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Attitudes and Risk Perceptions of Electronic Nicotine Delivery Systems (ENDS) Use Among Adults with Mental Health Disorders

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Attitudes and Risk Perceptions of Electronic Nicotine Delivery Systems (ENDS) Use
Among Adults with Mental Health Disorders

by

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We the undersigned committee hereby approve the attached doctoral research project in partial fulfillment for the degree of Doctor of Clinical Psychology, “Attitudes and Risk Perceptions of Electronic Nicotine Delivery Systems (ENDS) Use Among Adults with Mental Health Disorders,” by Alexis Leeann Booth, M.S.

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ABSTRACT

Attitudes and Risk Perceptions of Electronic Nicotine Delivery Systems (ENDS) Use Among Adults with Mental Health Disorders

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The rates of tobacco use among U.S. adults have been steadily decreasing over the past few years; however, the decline in smoking has been replaced with an increase in the use of Electronic Nicotine Delivery Systems (ENDS). ENDS are battery operated devices which involve the heating of an “e-liquid” to produce a vapor or aerosol which is then inhaled by the user, and are often referred to as “vapes, e-cigs, e-cigarettes, and vaporizers.” Individuals with mental health disorders smoke combustible cigarettes and use ENDS products at disproportionately higher rates than the general population. To date, research has not examined the perceptions of ENDS use and their associated health risks and/or their role in managing psychological symptoms among those with mental health disorders. Additionally, no studies have examined the attitudes of those with mental health disorders about secondhand vapors from ENDS products and how they impact their vaping behaviors around others, including children. This study aims to address these gaps within the literature. A total of 48 adult participants were enrolled in the study. Of the participants enrolled, the majority were female (83.3%, $n= 40$), followed by males (10.4%, $n= 5$), two Transgender individuals (4.2%), and one person who identified as “other” (2.1%). The mean age of the sample was 33 years old, with an age range of 18-67 years. Participants were categorized into ENDS users and Non-ENDS users; 72.9% ($n= 35$) were identified

as ENDS users and 27.1% ($n= 13$) were categorized as Non-ENDS users. ENDS users reported the most important reason for using ENDS products was for psychological symptom management (34.3%; $n= 12$). Overall, participants reported high perceptions of risks regarding health and ENDS use. Despite these risks, participants were more likely to perceive e-cigarettes as less harmful than traditional cigarettes. Similarly, participants were also significantly more likely to perceive the secondhand vapors from ENDS products as less harmful to others than traditional cigarettes. Non-ENDS users had significantly higher exposure risk perception scores (i.e. secondhand vapor exposure was harmful) than ENDS users. However, whether participants used ENDS products was not significantly associated with perceived harm from secondhand vapor exposure compared to secondhand exposure to traditional cigarettes. Examination of risk perceptions and their association to ENDS bans (i.e. restrictions) revealed 52.1% ($n= 25$) have a complete ban on vaping in the home, while 43.8% ($n= 21$) of participants had a complete vaping ban in the vehicle. Approximately 36% of the sample had a complete ban on vaping in the home and vehicle. Participants were less likely to have a complete ban on vaping within the vehicle than within the home. Adults with mental health disorders, therefore, are likely to expose those who reside and travel with them to potentially toxic secondhand vapors. The information obtained by this study will be helpful in designing targeted interventions to assist in the reduction of tobacco, ENDS, and dual use as well as promote homes and vehicles that are smoke-and vapor-free among a highly vulnerable population.

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Review of the Literature

Prevalence of Tobacco and ENDS Use Among Adults

Smoking and tobacco use are responsible for the death of more adults in the United States (U.S.) than the use of alcohol and illegal drugs, car accidents, homicides, and suicides combined (Kasza et al., 2017). Although cigarette use has declined significantly in the past few years, 47.4 million (19.3%) U.S. adults continue to use any type of tobacco product, including cigarettes (Wang et al., 2018). Along with the decline in cigarette use is the increased use of Electronic Nicotine Delivery Systems (ENDS) among adults (Wang et al., 2018). ENDS are battery operated electronics that heat up liquid tobacco and transforms it into a vapor. The vapor can then be inhaled by the user. Since ENDS create a vapor form of tobacco, they are commonly referred to as “vapes.” However, due to the widespread popularity of ENDS use, ENDS are also referred to as e-Cigs, Vaporizers, Vape Pens, Tank Systems, and Electronic Cigarettes. It is important to note that not all ENDS contain nicotine (Center for Disease Control and Prevention [CDC], 2015; Wang, et al., 2018).

Approximately, 86.7% of current tobacco users have smoked combustible products, and approximately 12.6% of adults have experimented with ENDS (Glover et al., 2018). In addition, approximately 40.5% of current tobacco smokers use ENDS daily (Wang et al., 2018). Additionally, 22% of former cigarette smokers have experimented with ENDS (Glover et al., 2018). ENDS use is more common among males (3.3% vs. 2.4%) and is more prevalent in those who are 18-24 years old (National Health Interview Survey [NHIS], 2017). In addition, ENDS use is highest in individuals who are Multi-

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Racial (5.6%), followed by Caucasians (3.3%), African Americans (2.2%), Hispanics (1.8%), and Asians (0.9%) (NHIS, 2017). Individuals who obtained their GED use ENDS more than those who obtained a professional degree, either at the Master's or Doctoral level (7.2% vs. 0.9%). Furthermore, ENDS use is highest amongst individuals who are single or have never been married (4.1%) and individuals who are of lower socioeconomic status (3.6%) (NHIS, 2017).

There are numerous reasons as to why the use of ENDS has increased amongst U.S. adults; however, research has shown primary reasons for ENDS use includes: tobacco cessation, cost of cigarettes, convenience, simulation of cigarette smoking, curiosity, flavoring, and a consideration of others (Wang et al., 2018). In addition, many individuals believe ENDS are a safer alternative to traditional cigarette smoking, even though the research is inconclusive (Bao, Xu, Lu, Snetzelarr, & Wallace, 2018; Glover et al., 2018). For example, a study conducted by Warner and Mendez (2019) compared the potential risks and benefits of ENDS use among U.S. adults. The authors utilized a model in which the effects of ENDS-induced smoking initiation and cessation was simulated by the year 2070, and the model tracked U.S. adult's smoking status and smoking-related deaths over time. Results of the study strongly indicate the benefits of using ENDS for smoking cessation outweigh the potential long-term health risks of ENDS use (Warner & Mendez, 2019). Conversely, a study conducted by Soneji, Sung, Primack, Pierce, and Sargent (2018) found that ENDS use among current smokers and never smokers resulted in an estimated level of harm of 1.6 million life years lost, due to smoking initiation amongst adolescents and adults (i.e., never smokers). Therefore, the authors suggested

the long-term effects of ENDS use may increase the amount of life years lost (Soneji et al., 2018). Despite the mixed research on the benefits and risks associated with ENDS use, individuals continue to switch from combustible cigarettes to ENDS.

Dual Use

Due to insufficient evidence of the long-term health effects of ENDS, those who smoke combustible cigarettes are now becoming dual users. Approximately 6 million U.S. adults use both ENDS and smoke cigarettes (Piper, Baker, Benowitz, Kobinsky, & Jorenby, 2018). According to the recent National Health Interview Survey (2017), 58% of current adult ENDS users in the general population are dual users, defined as the use of both ENDS and combustible cigarettes. Among dual users (i.e., combustible and non-combustible products) 84.1% used two products, 13.4% have used more than three, and 2.5% have used four or more (Wang et al., 2018). Dual users are most likely to be young, Caucasian, and report a history of psychiatric problems and co-morbidities (Piper et al., 2018).

Prevalence of Tobacco and ENDS Use Among Adults with Mental Health Disorders

Approximately half of all smokers experience mental health disorders at some point within their lifetime (Hefner, Valentine, & Sofuoglu, 2017). Although the use of tobacco and cigarettes are declining for the general population, cigarette smoking and the use of other tobacco products remains high amongst those diagnosed with mental health disorders. Adults with mental health disorders comprise 19% of the population and consume one-third of the cigarettes smoked (Sarfraz, Fils-Aime, Brand, Vesely, & Beebe, 2018). In fact, 53% of those with serious mental health disorders smoke tobacco daily

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(Evins, Cather, & Laffer, 2015). Rates of smoking are twice that of the general population for those with mental health disorders, and these individuals are three times more likely to become nicotine dependent (Sarfraz et al., 2018). In addition, individuals with mental health disorders are at disproportionately high risk for tobacco-related illnesses and have difficulties with tobacco cessation compared to the general population (Hefner et al., 2017). Difficulties in quitting smoking may be due to biological factors that make smoking more reinforcing and contribute to more problematic withdrawal symptoms among individuals with mental health disorders (Berg, Sentir, Cooley, Engleman, & Chambers, 2013; Leventhal, Ameringer, Osborn, Zvolensky, & Langdon, 2013; Weinberger, Desai, & McKee, 2010 in Beidel et al., 2014). The lifetime prevalence rates of tobacco use range from 40-85% amongst those with mental health disorders (Pratt, Sargent, Daniels, Santos, & Brunette, 2016; Prochaska, & Grana, 2014). In addition, rates of smoking differ by specific diagnostic groups. Approximately 38% of those with any anxiety disorder use tobacco while 45% of those with mood disorders (i.e., depression) report tobacco use (Cummins, Zhu, Tedeschi, Gamst, & Myers, 2014). The rate of smoking is 64% among those with any substance use disorder (Cummins et al., 2014). Reasons for the higher rates in this population include accessibility, perceptions/attitudes, and marketing of tobacco products. This is especially true for ENDS.

