukanti et al., 2017). The findings of Cooper et al. are similar to that of the other two studies, however they add to this body of literature by concluding "perceptions of harms and addictiveness were lower among exclusive and dual users, compared to non-users (Cooper et al., 2017)." These studies help to show that across all demographic groups, young adults and adolescents believe that electronic cigarettes are safer and less risky to use than conventional cigarettes.

Perceived risk and harm are central constructs in most theories of health behavior. Health behavior theories agree that a high perceived risk of harm should encourage people to take action to reduce their risk. Tests of the relationship between personal risk perception and risk behavior can address any of three distinct hypotheses. Brewer (2004) refers to them as an accuracy hypothesis, the behavior motivation hypothesis, and the risk reappraisal hypothesis. The accuracy hypothesis asserts that perceptions of risk at any given time properly reflect one's risk behaviors and others risk factors at that time. Further, the accuracy hypothesis is a descriptive statement about the relationship between risk perceptions and behavior that do not imply any

causal connection between the two agents. The behavior motivation hypothesis describes the effect of perceptions of risk on changes in behavior. This hypothesis is about the cause, the perceived personal risk, and the effect, the change in behavior thought to affect risk. Lastly, the risk reappraisal hypothesis describes the effects of changes in behavior on changes in perceived risk. This hypothesis states that if an action is believed to reduce risk, people who take that action will lower their personal risk perceptions (Brewer et al., 2004).

Given the clear negative consequences of smoking, the number of smokers around the world is quite puzzling. Researchers and scholars have searched for potential traits which are associated with smoking, hoping to better understand why a person chooses to do so. There is some evidence to support that smokers are aware of the risks; however, experts believe that people do not accurately interpret them. These findings suggest that smokers are often risk insensitive. Many studies have indicated that compared to non-smokers, smokers are more likely to participate in a variety of risky behaviors. For example, smokers tend to be more involved in traffic accidents, are less likely to wear seatbelts, and more likely to engage in risky sexual behavior (Ert et al., 2013). Other areas of research have focused on personality traits and smoking. Various studies have shown that smoking is associated with impulsivity, psychoticism, defensive optimism, and sensation seeking. Some studies have found that smokers tend to exhibit poorer self-control than non-smokers (McKenna et al., 1993). Personality traits have the potential to explain some of the reasons for the rise in youth and young adult e-cigarette use.

In conclusion, various factors may contribute to why an individual choses to engage in the risky behavior of smoking. Whether that be social norms, health policy, marketing, or personality traits, in light of the recent COVID-19 pandemic, understanding this issue is of high importance for public health experts.

COVID 19, Smoking, and Risk Taking

The present study explores the relationship between the frequency of smoking, both electronic and conventional cigarettes, and a person's engagement in risky behavior. In summarizing the findings from the literature review above, here is what we know: rates of conventional cigarette use have decreased, while rates of electronic cigarette use are on the rise; people believe that electronic cigarettes are safer, less addictive, less risky, and more socially acceptable than conventional cigarettes; and smokers, compared to non-smokers, are more likely to participate in a variety of risky behaviors.

COVID-19 (or Coronavirus) is an infectious disease that primarily attacks the lungs. Smoking, whether it be conventional or electronic cigarettes, impairs lung function and makes it hard for the body to fight off not only the coronavirus, but other diseases as well. Tobacco, a product found in conventional cigarettes, is a major risk factor for noncommunicable diseases like cardiovascular disease, cancer, respiratory disease, and diabetes, which put people with these conditions at higher risk for developing severe illness when affected by COVID-19. A review of studies by public health experts convened by the World Health Organization on 29 April 2020 found that smokers are more likely to develop severe disease with COVID-19, compared to non-smokers (World Health Organization, 2020). To conclude, there is strong evidence to suggest that smoking behaviors impact the way in which an individual responds to infection by COVID-19.