ENDS use is significantly high among adults who report serious psychological distress (7.9%) compared to those who do not (2.6%) (NHIS, 2017). In fact, 14.8% of individuals with a mental health disorder reported using ENDS compared to 6.6% of the

general population (Pratt et al., 2016; Steinberg, Williams, & Li, 2015). ENDS use increased from 2.7% in 2010 to 8.1% in 2012, with the numbers steadily growing for this population (Pratt et al., 2016). Utilizing a U.S national adult sample, Cummins and colleagues (2014) examined ENDS use among those with mental health disorders by selected diagnostic groups. Participants were asked to disclose whether they had been diagnosed with anxiety, depression, or any other mental health disorder. Results indicated rates of ENDS use varied within this population. Close to 14% (13.7%) of those with depression used ENDS, followed by 8.6% of those with any anxiety disorder, and 3.6% of those with some other mental health disorder (Cummins et al., 2014). Individuals with mental health disorders who used ENDS were also likely to experience co-morbid conditions. In fact, 30% of individuals with mental health disorders who were ENDS users reported two mental health disorders, and approximately 10% reported three or more disorders (Cummins et al., 2014). ENDS use was also more common among females with a mental health disorder (63.5%) and those in the 45-59-year age range (31.2%). In this national sample, those with a mental health disorder who used ENDS were more likely to have a high school education or less compared to those without a mental health disorder. In terms of race, ENDS users were more commonly Caucasian (71.8%), followed by Hispanic (11.6%), African American (10.3%), and Multi-Racial (4.5%) individuals. In another study, rates of ENDS use among those with serious mental health disorders (i.e., schizophrenia and bipolar disorder) were reported to be as high as 25% (Hefner et al., 2017).

Dual Use

With the rates of tobacco and ENDS use highest among those with mental health disorders, it is not surprising that dual use has become a significant problem. Studies examining population-based, as well as clinical samples (i.e., inpatient samples), have found that almost 21% of those with mental health problems use both cigarettes and ENDS. Individuals with self-reported mental health problems had higher rates of dual use than those with serious, formally diagnosed mental health disorders (i.e., inpatient samples) (Hefner et al., 2017; Pratt et al., 2016). However, those with serious mental health disorders (i.e., schizophrenia and bipolar disorder) were heavier smokers and reported more failed cessation attempts than others with mental health disorders (i.e., mood disorders) and the general population (Hickling et al., 2018). Additionally, the rates of dual use among those with serious mental health disorders were higher than those diagnosed with substance use disorders (Hefner et al., 2017). In addition, individuals with significant mental health disorders (i.e., acute psychiatric hospitalization) steadily increased their use of ENDS over time (Prochaska et al., 2014).

Attitudes and Risk Perceptions About ENDS Use

The reasons for use of ENDS among those with mental health disorders are like those of the general population. Some of the more common reasons for ENDS use include: perceptions of safety, tobacco cessation, accessibility, flavoring, policies, and sensory familiarity (Glantz, & Bareham, 2018; Prochaska et al., 2014; Spears, Jones, Weaver, Pechacek, & Eriksen, 2018). Those with mental health disorders endorsed using ENDS “just because” as the main reason for use (68.9%), followed by smoking cessation

(55.2%), perception of safety (51.2%), and accessibility (46.7%) (Cummins et al., 2014). Among current smokers with mental health disorders, the ability to use ENDS in non-smoking areas, cost, and reduction of harm to others were reported reasons for ENDS use (Spears et al., 2018). Additionally, those with serious mental health disorders (e.g., schizophrenia) reported perceived health benefits and a strong desire to quit smoking as reasons for ENDS use (Spears et al., 2018). Similarly, individuals receiving community mental health treatment reported subjective reasons for ENDS use, including: a reduction in sleeping difficulties, acceptance by peers, less coughing, and a reduction in feeling addicted to nicotine (Pratt et al., 2016).

Smoking expectancies, or beliefs about the perceived positive effects of smoking and ENDS use, are associated with increased ENDS use in those with self-reported psychological distress (Miller et al., 2017). Miller and colleagues (2017) examined the positive and negative expectancies of ENDS use among current smokers or ENDS users who were or were not experiencing serious psychological distress. Positive expectancies included: stimulation, positive social effects, weight control, taste/sensory pleasure, and negative affect reduction. Negative expectancies included: negative physical effects (e.g., dry cough), negative psychosocial effects, and future health concerns (Miller et al., 2017). Current smokers with serious psychological distress, with no prior ENDS use, had higher positive expectancies for combustible cigarettes, as well as ENDS products, than those without serious psychological distress (Miller et al., 2017). Results of this study also indicated smokers with serious psychological distress are more vulnerable to ENDS

use, due to greater positive expectancies of these products than the general population (Miller et al., 2017).

Exposure to ENDS Products

The high rates of individuals with mental health disorders who perceive reduced risks associated with ENDS use may be due to targeting of this population by tobacco marketing and advertising companies (Hefner et al., 2017). Although the long-term effects of ENDS use are currently unknown, research has revealed over 95% of websites promote the health benefits of ENDS use and 64% made smoking cessation related claims (Miller et al., 2017). ENDS use has even been promoted via celebrities who endorsed ENDS to assist them in coping with stress, reducing their anxiety and depression, and the promotion of social inclusion (Spears et al., 2018).

The tobacco industry has promoted smoking within psychiatric settings through direct (e.g., marketing) and indirect (e.g., policy) ways. In fact, tobacco researchers have promoted the use of ENDS for individuals who suffer from schizophrenia and smoke tobacco (Prochaska, Das, & Young-Wolff, 2017). Tobacco-industry funded research has promoted the use of nicotine as a coping mechanism for symptoms of schizophrenia. In addition, these researchers attributed symptoms of nicotine withdrawal and difficulties with tobacco cessation to the individuals' psychiatric problems, rather than due to the side effects of nicotine use (Prochaska et al., 2017). In addition to product marketing, the high tobacco retailer density near treatment facilities for those with mental health disorders, creates increased accessibility to ENDS and tobacco products (Prochaska et al., 2017).

In addition to the targeting and marketing of advertisements to those with mental health disorders, medical providers inadvertently promote the use of ENDS within the patient's treatment environment. Psychiatrists are the least likely to address smoking and tobacco use among their patients, with 23% assisting with tobacco cessation and only 11% providing treatment referrals (Prochaska et al., 2017). Twenty two percent of psychiatrists felt those with mental health disorders had more significant problems to address than smoking cessation, and the most commonly held beliefs were patients with mental health disorders have no desire to quit smoking (51%) and smoking cessation is too stressful for their patients (38%) (Prochaska et al., 2017). Psychiatrists are not the only ones who promote the use of tobacco and ENDS, as the mental health setting also promotes its use. For instance, in 1993 the Joint Commission's efforts to ban smoking in all hospitals, including psychiatric hospitals, across the U.S. was unsuccessful, as many individuals believed smoking with patients was therapeutic (53%) and that cigarettes should be distributed to patients (22%) (Prochaska et al., 2017). However, perceptions and attitudes have changed, as psychiatric hospital smoking bans have increased from 20% in 2005 to 79% in 2011 (Prochaska et al., 2017).

Risk and Protective Factors Associated with ENDS Use

In order to develop targeted interventions to reduce use of tobacco and ENDS, risk factors must be identified for vulnerable adults with mental health disorders. An examination of sociodemographic factors related to tobacco and e-cigarette use among a national sample of U.S. adults aged >18 years of age found that e-cigarette use was highest among men aged 18-24 yrs. (Wang et al., 2018) Additionally, e-cigarette use was highest among multi-racial non-Hispanic individuals, followed by Caucasians, and

African Americans. ENDS use is more prominent in the South and lowest in the Northeast regions of the U.S. Individuals who obtained their GED, as opposed to those who obtained a graduate/professional degree exhibit higher rates of ENDS use (Wang et al., 2018). Those who are single/never married and make less than \$35,000 per year are also at higher risk for ENDS use. Lastly, ENDS use is highest among those who are members of the LGBTQ community and who suffer from serious psychological distress (Wang et al., 2018).

In addition to sociodemographic risk factors, psychosocial risk factors are likely to contribute to adult ENDS use. To date, research on psychosocial risk factors and corresponding ENDS use has been limited, although results from smoking studies may be applicable to understanding ENDS use. For example, stress and perceived stress have been shown to influence various health-related behaviors, including tobacco use. A survey was conducted by Ng and Jeffery (2003) on over 12,000 participants in which they examined work stress and perceived stress on corresponding health-related behaviors including food intake, alcohol consumption, exercise, and smoking. Results demonstrated higher stress for both men and women were associated with high fat diets, less exercise, increased smoking, less smoking cessation, and less control to not smoke when distressed (Ng & Jeffery, 2003). Additionally, perceived risks of smoking have been associated with an individual's smoking behaviors. Longitudinal survey data collected over two years from over 395 individuals revealed those individuals with the lowest perceptions of harm were 3.64 times more likely to begin smoking than those who perceived greater risk from smoking (Song et al., 2009). Although these studies have

focused primarily on tobacco use, these identified psychosocial risk factors are likely to also play a role in adult ENDS use.

Research has begun to examine how health status (i.e., physical and mental health) and protective health practices (i.e., healthy diet, sleep, and physical activity) contribute to the frequency of ENDS consumption for adolescents. For example, Dunbar et al. (2017) examined the relationship between physical and mental health (i.e., depression and anxiety), protective health behaviors, and health risk behaviors of over 2,000 adolescents and their corresponding frequency of ENDS use. ENDS only users were compared to dual users, cigarette only users, and non-users regarding their protective health behaviors. Results indicated e-cigarette only users had significantly higher rates of alcohol and other drug use compared to non-users; however, these individuals had lower rates of alcohol and other drug use when compared to dual users (Dunbar et al., 2017). In addition, e-cigarette only users reported lower levels of anxiety and depression compared to dual users and cigarette-only users. The authors' concluded e-cigarette only use was associated with lower engagement in risky behaviors, but not better physical health or engagement in protective health factors; dual users represented a high-risk group due to greater alcohol/drug use and alcohol consumption (Dunbar, et al., 2017). The findings indicated that maladaptive coping strategies (i.e., alcohol and drug use), often used by those with mental health problems (i.e., dual diagnosis), are significant predictors of ENDS use.

Among clinical samples, severity of an individual's mental health disorder has also been shown to influence ENDS use. Those who have less severe mental health disorders are at a lower risk for ENDS use than those with more severe mental health

disorders (Pratt et al., 2016). Those with more severe mental health disorders are heavier smokers, relapse more often, and are unable to quit smoking more than their peers with less severe disorders (Hickling et al., 2018). Lastly, those with more severe mental health disorders smoke more and use ENDS at a higher frequency than those with substance use disorders (Hefner et al., 2017).

Health Effects of ENDS Use and Secondhand Exposure to ENDS Vapors

Smoking is the largest single contributor to poor physical health and mortality among those with mental health disorders (Hickling et al., 2018). In fact, individuals who suffer from mental health disorders and smoke die, on average, 30 years earlier than those in the general population (Pratt et al., 2016). Determining the health effects of e-cigarettes and ENDS is difficult, due to the various customizations and combinations possible with ENDS products. For example, nicotine concentration, e-liquids, battery power, and “puff topography,” vary the concentration of aerosol inhalation (U.S. Department of Health and Human Services [USDHHS], 2016). In addition, the type of ENDS product (e.g., “ciga-like” vs “tanks”) can deliver more or less nicotine than a traditional cigarette. The e-liquid itself is another compound variable, as the e-liquid has various amounts of nicotine within it, and the chemical reactions present in ENDS products may result in the formation of new, harmful compounds (USDHHS, 2016). Lastly, the generalizability of health effects is compromised by the user’s “puff topography,” or the duration, intensity, and frequency of a user’s inhalation of the aerosol (USDHHS, 2016).

In 2016, the U.S. Surgeon General released a report related to the health effects of e-cigarette use. The report reiterated the power of addiction regarding nicotine and its

effects on the body's brain receptors. The report stated nicotine addiction is of concern regarding e-cigarettes and ENDS, because the blood nicotine levels in ENDS products have been reported to be comparable or even higher than blood nicotine levels in traditional cigarettes (USDHHS, 2016). In addition, the report discussed the health effects related to the aerosol vapor created and released from the ENDS products. Aerosols contain at least 31 compounds, including: nicotine, formaldehyde, acetaldehyde glycidol, acrolein, acetol, and diacetyl (USDHHS, 2016). Glycidol is a new carcinogen not previously found within the aerosols, and acrolein is a powerful irritant (USDHHS, 2016). In addition, the aerosols contain heavy metals such as lead and cadmium (USDHHS, 2016).

The American E-Liquid Manufacturing Standards Association has recommended the use of U.S. Pharmacopeia-Grade (USP) nicotine in ENDS products. The USP specifies that ENDS products are only allowed to have a maximum of 0.5% of a single impurity within the nicotine e-liquid, and a maximum of 1% total impurities within the e-liquid (USDHHS, 2016). However, the health implications of these impurities are currently unknown, and more research is needed to determine the health effects of high levels of nicotine impurities. In a study conducted by Lukasz et al. (2014), toxic metals within the vapor inhaled by ENDS product users were examined. The researchers generated vapors from 12 different brands of ENDS products and extracted toxic compounds from the vapors. Approximately 4 carbonyl compounds were found within the vapor. Carbonyl compounds have known toxic and irritating properties.

Approximately 2 volatile organic compounds were found within the vapor. Volatile organic compounds can cause respiratory, allergic, and immune effects, such as: eye,

nose, and throat irritation, headaches, nausea, fatigue, and dizziness (Lukasz et al., 2014). In addition, the researchers found two tobacco-specific nitrosamines, which are created from nicotine and tobacco alkaloids. These compounds are strong carcinogens that effect the lungs and oral cavity (Lukasz et al., 2014). Lastly, the researchers found heavy metals within the vapors, including: cadmium, nickel, and lead (Lukasz et al., 2014).

Research has begun to examine the creation of toxic chemicals via changes in the chemical components, due to the heating coils found within ENDS products. In some ENDS products, the heating coil can exceed temperatures above 350 degrees Fahrenheit (USDHHS, 2016). Research suggests these dangerous compounds are created when the e-liquid touches the heating coil and is oxidized to form formaldehyde, acetaldehyde, acrolein, glyoxal, and methylglyoxal (USDHHS, 2016). Individuals who directly drip e-liquid onto the heating coil get a bigger “hit,” thus exposing themselves to higher concentrations of toxic carbonyls (Talih, Balhas, Salman, Karaoghlanian, & Shihadeh, 2016).

In addition to the toxic compounds found within the e-liquid and vapors of various ENDS products, the flavoring components have often gone understudied. Even though characterizing combustible cigarettes of having “flavors” is prohibited by *The Family Smoking Prevention and Tobacco Control Act of 2009*, this is not the case with ENDS products (USDHHS, 2016). With other 7,000 unique e-cigarette flavors, researchers have found it difficult to adequately test the safety of ingesting these flavors (USDHHS, 2016). While most research has regarded the ingestion of ENDS product flavors, most have been unsuccessful at testing the safety of inhaling these flavors, as it is hard to control the flavoring component when the e-liquid is heated at various

temperatures (USDHHS, 2016). In addition, most compounds found in e-cigarette flavoring products remains undeclared on ENDS product packaging, further resulting in the inability to determine the health effects of inhaling flavored vapors (USDHHS, 2016). Similarly, some chemicals in ENDS products that produce cytotoxicity are not attributed to the nicotine in the e-liquid, but the concentration of chemicals employed as flavors (USDHHS, 2016). A study conducted by Behar et al. (2014) revealed cinnamon-related chemicals were found in the e-liquids. These chemicals are highly bioactive and have been used as anti-cancer agents, as well as a bactericide (Behar et al., 2014). Other flavoring agents such as: butter, caramel, cocoa, coffee, and dairy products found within the e-liquid flavors are associated with a decline in respiratory functioning (USDHHS, 2016).

Most health risks related to the use of ENDS products have to do with the inhalation of the vapors and the toxic chemicals within; however, other research has demonstrated health risks related to the mechanics of ENDS products. From 2009 to 2014 there have been approximately 25 incidents of e-cigarette explosions and fires (USDHHS, 2016). There have been no known ENDS product related deaths; however, one incident set fire to an entire bedroom and others have caused severe facial damage or injuries to an individual's body and hands (USDHHS, 2016). Research has shown that most of these incidents involving explosion of ENDS products resulted from overcharging the lithium batteries that power ENDS products (USDHHS, 2016). In addition to fires and explosions, research has shown the ingestion of e-liquids can cause nicotine poisoning. Nicotine poisoning can result in nausea, vomiting, headaches, and

dizziness. At higher levels, nicotine poisoning can result in seizures, tachycardia, abdominal pain, confusion, and possibly death (USDHHS, 2016).

Although the long-term health effects of ENDS product use are not currently known, many short-term health effects have been identified. The 2016 Surgeon General's report identified health effects of aerosolized nicotine and cardiovascular problems. Short term effects identified include increased heart rate, increased blood pressure, greater cardiac output, and an increase in myocardial oxygen demand (USDHHS, 2016). A study conducted by Bold, Krishnan-Sarin, and Stoney (2018) found ENDS products can have harmful effects on the body's cardiovascular and endocrine systems. In addition, ENDS products could precipitate ischemic events in individuals with coronary artery disease (Bold et al., 2018). Additionally, nicotine has an adverse effect on respiratory airways, which could play a role in the development of lung cancer with chronic ENDS product use (USDHHS, 2016). Lastly, the use of ENDS products while pregnant can result in fetal birth defects (USDHHS, 2016).

A study conducted by Lerner et al. (2015) revealed the vapors produced by ENDS products, as well as the e-liquids/flavorings, are toxic to human epithelial cells, producing oxidative stress and an inflammatory response. The researchers utilized a refillable e-pen and a disposable e-cigarette, in which the cartridge containing the e-liquid can be replaced with a new cartridge. The toxicity produced by the different ENDS product was detected by utilizing a florescent dye which would turn green to indicate oxidative activity (Lerner et al., 2015). Results demonstrated the inflammatory response of the epithelial cells depended upon the type of ENDS product used (Lerner et al., 2015).

However, one e-liquid flavoring (i.e., cinnamon roll) produced a significant inflammatory response (Lerner et al., 2015).

As more research has demonstrated the short-term health effects of ENDS use, studies have also explored the health effects of secondhand vapors created by ENDS on bystanders, non-smokers, and children. A study by Geiss, Bianchi, Barahona, and Barrero-Moreno (2015) examined the composition of the vapor expelled by ENDS products in an indoor environment. The researchers utilized a controlled environment (i.e., emission chamber) to study the composition of the vapor. Two different refillable ENDS products were examined, as they are the most common type of e-cigarette used. A glass filter was used to contain the particles once extracted from the vapor. Results of the study indicated the following harmful particles were found: propylene glycol, glycerol, nicotine, carbonyls, and aerosol particulates (Geiss et al., 2015). Therefore, passive inhalation of the vapors produced by ENDS users can be harmful to bystanders who do not use ENDS products. However, the harmful effects of the particles released by the vapors depend upon numerous factors including ventilation, room size, climate, and the number of ENDS users within the same room or area (Geiss et al., 2015).

Another study conducted by Schober et al. (2014) also examined the impact of vapors on indoor air quality. The researchers recruited nine participants for the study. The participants were instructed to consume e-cigarettes with and without nicotine in a ventilated room for approximately two hours, over the course of 6 sessions (Schober et al., 2014). The researchers analyzed the pollutants found within the indoor vapor, as well as measured the release of fractional exhaled nitric oxide (FeNO) and analyzed the urine of the participants. Results indicated the vapors produced poor indoor air quality. In

addition, there was an increase in the release of FeNO, which produces inflammatory responses, as seven out of nine participants demonstrated an increase in FeNO urinary levels (Schober et al., 2014).

Despite the potential adverse health effects of vapor exposure, secondhand vapor exposure continues to be viewed as safer than secondhand cigarette exposure. In fact, two-fifths of U.S. adults believe children's exposure to secondhand vapors cause "some" or "little harm." One-third of U.S. adults are "unsure" if the vapors cause harm to children. Individuals who believe secondhand vapors cause "no harm" to children were highest among men than women, former and current smokers, as well as former and current ENDS users (Nguyen, Tong, Marynak, & King, 2015). When examining U.S. adult's knowledge regarding the safety of inhaling secondhand ENDS vapors, the majority of respondents were unsure whether or not the secondhand vapor contained only water vapor (58%), tar (63%), or formaldehyde (75%) (Tan, Mello, Sanders-Jackson, & Bigman, 2017). Additionally, respondents believed inhaling secondhand vapor was less harmful than secondhand tobacco smoke. Former and current smokers reported lower perceived harms than non-smokers, and past and current users had perceived e-cigarettes as less harmful than never smokers (Tan et al., 2017).