Research Question and Hypotheses

The research question stands as follows; are frequent smokers more likely to engage in risky behavior? Based on previous findings stated in the literature review above, I predict that as a person's frequency of smoking increases, so will their general propensity to take risk, as well

as their engagement in risky behavior associated with the coronavirus pandemic. The key implication of this research study is that if it is in fact true that frequent smokers are more likely to engage in risky behavior, such as going to a bar with friends, we know that they are also more likely to develop complications from the coronavirus disease. Whether frequent smokers feel that they are high risk for coronavirus complications will also be addressed in the administered survey. The purpose of this study is to fill the recent gap in the coronavirus pandemic literature between smoking and risk taking, specifically in regard to behaviors that are deemed risky in a pandemic.

Methods

Through a survey administered electronically to 200 young adults, I analyzed smoking habits and risk-taking behaviors to determine if a significant relationship exists between the two. All participants received the same survey, via Google forms, then the data was extracted into a Google sheet, then converted to excel and SPSS format. All participants in the study sample were young adults ranging from 18 to 25 years old. A question in the demographic section of the survey asked participants their age, and if they did not fall into the age range stated above, their responses were removed from further analysis. I chose to focus on the young adult population for this study because of the way in which this age group is so heavily present in electronic cigarette research. Further research could be done in the future to assess variations between different age groups.

Using convivence sampling, I sent the survey electronically to friends, family, classmates, college sports teams, and anyone else I believed would be likely to fall in the young adult age range. Then, snowball sampling took effect as the concluding message of the electronic survey asks the respondent to send the survey link to people who may be interested in

completing the survey. Only 10 survey responses did not fall into the 18-25 age range, therefore this sampling method proved to be effective for the purpose of the study. The first section of the survey provided a detailed informed consent statement, assuring the participants that their results are anonymous and will only be used for research purposes. Secondly, participants received my email and were told to reach out with any questions regarding the survey.

The administered survey consists of seven sections. The first and second sections ask participants about smoking habits and behaviors, for both electronic cigarettes and conventional cigarettes. These sections of the survey were adapted from the National Youth Tobacco Survey (NYTS). The NYTS is administered every year to middle and high-school aged students, to test their tobacco related beliefs, attitudes, behaviors and exposure to pro- and anti-tobacco influences. Questions selected from the NYTS for this research included frequency of smoking, reasons for smoking, as well as other questions to gauge health behaviors and attitudes.

The third section of the survey provides participants with three different groups of activities and asks them to check off all of those they have done since the start of the current pandemic, March 2020. The first section of activities are considered “low risk,” the second are “moderate risk,” and the third are “high risk” activities to complete, according to the Centers for Disease Control and Prevention. Participants were not aware of the level of risk associated with each of the sections, they were simply asked to check off all of the activities for which they have done. Low risk activities include grocery shopping and camping, while high risk activities include going to a movie theatre and spending frequent time around friends and family without a mask on. Participants were assigned a score based on one point for each low risk activity, two points for each moderate risk activity, and three for each high-risk activity. I developed this score

myself, and it has never been used in research before, therefore the General Risk Propensity Scale (GRiPS) was also used to gauge risk taking behaviors.

Section five of the survey uses the General Risk Propensity Scale (GRiPS) to assess domain-general risk propensity using short items written in simple language (Zhang, 2019). Participants were asked to what extent they agree with various items including "I would take a risk even if it meant I might get hurt" using a five-point Likert scale. Participants were then calculated a score, which represents their general propensity to take risk. In combination both the COVID behavior scale, and the general risk propensity scale, were used in the data analysis. Both scales were both be used to test the hypothesis of whether or not smokers, compared to non-smokers, are more prone to risky behavior. Participants scores on both scales were compared with their self-reported score of how many days in the last 30, they smoked electronic or conventional cigarettes.

Sections six and seven include basic questions to close out the survey. Participants answered questions regarding demographic variables such as gender, age, and race. Gender and age are crucial in this analysis, as past literature suggests men, compared to women, are more likely to take risks. Lastly, participants completed coronavirus related questions. The questions include if they have received a positive test for coronavirus, or if they feel that they are at high risk of experiencing complications if they were to contract the disease.