Social media also plays a role in shaping the perceptions of harm regarding secondhand vapor exposure. Unger et al. (2016) examined the perceptions of secondhand e-cigarette vapor exposure among adults who use Twitter. The researchers collected "tweets" over a 6-week period that contained content about e-cigarette use. The "tweets" were coded either pro-, anti-, or neutral regarding perceptions of harm, and according to topic (i.e., health, social, and advertisements). Results of the study revealed 531 pro-e-

cigarette “tweets,” 392 anti-e-cigarette “tweets,” and 596 neutral “tweets” (Unger et al., 2016). In addition, social-focused “tweets” were predominately pro-e-cigarette, whereas health-focused “tweets” were more anti-e-cigarette (Unger et al., 2016).

Smoking Bans/Restrictions

With the continued increase in ENDS use, it is likely that children and non-smokers will be increasingly exposed to secondhand vapor by ENDS users. Although a body of studies has documented the positive effects of implementing smoking restrictions within homes and vehicles in the general population as a means to protect others from secondhand smoke, no studies to date have examined whether ENDS are similarly restricted in these settings to protect others from secondhand vapor exposure. Smoking bans within the general population have attempted to target elimination of tobacco smoke and secondhand vapor exposure within family homes and vehicles, as children and other non-smokers are likely to be present for significant periods of time within these settings. Smoking restrictions within the home have been shown to reduce exposure of secondhand smoke to non-smokers and children (Tyc, Puleo, DeMoor, Ford, & Emmons, 2013).

Although the number of U.S. households with smoke-free policies has increased recently, the rates are lower in households where smokers reside (Tyc et al., 2013). However, research has shown that restricting smoking in the home can affect a current smoker’s behaviors including decreased daily consumption of cigarettes, increased cessation attempts, longer duration of cessation attempts, and relapse prevention (Tyc et al., 2013). Establishment of smoking restrictions in the home may be influenced by sociodemographic characteristics and individual attitudinal variables. For example,

individuals who live in rural and low-income areas are less likely to restrict smoking in the home, whereas households with younger residents and at least one nonsmoker in the home are more likely to restrict (Tyc et al., 2013). An additional significant factor in the implementation of household bans include concern for the health of non-smokers within the home (Tyc et al., 2013).

Despite the well-established findings that secondhand smoke exposure is harmful to one's health, as well as the growing demand for tobacco use policies, only 81.1% of individuals nationwide have adopted voluntary smoke-free home policies (King, Dube, & Homa, 2013). Additionally, the prevalence was higher for non-smokers (89.1%) than current smokers (48%) (King et al., 2013). Approximately 73.6% of individuals have smoke-free bans in their vehicles nationwide, and non-smokers had higher rates of bans within their vehicles (84.9%), as opposed to smokers (27%) (King et al., 2013). Due to the lower rates of smoking bans within the home and vehicles of current smokers, numerous non-smokers and children are regularly exposed to secondhand smoke. In fact, 3.1% of non-smokers are exposed to secondhand smoke daily within the home, and 1.3% of non-smokers are exposed within the vehicle daily (King et al., 2013). Exposure to secondhand smoke was significantly lower for homes and vehicles that had implemented 100% bans on tobacco smoke, as opposed to homes with no smoking bans (King et al., 2013).

Children of ENDS users are also at risk for short-term and long-term health effects produced by secondhand ENDS vapors. Most children are exposed to the vapors indoors or inside cars (Kopp et al., 2018). Additionally, many smoke-free policies have been adopted by more affluent communities, placing lower socioeconomic status (SES)

children at higher risk (Kopp et al., 2018). Other risk factors for secondhand smoke exposure include parental smoking, lower parental education level, and less negative attitudes towards the health effects of tobacco smoke (Kopp et al., 2018). Although the health effects of combustible cigarettes are well known, the effects of ENDS on children's health is limited and uncertain, which is due to the unknown duration and frequency of children's exposure to secondhand ENDS vapors. Kopp and colleagues (2018) examined voluntary indoor combustible and non-combustible tobacco product restrictions implemented in households in urban counties in Ohio with and without children residing in the home. Participants were randomly selected by address-based sampling methods. Eligible participants who completed the survey were exclusive combustible cigarette users, exclusive smokeless tobacco users (SLT), exclusive e-cigarette users, or dual users. Results indicated e-cigarette users had complete indoor bans on combustible tobacco products when compared to combustible cigarette users and dual users (Kopp et al., 2018). E-cigarette users and dual users had fewer restrictions on indoor bans for non-combustible products when compared to combustible products. Households with complete combustible bans were more frequent in urban areas, men, Caucasian individuals, those with higher educations, and higher income families (Kopp et al., 2018). E-cigarette and non-combustible complete bans were more frequent in urban households, women, and Non-Caucasian participants. Approximately half of all households with children (51.6%) had complete bans on combustible products, whereas only one-fourth of households with children (25.7%) had complete bans on non-combustible products (Kopp et al., 2018). Lastly, households with complete bans on

indoor use of combustible or non-combustible products were higher for households with children (42.1%) than those without children (19.5%) (Kopp et al., 2018).

The 2016 Surgeon General report recommends banning the use of e-cigarettes and combustible cigarettes in all indoor areas (USDHHS, 2016). However, many states do not ban use of ENDS and e-cigarettes indoors, as well as in public spaces. Although states have taken steps to regulate ENDS use (i.e., age and purchase restrictions), most states continue to refrain from mandated bans regarding ENDS use. Moreover, any state policies related to public settings would not necessarily extend to private homes and vehicles, where such restrictions are strictly voluntary. This is concerning, as most research has shown only 100% smoke-free policies are effective in reducing exposure to secondhand smoke/vapors to non-smokers, children, and others (King et al., 2013). Currently, the rates of home and vehicle restrictions on vaping among adults with mental health disorders have not been examined.

Study Rationale and Justification

Disproportionately high smoking rates have been reported among individuals with mental health disorders. Although tobacco use within the general population is on the decline, rates have remained relatively stable among smokers with mental health disorders (Dickerson et al, 2012; Secades-Villa et al, 2013; Williams, Steinberg, Griffiths, & Cooperman, 2013). Smokers with mental health disorders, particularly those with longer smoking histories, are less likely to quit (Williams et al., 2013 in Beidel et al., 2014), have more difficulty quitting (Williams et al, 2013 in Beidel et al., 2014), and are more likely to relapse after successfully quitting smoking (Ziedonis et al., 2008 in Spears, 2018). These challenges, combined with a higher risk for tobacco-related

morbidity and mortality among this population (William et al., 2013 in Beidel et al., 2014), call for effective smoking cessation interventions and/or harm reduction strategies, such as use of ENDS, to assist in their cessation attempts. In fact, evidence suggests that smokers with mental health disorders are twice as likely to have used ENDS in past attempts to quit smoking as compared to those without a mental health disorder (Spears et al., 2018).

As in the general population, the use of ENDS among those diagnosed with a mental health disorder has been steadily increasing (NHIS, 2017; Pratt et al., 2016; Steinberg, Williams, & Li, 2015). The prevalence rates of ENDS use among this population have been variable across studies and may reflect the lack of standardization regarding the definition of mental health disorders that are often used to determine eligibility criteria and the samples that are examined. Within the literature, researchers have labeled and measured mental health disorders in multiple ways including mental health conditions, mental illness, severe mental illness, and psychological distress (Miller et al., 2017; Pratt et al., 2016; Spears et al., 2018). Other methodological influences on prevalence rates have included the way studies define ENDS use (NHIS, 2017).

Although the long-term health effects of ENDS use are unknown, there is an extensive body of research demonstrating the short-term adverse cardiovascular and respiratory effects of ENDS use (USDHHS, 2016). Despite these health risks, the general public as well those with mental health disorders view ENDS as a safer alternative to smoking cigarettes (Cummins et al., 2014; Pratt et al., 2016; Spears et al., 2018). This issue is further compounded by the targeting of those with mental health disorders by tobacco companies and industries that market the use of tobacco and ENDS as “cures”

for their mental health disorders (e.g., schizophrenia), making this population more vulnerable to manipulation by these companies (Prochaska et al., 2017). Additionally, no research to date has examined the use of ENDS as a means of managing the symptoms associated with an individual's mental health disorder.

In addition to higher rates of smoking and ENDS use, as well as the specific targeting of this population by tobacco companies, those with mental health disorders are also vulnerable within their own settings (i.e., mental health facilities). Research has shown psychiatrists are the least likely to address patient's smoking habits and promote smoking cessation (Prochaska et al., 2017). Many individuals with mental health disorders are not asked about or informed about their smoking/vaping habits and the risks associated with ENDS use. In addition, psychiatrists feel their patients have "bigger problems" than their smoking habits (Prochaska et al., 2017). Without support from mental health facilities and their respective communities, those with mental health disorders are increasingly vulnerable and at risk for ENDS use.

Given the alarming trends of increased ENDS use among those with mental health disorders, along with their perceptions of ENDS as posing few health risks, it is likely that they will increasingly use these products around others, including children. As a result, children and others living with ENDS users are likely to be exposed to toxins from secondhand vapors in their homes and vehicles, and at risk for adverse health effects. Until now, no studies have examined attitudes and risk perceptions about secondhand ENDS exposure among this high-risk population and the impact of these perceptions on their smoking and vaping behaviors around others in the home and car setting. Although research has demonstrated that smoking bans are effective in reducing secondhand smoke

exposure, only 81.1% of the population have implemented smoking bans within their homes and 73.6% have banned smoking within their vehicles. This rate is lower for smokers as opposed to non-smokers (King et al., 2013). Whether those with mental health disorders similarly implement smoking/vaping restrictions within their homes and vehicles to reduce others' exposure to secondhand smoke/vapors has never been evaluated.