Results

Demographics

After accepting responses for one week in November of 2020, the survey collected a total of 210 Reponses. Ten were excluded in the final analysis because they did not fit the age requirement for inclusion. Of the 200 young adults aged between 18 and 25, 80% identified as

female, and 20% identified as male. Majority of the study sample selected their education level as “currently enrolled in college” or “graduated from college.” Nearly 60% of participants were age 21 or 22 at the time of completing the survey. Lastly, 95.3% of the study sample selected white as their race for which they identify.

Smoking Habits

Of the study sample, 77.6% of participants have ever tried an electronic cigarette, while only 53.7% have ever tried a conventional cigarette. Although this survey item does not tell us the frequency for which a person smokes, because it only asked if they have tried even one or two puffs of these products, it is still a good indicator that this demographic is experimenting with electronic cigarettes, much more than conventional cigarettes. Furthermore, of the participants who have tried these products, about 2/3 of each group (electronic cigarettes user and conventional cigarette users) were exposed to these products for the first time at 18 years or younger. Although the study sample does not include teenagers, consistent with the research we know that people are using these products for the first time at a very young age. A small percentage of the study sample are considered to be frequent users of these products. Only 1.5% of the study sample are frequent conventional cigarette users, while 21.4% of the study sample are considered to be frequent electronic cigarette users.

As stated in the literature review, electronic cigarettes are aggressively advertised as a means to quit smoking conventional cigarettes. When participants were to check off all the reasons for which they use electronic cigarettes, only 3.3% of the study sample selected the option which stated to quit conventional cigarettes. Other answers commonly picked by participants included flavors (21%), a friend or family member used them (48%), curious about

them (32%), peer pressured into using (13%), and they are less harmful than other products (14%).

Smoking and Risk Taking

Each individual's frequency of smoking was determined by the number between 0-30 for which they self-reported smoking electronic cigarettes and conventional cigarettes in the 30 days before completing the survey. To clarify participants were asked in the last 30 days on how many did they smoke electronic cigarettes, then a separate question asking on how many of the last 30 days did they smoke conventional cigarettes. In testing the correlation between frequency of smoking electronic cigarettes and the general risk propensity scale, I found a moderate positive correlation ($r = 0.352$, $p < 0.001$). When testing the correlation between frequency of smoking conventional cigarettes and the general risk propensity scale, the results showed a weak to moderate positive correlation ($r = 0.295$, $p < 0.001$).

After calculating each individuals score for the COVID activity scale, their number were run in a correlation test with the number of days for which they smoked electronic and conventional cigarettes in the past 30 days before completing the survey. Frequency of smoking electronic cigarettes posted a weak to moderate correlation ($r = 0.233$, $p < 0.001$) with the COVID activity scale. Frequency of smoking conventional cigarettes also resulted in a weak to moderate correlation ($r = 0.231$, $p < 0.001$) with the COVID activity scale.

COVID-19, Risk Taking, and Smoking

Of the sample, 1.5% were considered to be frequent users of conventional cigarettes. Of these frequent users, none of them considered themselves to be high risk for complications surrounding the coronavirus. On the other hand, 21.4% of the study sample are considered to be frequent electronic cigarette users. Less than 5% of these individuals identified themselves to be

high risk for coronavirus complications. An interesting finding is that of the study sample, 20.9% of individuals either tested positive for the coronavirus, or did not test positive but believe they had the virus at some point.

In conclusion, the results do support the hypothesis that frequent smokers are more likely to engage in risky behavior. In other words, as a person's frequency of smoking rises, so does their general propensity to take risk, as well as their engagement in risky activities during the coronavirus pandemic.