Unlike previous studies, this study will add to the literature by examining attitudes and risk perceptions about ENDS use among individuals diagnosed with a mental health disorder and being treated at a community mental health center. The study sample will include those with less severe mental health disorders (e.g., anxiety and depression), as well as those with more severe mental health disorders (e.g., schizophrenia and bipolar disorders). Research to date has only examined attitudes and intentions to use ENDS in this population as they relate to smoking cessation. This study will examine the reasons for ENDS use including psychological and/or physical symptom management. Additionally, this study will build on the existing research by examining risk perceptions about secondhand exposure to ENDS vapors and their relationship to exposure behaviors within individuals' homes and vehicles. To date, these relationships have been largely understudied among those with mental health disorders. This collective information will help to shape public messaging and design effective interventions to address chronic ENDS use and concurrent ENDS use with cigarettes and promote homes and vehicles that are smoke-and vapor-free in a highly vulnerable population.

Study Objectives and Hypotheses

Objective 1: To examine health risk perceptions of ENDS use among those with mental health disorders.

Hypothesis 1.1: Individuals with mental health disorders will perceive the use of ENDS as less harmful than combustible cigarettes.

Hypothesis 1.2: Those with mental health disorders will report positive expectancies about ENDS products to manage their psychological symptoms.

Objective 2: To examine health risk perceptions of secondhand exposure to vapors from ENDS products and their relationship to exposure behaviors within their homes and vehicles among individuals with mental health disorders.

Hypothesis 2.1: Individuals with mental health disorders are likely to view secondhand vapor as less harmful than secondhand exposure to cigarette smoke.

Hypothesis 2.2: Those with mental health disorders are likely to expose children and others to secondhand smoke and/or vapors in their homes and vehicles at higher rates (i.e. less likely to restrict smoking/vaping) than rates reported in previous studies.

Hypothesis 2.3: Increased risk perceptions about exposure to secondhand vapors will be inversely related to exposure behaviors (i.e., more likely to restrict) in their homes and vehicles.

Objective 3: To determine the factors associated with adult health risk perceptions of ENDS use and perceptions of harm related to secondhand vapor exposure from ENDS. Potential variables include demographic factors, number of smokers/vapers and children residing in their homes, as well as mental health diagnoses.

Hypothesis 3.1: Individuals who are male, reside with other smokers/vapers, have no children residing in the home, and use other substances will report lower health risk perceptions of ENDS use and lower perceptions of harm related to secondhand vapor exposure.

Method and Procedures

Participants

Adults ≥ 18 years of age were recruited from Community Psychological Services (CPS), an outpatient community mental health center. In addition, participants were recruited online via the internet through online poll services and social media (i.e., Reddit, Facebook, and email). Participants were recruited via in-person contact, by phone, mail, and email. The survey was distributed to all current clients, discharged clients, and future prospective clients at CPS as part of the intake process. Current clients received a letter, with a pre-determined code and their chart number (as names were not collected), informing them of the study and a link to access the online survey. Prospective clients (i.e., intakes) were provided a letter, or emailed a letter, informing them of the study and a link to access the online survey. Former clients who were previously discharged from the clinic were either provided a letter via mail informing them of the study with a link to access the online survey, or they were sent an email (obtained from their clinic record), with the letter informing them of the study and a link to access the online survey. Permission was granted for non-HIPPA compliant communication. Participant's names were not collected, but were instead, assigned a pre-determined code to enter on the informed consent page, to later link their data with their mental health diagnosis to maintain confidentiality. Participants who were recruited online did not have

to provide personal, identifiable information, as anonymous online poll services were used, therefore maintaining confidentiality of online participants.

Participants were eligible to complete the survey if they a) were a current, former, or non-smoker of any combustible tobacco product (defined as the use of “cigarettes, cigarillos, cigars, blunts, bidis, or other combustible tobacco products,”) or were a current, former, or non-ENDS user (defined as the use of “electronic cigarettes, e-cigarettes, vapes, electronic hookahs (e-hookahs), hookah pens, vape pens, electric pipes, or other electronic vapor products,”), or were a dual user (defined as simultaneous use of “cigarette and ENDS use,”) b) have a mental health diagnosis, which is defined as a mental health diagnosis obtained either by a psychiatrist, psychologist, or other qualified medical professional as verified in their clinic record, or self-report and c) be willing to participate by completing the survey.

A total of 129 adults enrolled in this study. An additional 81 were excluded from the analysis for not meeting inclusion criteria or failure to correctly complete the survey. A total of 48 participants had viable responses to analyze. Characteristics of participants were collected, including age, gender, diagnosis, ethnicity, race, education level, and household income (i.e., socioeconomic status). In addition, participants were asked to provide information regarding their smoking/ENDS status and behaviors, attitudes, and risk perceptions, as well as their household and vehicle rules regarding smoking and vaping. All participants were asked to provide their consent prior to study enrollment. Approval from the Florida Institute of Technology Institutional Review Board (IRB) and The Scott Center for Autism Treatment was obtained prior to recruitment. Participants

were given the option to enter a drawing for a chance to win one \$50 gift card for completion of the survey.

Measures

Participants completed a 39-item online survey. Participants responded to an initial set of questions as described in Appendix A to first verify their eligibility to complete the survey. In addition, CPS participants were required to enter their pre-determined code at the beginning of the survey to later link their mental health diagnosis with their survey data. Core components of the survey included the following:

Demographics. Demographic characteristics of the participants included age, gender, race/ethnicity, socioeconomic status, education level, number of smokers/vapers residing in their home, and number of children living in their home. The participant's primary mental health diagnosis was extracted from their clinic record, or by self-report, and coded categorically. Psychiatric diagnoses were categorized into groups based on DSM-5 criteria and included: Psychotic Disorder and/or other comorbid disorder, Mood Disorder, Anxiety Disorder, Mixed Anxiety and Mood Disorder, Substance Use Disorder, Substance Use Disorder and other comorbid disorder, and Other.

Smoking/ENDS Status and History. Participants were asked about their past and current smoking/ENDS status, history of smoking/ENDS-related behaviors, and current smoking/ENDS status of individuals within their households. Standard questions from tobacco surveys were utilized (Tyc, Lensing, Vukadinovich, & Hovell, 2013; USDHHS, 2016). "Ever Smokers" are defined as those who have smoked at least 100 cigarettes within their lifetime and who do not currently smoke any tobacco product at the time of the survey as defined in the literature (USDHHS, 2016). Participants who

denied smoking at least 100 cigarettes within their lifetime and who do not currently smoke any tobacco product at the time of the survey are defined as “Never Smokers.” “Current Smokers” are defined as those who smoke cigarettes or other tobacco product “every day” or “some days” at the time of the survey. Participants who endorsed using e-cigarettes or ENDS at least once in their lifetime, but not within the previous 30 days are defined as “Ever ENDS Users.” “Current ENDS Users” are defined as those who reported using e-cigarettes or any ENDS product in their lifetime and within the previous 30 days. “Never ENDS Users” are defined as participants who denied ever using an e-cigarette or ENDS product at least once within their lifetime and who have not used ENDS in the previous 30 days.

Current smokers who did not currently use e-cigarettes/ENDS products were asked one question (i.e., “yes or no”) about their future intentions to use e-cigarettes/ENDS products within the next 3-6 months. In addition, participants were asked two questions about whether others within their homes smoke and/or use ENDS, as well as how many children reside within their households. Responses were categorized as 0 smokers/vapers, 1-2 smokers/vapers, and ≥ 3 smokers/vapers, and 0 children, 1-2 children, and 3 or more children, respectively. Lastly, for those participants who reported using ENDS products, three questions were included regarding nicotine levels.

Reasons for ENDS Use. Participants were asked about their reasons for ENDS use with items focused on management of physical and psychological symptoms. Participants were asked two questions regarding their reasons for smoking/ENDS use and was categorized as a “yes or no” response. “Yes” responses were followed by a question to list the specific symptoms the participant was attempting to manage. Participants who

responded affirmatively to both questions were asked to choose (i.e., 1 item) the most important reason for their smoking/ENDS use.

Perceptions of Health Risks Associated with ENDS. Participants were asked about their perceptions of harm from ENDS use, as well as the use of ENDS for smoking cessation. Items were adapted from the co-investigator's previous smoking research for the current study, with the authors' permission (Tyc, Lensing, Vukadinovich, & Hovell, 2013). Participants were asked four questions about risk perceptions and two questions regarding smoking cessation. The items were rated on either a 4-point Likert scale ranging from "Strongly Disagree to Strongly Agree," or a 3-point Likert scale with the options of "less harmful," "as harmful," or "more harmful." A total risk perception score was computed, with higher risk perception scores indicative of greater/stronger perceptions of harm from the use of ENDS.

Perceptions of Secondhand Vapor Exposure. Participants were asked about their perceptions of secondhand vapor exposure to others, including children. Items were adapted from the co-investigator's prior smoking research for the current study, with the authors' permission (Tyc et al., 2013). One item regarding secondhand vapor exposure to children and adults was asked utilizing a 3-point Likert scale (i.e., less harmful, as harmful, or more harmful). In addition, participants were asked three questions regarding perceived harms of secondhand vapor exposure to others, including children within their homes/vehicles. A total exposure score was computed, with higher scores indicative of greater/stronger perceptions of harm from exposure to ENDS.

Smoking/Vaping Restrictions/Bans. Participants were asked about their smoking/vaping rules/bans within their homes and vehicles as done in prior research

studies (Tyc et al., 2009). Smoking/vaping restrictions/bans were used as a proxy for exposure behaviors in the home and car settings. For the purposes of this study, a complete ban is defined as 100% smoke/vape free-home and vehicle, including no smoking of any tobacco product or use of ENDS inside the home and vehicle at any time. A partial ban is defined as smoking or the use of ENDS only allowed by certain individuals or at specific times (i.e., when children or other non-smokers/vapers are not present). No bans are defined as smoking/ENDS use is allowed anywhere or at any time within the home and vehicle. Ban status was totaled for traditional cigarette smoking, as well as for ENDS use. A combined ban total was then computed. Scoring for this measure was dichotomized as complete ban vs. a partial/no ban in the participants' homes and vehicles.

Study Design/Data Analysis

The current study utilized a cross-sectional design. Descriptive statistics, including means, standard deviations, and frequencies were calculated for participant demographics, the primary outcomes (prevalence of tobacco/ENDS use/dual use, attitudes/intentions to use ENDS, health risk perceptions, secondhand vapor exposure perceptions, and smoking/vaping bans), and all covariates. Chi square tests were utilized to assess for differences between groups for categorical variables. Due to the small sample size, when cells in the cross-tabulations were smaller than five and assumptions for the chi square tests were violated, Fisher's exact tests were conducted. Due to a non-normal distribution, Mann Whitney U tests were completed to compare risk perception scores between groups. Due to the nature of the study (i.e., exploratory), all analyses were

considered significant at the $p < .05$ level. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) - version 26.

Results

Participants

Demographic Variables. A total of 416 participants were approached for the study. Of these participants, 129 agreed to participate in the study (response rate= 0.31%). Of those who agreed to participate, 81 participants were excluded from the final sample for not completing the entire survey, missing data, or not meeting inclusion criteria (i.e., did not have a formal mental health diagnosis). The final sample consisted of 48 participants ($M_{age} = 33.04$ years, $SD = 12.64$, range= 18-67), including five men ($M_{age} = 33.2$ years, $SD = 13.18$, range= 20-55 years), 40 women ($M_{age} = 33.75$ years, $SD = 12.89$, range= 18-67 years), two participants who identified as Transgender ($M_{age} = 24.50$, $SD = 4.95$), and one participants who identified as “other.” Most of the participants were White/Caucasian ($n = 39$; 81.3%) and non-Hispanic/Latino ($n = 43$, 89.6%). Overall, participants reported having a college degree or higher ($n = 18$; 37.5%) and reported a household income of \$30,000-\$59,000 ($n = 12$; 34.3%). Additional demographic information can be found in Table 1.

Psychosocial Variables. Regarding psychosocial variables, 31.3% ($n = 15$) reported at least one smoker resided in their household while 43.8% ($n = 21$) lived with 1-2 e-cigarette users. Of participants who reported a spouse/partner, 45.8% ($n = 22$) indicated their partner does not currently use e-cigarettes. Most participants reported having no children (77.1%, $n = 37$) residing within their households. In terms of diagnostic classification, 35.4% ($n = 17$) individuals reported comorbid diagnoses, while

the remaining 64.6% ($n = 31$) reported a single diagnosis. Of the participants who reported a single diagnosis, 12.5% ($n = 6$) reported a Mood Disorder, followed by 6.3% ($n = 3$) with an Anxiety Disorder, 16.7% ($n = 8$) with a Mixed Anxiety and Mood Disorder, one participant reported a Psychotic Disorder (2.1%), two reported a Substance Use Disorder plus another mental health condition (4.2%), and 11 participants were placed into the Other category (22.9%) as their diagnosis did not fit within the primary diagnostic categories. In addition, 66.7% ($n = 32$) of participants “Strongly agreed/agreed” e-cigarettes could help them/others quit smoking. Similarly, 79.2% ($n = 38$) of participants “Strongly agreed/agreed” e-cigarettes could help them/others reduce the number of cigarettes they smoke.

Further analyses of psychosocial variables revealed a significant association between ENDS use status and number of smokers/vapers within their households. A greater proportion of ENDS users were significantly more likely to have one or more smokers and one or more vapers within their homes than non-ENDS users (Fisher’s exact test = 6.23, $p < .01$); (Fisher’s exact test = 11.54, $p < .001$) respectively. See Table 1 for additional psychosocial information.

Table 1

Demographic, Psychosocial, Mental Health-related, and Tobacco-related Variables by ENDS Use

Variable	ENDS User ($n = 35$) <i>M (SD)</i>	Non-ENDS User ($n = 13$) <i>M (SD)</i>	Total ($N = 48$) <i>M (SD)</i>	<i>t</i>
Age	32.37 (11.7)	34.85 (15.2)	33.04 (12.6)	-.598
	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	Fisher’s
Gender				1.00
Male	4 (11.4%)	1 (7.7%)	5 (10.4%)	

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Female	29 (82.9%)	11 (84.6%)	40 (83.3%)	
Transgender	2 (5.7%)	0 (0%)	2 (4.2%)	
Race				1.00
White/Caucasian	28 (80%)	11 (84.6%)	39 (81.3%)	
Asian	3 (8.6%)	1 (7.7%)	4 (8.3%)	
Biracial/Multiracial	3 (8.6%)	0 (0%)	3 (6.3%)	
Other	1 (2.9%)	1 (7.7%)	2 (4.2%)	
Ethnicity				0.304
Non-Hispanic/Latino	5 (14.3%)	0 (0%)	5 (10.4%)	
Hispanic/Latino	30 (85.7%)	13 (100%)	43 (89.6%)	
Education				1.00
High School or Less	5 (14.3%)	1 (7.7%)	6 (12.5%)	
Some College/College	18 (51.4%)	7 (53.8%)	25 (52.1%)	
Graduate Degree	12 (34.3%)	5 (38.5%)	17 (35.4%)	
Income (household)				0.522
<\$30,000	8 (22.9%)	8 (61.5%)	16 (33.3%)	
\$30,000-\$59,000	12 (34.3%)	1 (7.7%)	13 (27.1%)	
\$60,000-\$99,000	6 (17.1%)	1 (7.7%)	7 (14.6%)	
>\$100,000	9 (25.7%)	3 (23.1%)	12 (25%)	
Partner Vape Status				0.154
Yes	7 (20%)	0 (0%)	7 (14.6%)	
No	16 (45.7%)	7 (53.8%)	23 (47.9%)	
N/A	12 (34.3%)	6 (46.2%)	18 (37.5%)	
Vapers in Home				11.54*
0 Vapers	14 (40%)	13 (100%)	27 (56.3%)	
1 or More Vapers	21 (60%)	0 (0%)	21 (43.8%)	
Smokers in Home				6.23**
0 Smokers	20 (57.1%)	13 (100%)	33 (68.8%)	
1 or More Smokers	15 (42.9%)	0 (0%)	15 (31.3%)	
Children in Home				0.401
0 Children	29 (82.9%)	9 (69.2%)	38 (79.2%)	
1 or More Children	6 (17.1%)	4 (30.8%)	10 (20.8%)	
Diagnosis				1.00
Psychotic	1 (2.1%)	0 (0%)	1 (2.1%)	
Mood	6 (12.5%)	8 (61.5%)	21 (43.8%)	
Mixed Mood	8 (16.7%)	5 (38.5%)	22 (45.8%)	
Anxiety	3 (6.3%)	5 (38.5%)	18 (37.5%)	
Substance Use	0 (0%)	0 (0%)	2 (4.2%)	
Sub Use Plus	2 (4.2%)	1 (7.7%)	3 (6.3%)	
Other	11 (22.9%)	2 (15.4%)	13 (27.1%)	
Smoking Status				0.003*
Current Smoker	15 (42.9%)	0 (0%)	15 (31.3%)	
Ever Smoker	5 (14.3%)	1 (7.7%)	6 (12.5%)	
Non-Smoker	15 (42.9%)	12 (92.3%)	27 (56.3%)	
Vaping Status				<0.000

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Current Vaper	17 (48.6%)	0 (0%)	17 (35.4%)
Ever Vaper	18 (51.4%)	0 (0%)	18 (37.5%)
Non-Vaper	0 (0%)	13 (100%)	13 (27.1%)
Dual User			8 (16.7%)

Note. Significance levels applies to overall comparisons between ENDS users and non-ENDS users. ENDS users are participants who have current or past use of ENDS products; Non-ENDS users are those who have no current or past use of ENDS products. Frequencies may not add up to 100 due to participants' ability to choose more than one diagnostic category.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Rates of Smoking and ENDS Use. The sample was comprised of 42.9% ($n = 15$) current smokers, 48.6% ($n = 17$) current vapers, and 16.7% ($n = 8$) dual users. Of the total sample, 14.3% ($n = 5$) participants reported a history of cigarette use, with 51.4% ($n = 18$) reporting ever having tried e-cigarettes. In total, 72.9% of the sample had ever used an ENDS product, including current vapers ($n = 35$), while 27% ($n = 13$) had never used an ENDS product. Further analysis revealed 93.8% ($n = 45$) of participants were aware e-cigarettes contain nicotine. Of those who currently used ENDS, 41.7% ($n = 20$) agreed their e-liquid usually contains nicotine, ranging from 0.03% to a high of 5% or 35mg of nicotine. Intentions to vape were evaluated among current smokers only. Among current smokers with a mental health disorder, 26.7% ($n = 4$) endorsed they intend to vape within the next 3-6 months, compared to 73.3% ($n = 11$) who denied their intention to vape within the next 3-6 months. Refer to Table 1 for more information regarding vaping/smoking information.

Risk Perceptions Associated with ENDS. Risk perceptions were assessed by eight questions with total scores ranging from 8 (minimum) to 16 (maximum). The mean risk perception score was 13.64 ($SD = 1.82$) for the total sample. Overall, this is indicative

of higher risk perceptions regarding ENDS devices among this population, with a tendency to strongly agree/agree with items endorsing health risks associated with ENDS use. Most participants agreed with the belief that ENDS could be harmful to their health (91.7%, $n = 44$), with the majority endorsing “Strongly Agree” or “Agree” to the statement “Using electronic cigarettes or electronic vapor products is harmful to my health.” Similarly, most participants (66.7%, $n = 32$) endorsed “Strongly Agree” or “Agree” to the statement “Using electronic cigarettes or electronic vapor products around adults is harmful to their health.” When asked if “Using electronic cigarettes or electronic vapor products around infants or children is harmful to their health,” most participants (81.3%, $n = 39$) endorsed “Strongly Agree” or “Agree.” When examining ENDS users vs. non-ENDS users, no significant differences were found between ENDS users ($Md = 23.01$, $n = 35$) and non-ENDS users ($Md = 28.50$, $n = 13$) on health risk perception scores, $U = 175.50$, $z = -1.23$, $p = 0.22$, $r = 0.18$. Refer to Table 3 for more information regarding specific responses to risk perception items.