Discussion

Young adults frequently make many decisions that play out over time. Some of these include major life plans, such as where to attend college, and others are quick decisions that may impact their health. Whether it be in regard to drugs, alcohol, or smoking products, public health officials are always interested in this population because of the pivotal time in their lives young adults are situated in. Between the ages of 18 to 25, young adults make decisions that can greatly impact themselves later in life. As society as a whole, and social norms change, health behaviors also change over time in regard to smoking. Confirming previous research, this study found that conventional cigarette use has declined, while electronic cigarette use is on the rise (Ert et al., 2013).

Previous published literature related to the health behaviors and smoking closely align with the results in this study. Similar to past studies, we found that most people are not using electronic cigarettes as an alternative to conventional cigarettes. Very few people in this study cited use of electronic cigarettes as an alternative to conventional cigarettes. Trumbo (2018) found that about 25% of college students were using electronic cigarettes. The present study

found that the number of young adults who are using electronic cigarettes has only risen, and we know that the greatest increase is in those who have never smoked a conventional cigarette.

This rise in electronic cigarette use is of high concern because it indicates a renormalization of smoking, one that could lead to devasting public health outcomes. Past studies have looked at the role of social groups in youth and young adult smoking habits. One study in particular found that having a higher percentage of friends who use electronic cigarettes was associated with greater frequency of electronic cigarette use and dependance (Gorukanti et al., 2017). When asked reasons for using electronic cigarettes, 45% of study participants stated that a friend or family member used them. This reason was the most commonly chosen item on the list of options, and it shows the strong presence social norms and groups can have on an individual's health behaviors. Further, although electronic cigarettes are perceived unsafe by professionals, group prevalence might aid in supporting the idea that they are safe among young adults. In regard to smoking in public, we also know that youth and young adults who are frequently exposed to smoking in public places, perceive it to be less risky (Agaku et al., 2020). Other reasons commonly cited for electronic cigarette use in past studies are the flavors of the aerosol (Food and Drug Administration). This study found that 21% of users cited the flavoring of the products for reason of use. These results confirm the need for intervention to be aimed at the flavoring and marketing of these products if we want to see the prevalence of electronic cigarettes smokers decrease among young people.

Perceived risk and harm are central constructs in most theories of health behavior. Health behavior theories agree that a high perceived risk of harm should encourage people to take action to reduce their risk. This study found that smokers generally do not have a high perception of harm, and through the coronavirus pandemic they are also not taking action to reduce their risk.

The results of this study suggest a moderate positive correlation between smoking and risk-taking behaviors. As noted in past research, smokers are more likely to be involved in traffic accidents, less likely to wear seat belts, and more likely to engage in risky sexual behavior (Ert et al., 2013). The present study shows that smokers are more likely to go to bars or spend time with friends and family without masks, more often than non-smokers. Although personality traits were not explored in this study, past research shows that smokers tend to exhibit poorer self-control than non-smokers, which could contribute to smokers being more likely to engage in risky behavior during lock down periods of the pandemic (McKenna et al., 1993).

The World Health Organization has recently published a report that suggests that smokers are more likely to develop severe disease with COVID-19, compared to non-smokers. Our study results found that no frequent conventional cigarette smokers, and less than five percent of frequent e-cigarette smokers, perceived themselves to be at high risk of COVID-19 complications. This is of high concern because smokers should be aware of their risk factors during the current pandemic. Smoking, whether it be electronic or conventional cigarettes, can damage your lungs, and frequent users of the products should avoid participating in behaviors which will put them at a higher risk of developing complications. In conclusion, these results suggest that smokers and more likely to take risks, and intervention must be directed toward this large population of individuals to increase their awareness of their own personal risk factors during this time.

Limitations

The demographics of this study are far from representative of the entire population of young adults. Nearly all of the study participants are female, enrolled in or graduated college, and white. Although the results do align with previous studies, in order to generalize these results

to the entire population we would need a more representative sample. Secondly, people may be unwilling to be honest about their smoking habits due to cognitive dissonance. When asked in the last 30 days the participant smoked, they may not want to admit that they smoked every day or close to that number. Therefore, participants could have lowered their number which could have inhibited the study results. As in any self-reported survey, these problems are inevitable although participants were aware that the survey was anonymous. Lastly, the study sample included few frequent conventional cigarette smokers. Although it could hold true that this population does not have many cigarette smokers, a greater number of conventional cigarette smokers could have helped to strengthen the results.