Regarding participants’ perceptions of secondhand vapor exposure, three items were used to calculate a total exposure score ranging from 3 (minimum) to 6 (maximum). The mean exposure perception score was 4.79 ($SD = 1.09$) for the total sample. Overall, this is indicative of low risk perceptions related to secondhand vapor exposure. Although most participants (83.3%, $n = 40$) “Strongly Agreed” or “Agreed” with the statement, “Inhaling vapors from electronic cigarettes or electronic vapor products can harm the health of adults and children,” most participants (66.7%, $n = 32$) “Strongly Disagreed” or “Disagreed” with the statement, “Breathing air from a room where people vaped **yesterday** can harm the health of adults and children.” A significantly greater proportion

of participants who disagreed with this statement about the risks of past vaping were ENDS users (77%) compared to those identified as non-ENDS users (38.5%), Fisher's exact test = 4.76, $p < .05$.

A comparison of ENDS users and non-ENDS users found significant group differences in risk perceptions associated with secondhand vapor exposure. Non-ENDS users ($Mdn = 31.50$, $n = 13$) had significantly higher exposure risk perception scores (i.e. secondhand vapor exposure was harmful) than ENDS users ($Mdn = 21.90$, $n = 35$), $U = 136.50$, $z = -2.19$, $p < .05$, $r = 0.32$. See Table 3 for additional information and specific responses to exposure perception items.

Table 3

Frequencies for Risk Perception Items and Associated ENDS User Status

Variable	ENDS User ($n = 35$)	Non-ENDS ($n = 13$)	Total ($N = 48$)	
	n (%)	n (%)	n (%)	Fisher's
Using e-cigarettes is harmful to my health				0.56
Agree	31 (88.6%)	13 (100%)	44 (91.7%)	
Disagree	4 (11.4%)	0 (0%)	4 (8.3%)	
Using e-cigarettes around adults is harmful to their health				0.17
Agree	21 (60%)	11 (84.6%)	32 (66.7%)	
Disagree	14 (40%)	2 (15.4%)	16 (33.3%)	
Using e-cigarettes around kids are harmful to their health				1.00
Agree	28 (80%)	11 (84.6%)	39 (81.3%)	
Disagree	7 (20%)	2 (15.4%)	9 (18.7%)	
Inhaling vapor from e-cigs can the health of adults and children				1.00
Agree	29 (82.9%)	11 (84.6%)	40 (83.3%)	

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Disagree	6 (17.1%)	2 (15.4%)	8 (16.7%)	
Breathing air in a room where people vaped yesterday can harm health of adults and kids				4.76*
Agree	8 (22.9%)	8 (61.5%)	16 (33.3%)	
Disagree	27 (77.1%)	5 (38.5%)	32 (66.7%)	
Breathing air in a car where people vaped can harm the health of adults and children				0.09
Agree	19 (54.3%)	11 (84.6%)	30 (62.5%)	
Disagree	16 (45.7%)	2 (15.4%)	18 (37.5%)	
E-cigarettes are less harmful to me than regular cigarettes				0.52
Agree	21 (60%)	6 (46.2%)	27 (56.3%)	
Disagree	14 (40%)	7 (53.8%)	21 (43.8%)	
Breathing vapors from e-cigs is less harmful than breathing cigarette smoke				1.00
Agree	22 (62.9%)	8 (61.5%)	30 (62.5%)	
Disagree	13 (37.1%)	5 (38.5%)	18 (37.5%)	

Note: Responses were combined into ‘Disagree/Strongly Disagree’ and ‘Agree/Strongly Agree’ for analyses. * $p < 0.05$

Hypothesis 1

Hypothesis 1.1. For analytic purposes, and due to a small sample size, participants were grouped into the following categories: ENDS users and Non-ENDS users. ENDS users were defined as individuals who currently use or have ever used an ENDS product irrespective of smoking status, including current ENDS users, former ENDS users, current smokers who have used ENDS in the past, former smokers who have used ENDS in the past, non-smokers who have used ends in the past, and dual users. Non-ENDS users were defined as individuals who have never used ENDS products,

irrespective of smoking status, and includes current smokers, former smokers, non-smokers, and non-vapers.

To examine whether individuals with mental health disorders perceived the use of ENDS as less harmful than combustible cigarettes, Chi square or Fisher's exact testing was conducted. Participants were asked the following statement "Use of e-cigarettes or electronic vapor products is ____." Responses were chosen on a three-point scale and included "Less Harmful," "As Harmful," and "More Harmful," than traditional cigarettes. Results indicated a significantly greater proportion of participants perceived e-cigarettes as less harmful ($n=27$; 56.3%) compared to the proportion of participants who perceived e-cigarettes as equally harmful ($n=19$; 39.6%) or more harmful ($n=2$; 4.2%) than traditional cigarettes, $\chi^2(2, n= 48) = 20.38, p < .001$.

Additional analyses were conducted to examine the association between ENDS use status and perceptions of harm associated with e-cigarettes compared to traditional cigarettes. Participants were grouped into ENDS user and Non-ENDS user categories and percentages were computed for each. Within this study, it was found that 72.9% ($n= 35$) participants were ENDS users and 27.1% ($n= 13$) were Non-ENDS users. Results indicated no significant association between ENDS use and perceptions of risk associated with e-cigarettes when compared to traditional cigarettes (Fisher's exact test, $p=0.45$). Refer to Table 3 for more information regarding perceptions of harm and ENDS use.

Hypotheses 1.2. Frequencies for participants' reasons for using ENDS products can be found in Table 2. Of the participants who reported ENDS use for physical and psychological symptom management, 34.3% ($n= 12$) reported psychological symptom management as their most important reason for smoking/vaping, compared to the 5.7%

($n = 2$) participants who indicated physical symptom management as most important.

Specific psychological symptoms reported by participants included, but were not limited to, management of anxiety, depression, drug addiction, insomnia, Attention-Deficit/Hyperactivity Disorder (ADHD), racing thoughts, panic attacks, nervousness, stimulation, and feeling uneasy. Specific physical symptoms reported by participants included, but were not limited to, management of chronic pain, migraines, headaches, pain in the hands and feet, back and neck pain, and pinched nerves.

Table 2

Frequencies of Reasons for ENDS Use Among Adults with Mental Health Disorders

Vaping Variable	ENDS Use ($n = 35$)
Reasons for Vaping	
Physical	2 (5.7%)
Psychological	16 (45.7%)
Both	2 (5.7%)
Most Important	
Physical	2 (5.7%)
Psychological	12 (34.3%)

Note. Frequencies may not add up to 100 due to participants' ability to choose N/A if they did not vape for physical or psychological reasons, or they chose more than one option.

Hypothesis 2

Hypothesis 2.1. To investigate if individuals with mental health disorders view secondhand vapor as less harmful than secondhand exposure to traditional cigarettes, chi square testing and Fisher's exact tests was conducted. Participants were asked the following question "Use of e-cigarettes or electronic vapor products is _____," and they

were able to choose from a 3-point scale ranging from “Less Harmful,” “As Harmful,” and “More Harmful,” to children and adults around them than traditional cigarettes.

Results indicated a significantly greater proportion of adults with mental health disorders perceived secondhand vapor as “less harmful” to adults and children around them than secondhand exposure to traditional cigarette smoke ($n = 30$; 62.5%), compared to the proportion of adults with mental health disorders who view secondhand vapor as “equally harmful” ($n = 16$; 33.3%) or “more harmful” ($n = 2$; 4.16%) than secondhand smoke, $\chi^2(2, n = 48) = 24.5, p < .001$.

For analytic purposes, and due to a small sample size, participants were identified as ENDS users or non-ENDS users for group comparisons for the same question. ENDS users were defined as individuals who currently use or have used an ENDS product. Non-ENDS users were defined as individuals who do not currently use or have ever used an ENDS product. Results showed no significant association between ENDS use status (i.e., ENDS user vs. non-ENDS user) and perceived harm regarding secondhand vapor exposure to others (Fisher’s exact test = 0.73, $p > .10$).

Hypothesis 2.2. Rates of bans were assessed by asking participants to report rules within their households and vehicles regarding restrictions on smoking and/or vaping behaviors, as done in prior studies (Tyc et al., 2013). Responses were categorized into complete bans or a partial/no ban. A complete ban was defined as 100% smoke and vape-free homes and vehicles. A partial ban was defined as smoking or the use of ENDS by certain individuals and/or only at specific times. No ban was defined as smoking/ENDS use allowed anywhere at any time within the home/vehicle. Ban status was computed for both smoking and ENDS use, and a total ban score was computed and dichotomized as

complete ban vs. partial/no ban for analyses. Descriptive frequencies for rates of bans within the home and vehicle can be found in Table 4.

To examine if those with mental health disorders were more likely to expose children and others to secondhand smoke and/or vapors at higher rates (i.e., less likely to restrict or ban smoking/vaping) than rates reported in previous studies, rates of bans were computed for the current study and compared to the general population. Results indicate most participants with mental health disorders have a complete ban (93.7%, $n = 45$) on smoking within the home and 6.3% ($n = 3$) have a partial ban on smoking within the home. No participants reported that they allow smoking (no ban) in the home. Regarding vehicle smoking bans, 72.9% ($n = 35$) of participants reported a complete smoking ban in the car, followed by 22.9% ($n = 11$) with a partial smoking ban. No participants reported that they allow smoking (no ban) in the vehicle. Regarding vaping bans in the home, most participants reported complete vaping bans in the home (52.1%, $n = 25$), followed by a partial vaping ban (25%, $n = 12$), and no vaping bans (20.8%, $n = 10$). Similarly, most participants reported a complete ban on vaping in their vehicles (43.8%, $n = 21$), followed by a partial vaping ban (27.1%, $n = 13$), and no vaping bans (25%, $n = 12$).

To compare ban rates within this current study to ban rates within the general population, response options were dichotomized into complete bans vs. partial/no bans. For the complete household ban analysis, our study rate of 93.8% was compared to a previously published rate of 83.0% of the U.S. population who completely banned smoking within their homes from 2010-2011, as published by the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) (King, Patel, & Babb, 2014). Rates of complete smoking bans among adults with mental health disorders are

significantly higher than general population rates, $\chi^2(1, n= 45) = 3.93, p < .05$. In addition, the current study rate of complete smoking bans within the vehicle (72.9%) among adults with mental health disorders was compared to a previously published rate of 78.1% of the U.S. population who completely banned cigarette smoking within their cars, as stated in the National Adult Tobacco Survey (Kruger, Jama, Homa, Babb, & King, 2015). Rates of complete smoking bans within vehicles among adults with mental health disorders are comparable to general population rates, $\chi^2(1, n= 35) = .723, p = .395$.