Future Research

Future research on this topic is worth exploring. The literature review analyzed research on the impact rare events have on risky behavior. A more in-depth survey would be used to capture perceptions specifically about COVID-19, beyond simply if the participants feel that they are at high risk. It would be helpful to know why, or why not, frequent smokers feel they are at high risk of complications. Furthermore, exploring social norms and the coronavirus pandemic could help to explain past research findings. It would worthwhile to know why people chose to participate in behavior that is deemed risky by The Centers for Disease Control and Prevention during a pandemic.

Conclusion

As Popova and Ling (2013) note, conventional cigarette smoking rates decreased in the United States due to health concerns, regulatory burden, and the denormalization of smoking behaviors. With the introduction of electronic cigarettes to the market, we have seen a rise in health concerns, a lack of intervention by organizations, and the re-normalization of smoking.

Research suggests that children and young adults believe that e-cigarettes are safer, less addictive, less risky, and more socially acceptable than conventional cigarettes. Although the long-term health effects are still unknown, a large body of literature supports the idea that these significant changes in perceptions and norms of electronic cigarette use could lead to an even greater public health crises in just a few years. Now, in the middle of the coronavirus pandemic, it is even more important than ever to understand perceptions of risk among smokers.

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Appendix

Survey Instrument

Link to survey: https://forms.gle/qeCpQ595ZKB4FENZ7

Pre-Survey Message

> Thank you for agreeing to complete my survey! I am collecting data for my senior capstone course within the Organization and Management Studies department at Gettysburg College. All of your answers are anonymous, as your responses will only be used for research purposes.
>
> If you have any questions about the survey, please email Allison Stranick: straal01@gettysburg.edu.
>
> I really appreciate your input!

Question 5: Have you ever used an e-cigarette, even once or twice?

- Yes
- No
- I am not sure

Question 6: How old were you when you first tried electronic cigarette smoking, even one or two puffs?

- 8 years old or younger
- 9 years old
- 10 years old
- 11 years old
- 12 years old
- 13 years old
- 14 years old
- 15 years old
- 16 years old
- 17 years old
- 18 years old
- 19 years old or older
- I have never used an electronic cigarette

Question 7: When was the last time you smoked an electronic cigarette, even one or two puffs? (Please choose the first answer that fits)

- Earlier today
- Not today but sometime during the past 7 days
- Not during the past 7 days but sometime during the past 30 days

- Not during the past 30 days but sometime during the past 6 months
- Not during the past 6 months but sometime during the past year
- 1 to 4yearsago
- 5 or more years ago

Question 8: During the last 30 days, on how many days did you use electronic cigarettes (0-30)?

- _____

Question 9: What are the reasons you have used electronic cigarettes (select all that apply)?

- Friend or family member used them
- To try to quit using other tobacco products, such as cigarettes
- They cost less than other tobacco products, such as cigarettes
- They are easier to get than other tobacco products, such as cigarettes
- I've seen people on TV, online, or in movies use them
- They are less harmful than other forms of tobacco, such as cigarettes
- They are available in flavors, such as mint, candy, fruit, or chocolate
- I can use them unnoticed at home or at school
- I was peer pressured into using them
- I can use them to do tricks
- I was curious about them
- I used them for some other reason (specify: _____)
- I have never used an electronic cigarette

Question 10: Have you ever tried cigarette smoking, even one or two puffs?

- Yes
- No
- I do not know

Question 11: How old were you when you first tried cigarette smoking, even one or two puffs?

- 8 years old or younger
- 9 years old
- 10 years old
- 11 years old
- 12 years old
- 13 years old
- 14 years old
- 15 years old
- 16 years old

- 17 years old
- 18 years old
- 19 years old or older
- I have never smoked a cigarette

Question 12: About how many cigarettes have you smoked in your entire life?

- 1 or more puffs but never a whole cigarette
- 1 cigarette
- 2 to 5 cigarettes
- 6 to 15 cigarettes (about 1/2 a pack total)
- 16 to 25 cigarettes (about 1 pack total)
- 26 to 99 cigarettes (more than 1 pack, but less than 5 packs)
- 100 or more cigarettes (5 or more packs)
- I have never smoked a cigarette

Question 13: During the past 30 days, on how many days did you smoke cigarettes? (0 to 30)

- _____

Question 14: When was the last time you smoked a cigarette, even one or two puffs? (Please choose the first answer that fits)

- Earlier today
- Not today but sometime during the past 7 days
- Not during the past 7 days but sometime during the past 30 days
- Not during the past 30 days but sometime during the past 6 months
- Not during the past 6 months but sometime during the past year
- 1 to 4yearsago
- 5 or more years ago

Question 15: Since the start of the COVID-19 pandemic, **check all** activities that you have done (between March 2020 and now).

- Get restaurant takeout
- Pump gasoline
- Play tennis
- Go camping
- Open the mail
- Grocery shopping
- Go for a walk, run, or bike ride with others
- Play golf
- Go fishing

- Go kayaking, boating, or sailing
- Attend a picnic
- Go to a farmer's market
- Go to a drive-in movie or concert
- Stay in a vacation rental in a rural area

Question 16: Question 15: Since the start of the COVID-19 pandemic, **check all** activities that you have done (between March 2020 and now).

- Stay at a hotel for two nights or more
- Sit in a doctor's waiting room
- Go to a library or museum
- Eat in a restaurant (outside)
- Walk in a busy downtown
- Spend an hour at a playground
- Have dinner at someone else's house
- Attend a backyard barbecue or gathering
- Go to a beach
- Shop at a mall
- Go to a playground
- Travel by train
- Stay in a vacation rental in a busy/urban area
- Go to the mall

Question 17: Question 15: Since the start of the COVID-19 pandemic, **check all** activities that you have done (between March 2020 and now).

- Go to a hair salon or barbershop
- Eat in a restaurant (inside)
- Attend a wedding or funeral
- Travel by plane
- Play basketball, football or any contact sport
- Hug or shake hands when greeting a friend
- Eat at a buffet
- Work out at a gym
- Attend frequent small gatherings with friends/family
- Go to a movie theater
- Attend a large music concert
- Go to a sports stadium
- Attend a religious service with 500-plus worshipers
- Go to a bar

Items 18-26: Please read the statements and choose the best answer.

Taking risks makes life more fun
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

My friends would say that I'm a risk taker
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

I enjoy taking risks in most aspects of my life
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

I would take a risk even if it meant I might get hurt
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

Taking risks is an important part of my life
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

I commonly make risky decisions
- Strongly disagree

- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

I am a believer of taking chances
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

I am attracted, rather than scared, by risk
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree

Question 1: What is your age?
- 17 or younger
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25 or older

Question 2: What is your gender?
- Male
- Female
- Other
- Prefer not to say

Question 3: Choose the answer that best describes your educational status.
- Currently enrolled in high school
- Currently enrolled in college
- Graduated from college
- Other _____

Question 4: What race or races do you consider yourself to be?
- American Indian or Alaska Native

- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Other

Question 27: Have you received a positive COVID-19 test?

- Yes
- No
- I have not been tested, but I believe I may have had the virus
- I am not sure

Question 28: If yes to question 27, did you experience and harsh symptoms or complications that disrupted your daily life?

- Yes
- No
- I have not received a positive COVID-19 test, and I do not believe I had the virus
- I am not sure

Question 29: Do you feel you are at high risk of experiencing complications or harsh symptoms due to COVID-19 if you were to get the virus, if you answered no to question 27?

- Yes
- No
- I don’t know
- I had COVID

Post-Survey Message

Thanks for participating in my senior capstone survey!

Tables and Figures

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	40	19.9	20.0	20.0
	1	160	79.6	80.0	100.0
	Total	200	99.5	100.0	
Missing	System	1	.5		
Total		201	100.0		

EverUseECIG

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	44	21.9	22.0	22.0
	1	156	77.6	78.0	100.0
	Total	200	99.5	100.0	
Missing	System	1	.5		
Total		201	100.0		

EverUseCIG

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	92	45.8	46.0	46.0
	1	108	53.7	54.0	100.0
	Total	200	99.5	100.0	
Missing	System	1	.5		
Total		201	100.0		

Correlations

		GRIPSFinal	COVIDRiskActivityScore
GRIPSFinal	Pearson Correlation	1	.317**
	Sig. (2-tailed)		<.001
	N	201	200
COVIDRiskActivityScore	Pearson Correlation	.317**	1
	Sig. (2-tailed)	<.001	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		GRIPSFinal	FreqSmokeCIG30Days
GRIPSFinal	Pearson Correlation	1	.295**
	Sig. (2-tailed)		<.001
	N	201	200
FreqSmokeCIG30Days	Pearson Correlation	.295**	1
	Sig. (2-tailed)	<.001	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		GRIPSFinal	FreqSmokeECIG30Days
GRIPSFinal	Pearson Correlation	1	.352**
	Sig. (2-tailed)		<.001
	N	201	200
FreqSmokeECIG30Days	Pearson Correlation	.352**	1
	Sig. (2-tailed)	<.001	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		FreqSmokeECIG30Days	COVIDRiskActivityScore
FreqSmokeECIG30Days	Pearson Correlation	1	.233**
	Sig. (2-tailed)		<.001
	N	200	200
COVIDRiskActivityScore	Pearson Correlation	.233**	1
	Sig. (2-tailed)	<.001	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		COVIDRiskActivityScore	FreqSmokeCIG30Days
COVIDRiskActivityScore	Pearson Correlation	1	.231**
	Sig. (2-tailed)		.001
	N	200	200
FreqSmokeCIG30Days	Pearson Correlation	.231**	1
	Sig. (2-tailed)	.001	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Variables

Variable Name	Categories	Meaning
EverUseECIG	Yes = 1 No = 0	Has the person ever tried an electronic cigarette (even once or twice)
AgedTriedECIG	*Categorical variable to be analyzed in google forms*	Age that participants who have tried an electronic cigarette did so
FreqSmokeECIG30Days	Number 0 to 30	The number of days in the last 30 which someone smoked an e-cigarette
FreqECIGSmoker	Yes = 1 No = 0	If the person is a frequent electronic cigarette smoker (10 or more days in the last 30)
EverUseCIG	Yes = 1 No = 0	Has the person ever tried a cigarette (even once or twice)
FirstTriedCIG	*Categorical variable to be analyzed in google forms*	Age that participants who have tried a cigarette did so
FreqSmokeCIG30Days	Number 0 to 30	The number of days in the last 30 which someone smoked a cigarette
FreqCIGSmoker	Yes = 1 No = 0	If the person is a frequent cigarette smoker (10 or more days in the last 30)
COVIDRiskActivityScore	Range	Number assigned to participants for how risky their behavior has been during COVID-19
GRIPSFinal	Number 0-5	Number assignment to participants based on the risk propensity scale
Gender	Female = 1 Male = 0	Self reported gender
EDUCStatus	*Categorical variable to be analyzed in google forms*	Self reported educational status
Race	*Categorical variable to be analyzed in google forms*	Self reported race
PositiveCovid	1 = Tested Positive OR believed they had the virus 0 = No	If the person had the virus confirmed by a test OR if they believe they had it even without a test
RiskPerception	1 = Yes 0 = No, I am not sure	If the person feels they are at risk of experiencing hard symptoms or complication