Similarly, to compare rates of vaping bans in homes and vehicles among adults with mental health disorders to the general population, rates of bans were computed for the current sample and compared to previously published studies. For analysis purposes, ban status was dichotomized into complete vaping ban vs. partial/no vaping ban. For the household ban analysis, our finding of 52.1% of participants who completely ban vaping within their homes was compared to a published rate of 83.0% of the U.S. population who completely banned smoking within their home (King, Patel, & Babb, 2014). In addition, our rate of 52.1% was also compared to a published rate of 28.5% of the U.S. population who completely banned vaping within their homes as published in the 2016 International Tobacco Control Four Country Smoking and Vaping Survey (Nahhas et al., 2019). For the household ban analysis, rates of complete vaping bans within the homes of those with mental health disorders were significantly lower than complete smoking bans in the homes of the U.S. population, $\chi^2(1, n= 48) = 29.59, p < .001$, but were significantly higher than the rates of vaping/e-cigarette bans in the homes of the U.S. population, $\chi^2(1, n= 48) = 13.36, p < .001$. For the vehicle ban analysis, our rate of 43.8% ($n = 21$) adults with mental health disorders who completely ban vaping within their vehicles was

compared to a previously published rate of 78.1% of the U.S. population who completely banned smoking within their vehicles, as stated in the 2012-2013 National Adult Tobacco Survey (Kruger, Jama, Homa, Babba, & King, 2015). Rates of complete vaping bans within those with mental health disorders' vehicles is significantly lower than the rates of the general U.S. population who completely ban smoking within their vehicles, $\chi^2(1, n=46) = 28.05, p < .001$. Currently, to our knowledge, there are no published rates of complete vaping bans within vehicles among the U.S. population. Refer to Table 4 for more information regarding smoking and vaping bans obtained by this study.

Table 4

Frequency of Smoking and Vaping Bans

Variable	Total Sample ($N = 48$)
	n (%)
Smoking ban (home)	
Complete ban	45 (93.8%)
Partial ban	3 (6.3%)
No ban	0 (0%)
Smoking ban (vehicle)	
Complete ban	35 (72.9%)
Partial ban	11 (22.9%)
No ban	0 (0%)
N/A	2 (4.2%)
Vaping ban (home)	
Complete ban	25 (52.1%)
Partial ban	12 (25%)
No ban	10 (20.8%)
N/A	1 (2.1%)
Vaping ban (vehicle)	
Complete ban	21 (43.8%)
Partial ban	13 (27.1%)
No ban	12 (25%)
N/A	2 (4.2%)

Note. N/A refers to restrictions within the home (i.e., treatment facility) which prevents smoking/vaping, or N/A refers to participants with no car/truck.

Further analysis revealed adults with mental health disorders are significantly more likely to initiate a complete ban on *smoking* within the car than a complete ban on *vaping*, (Fisher's exact test = 9.85, $p < .001$). However, results indicate those with mental health disorders who have a complete ban on *smoking* in the home are comparable to those who completely ban *vaping* within the home, (Fisher's exact test, $p = 1.0$). In addition, those with mental health disorders are significantly more likely to implement a complete *smoking* ban in the home and car, as opposed to a complete *vaping* ban in the home and the car, (Fisher's exact test = 9.47, $p < .001$). Further analyses revealed those with mental health disorders are significantly more likely to have a complete *vaping* ban in their homes than in their vehicles, (Fisher's exact test = 15.04, $p < .001$). However, participants' rates of complete *smoking* bans within the home are comparable to their complete *smoking* bans within their vehicles, (Fisher's exact test, $p = 0.58$). Refer to Table 5 for more information regarding smoking/vaping bans based on location (i.e., home or vehicle).

Table 5

Frequency of Smoking and Vaping Bans by Location (Home and Vehicle)

Variable	Total Sample ($N = 48$)
	n (%)
Home ban	
Complete smoking and vaping ban	24 (50%)
Complete smoking ban only	45 (93.8%)
Complete vaping ban only	25 (52.1%)
No/partial smoking and vaping ban	1 (2.1%)
Vehicle ban	
Complete smoking and vaping ban	21 (43.8%)

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Complete smoking ban only	35 (72.9%)
Complete vaping ban only	21 (43.8%)
No/partial smoking and vaping ban	11 (22.9%)
Smoking ban	
Complete home and vehicle ban	33 (68.8%)
Complete home ban only	11 (22.9%)
Complete vehicle ban only	2 (4.2%)
No/partial home and vehicle ban	0 (0%)
Vaping ban	
Complete home and vehicle ban	18 (37.5%)
Complete home ban only	6 (12.5%)
Complete vehicle ban only	3 (6.3%)
No/partial home and vehicle ban	19 (39.6%)

Note. Some participants may have neglected to provide information on bans or ban status may not have been applicable to them, such that the frequencies may not reflect the entire sample.

Hypothesis 2.3. To examine the relationship between perceptions of risk and behavioral restrictions (i.e., home and vehicle vaping bans), Chi square testing, Fisher’s exact testing, and Mann-Whitney U tests were conducted. For analytic purposes, vaping ban status was dichotomized into two groups defined as complete ENDS bans vs. partial/no ENDS bans. Results indicated no significant differences in risk perception score between participants who implemented a complete vaping ban in their home ($Mdn= 25.16$, $n= 25$) to those who reported a partial/no vaping ban in their home ($Mdn= 22.68$, $n= 22$), $U= 246$, $z= -.63$, $p= .53$, $r= .09$ Likewise, risk perception scores were similar between those who implemented a complete vaping ban in their car ($Mdn= 26.4$, $n=21$) to those who reported a partial/no vaping ban in their car ($Mdn= 21.06$, $n=25$), $U= 201.5$, $z = -1.37$, $p= .17$, $r = 0.2$.

In addition, individual risk perception items were analyzed to examine the association between perceived risk (i.e., health, exposure) and ban status. For analytic purposes, risk perception item responses were dichotomized into “Strongly Disagree/Disagree” and “Strongly Agree/Agree.” Ban status was dichotomized into complete ENDS bans vs. partial/no ENDS bans within the home and vehicle. Results indicated no significant association between ban status and level of agreement with individual risk perception items (all p 's >.10). However, compared to those who reported complete bans, participants with partial/no bans in their homes and vehicles were significantly more likely to agree or strongly agree that e-cigarettes could help them/others reduce the number of cigarettes they smoked, (Fisher's exact test= 0.03, p < .05). Refer to Table 6 for responses to specific risk perception items and corresponding ban status.

Table 6

Frequencies for Risk Perception Items and Associated ENDS Ban Status

Variable	Sample ($N = 48$) n (%)	Complete ($n = 25$) n (%)	Partial/ No ($n = 22$) n (%)	Fisher
Using e-cigs can harm my health				0.14
Agree	44 (91.7%)	18 (37.5%)	24 (50%)	
Disagree	4 (8.3%)	0 (0%)	4 (8.3%)	
Using e-cigs around adults is harmful to their health				0.12
Agree	32 (66.7%)	15 (31.3%)	16 (33.3%)	
Disagree	16 (33.3%)	3 (6.3%)	12 (25%)	
Using e-cigs around infants is harmful to their health				0.45
Agree	39 (81.3%)	16 (33.3%)	21 (43.8%)	
Disagree	9 (18.8%)	2 (4.2%)	7 (14.6%)	

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Inhaling vapor from e-cigs can harm the health of adults and kids				0.45
Agree	40 (83.3%)	16 (33.3%)	22 (45.8%)	
Disagree	8 (16.7%)	2 (4.2%)	6 (12.5%)	
Breathing air in a room where people vaped yesterday can harm the health of adults and children				0.53
Agree	16 (33.3%)	7 (14.6%)	8 (16.7%)	
Disagree	32 (66.7%)	11 (22.9%)	20 (41.7%)	
Breathing air in a car where people vaped can harm the health of adults and kids				0.36
Agree	30 (62.5%)	13 (27.1%)	16 (33.3%)	
Disagree	18 (37.5%)	5 (52.1%)	12 (25%)	
E-cigarettes could help quit smoking regular cigarettes				0.75
Agree	32 (66.7%)	11 (22.9%)	19 (39.6%)	
Disagree	16 (33.3%)	7 (14.6%)	9 (18.8%)	
E-cigarettes could help reduce number of cigarettes smoked				0.03*
Agree	38 (79.2%)	11 (22.9%)	25 (52.1%)	
Disagree	10 (20.8%)	7 (14.6%)	3 (6.3%)	

Note. Responses were combined into Strongly Agree/Agree and Strongly Disagree/Disagree for analyses; Ban status was categorized as Complete Ban vs. Partial/No Ban. Percentages may not add up to 100 due to missing values, and/or ban status was not applicable for every participant.

* $p < .05$.

Hypothesis 3

Hypothesis 3.1. To examine factors associated with health risk perceptions of ENDS use and perceptions of harm related to secondhand vapor exposure from ENDS, frequencies of variables (i.e., demographic, psychosocial, mental health, and tobacco-related) were compared to participants' smoking/vaping status. For analytic purposes, as well as small sample size, participants were grouped into High and Low health risk

perception groups, as well as High and Low exposure risk perception groups. The health risk perception groups were determined by a median split of the scores obtained on the health risk perception measure for the total sample ($Mdn. = 14$). Participants who scored a 14 or lower were placed into the low health risk group and those who scored a 15 or higher were placed in the high health risk group. Similarly, the exposure risk perception groups were determined by a median split of the scores obtained on the exposure risk perception measure for the total sample ($Mdn. = 5$). Participants who scored a 4 or lower were placed into the low exposure risk perceptions group, and those who scored a 5 or higher were placed into the high exposure risk perceptions group.

Of the demographic variables assessed for the health risk perception items, participants' race (Fisher's exact test, $p= 0.71$), ethnicity (Fisher's exact test, $p= 0.64$), household income (Fisher's exact test, $p= 0.71$), and education (Fisher's exact test, $p= 0.34$) were not significantly associated with health risk perceptions. However, a significant proportion of females had higher health risk perceptions related to ENDS use than males and those who identified as Transgender (Fisher's exact test= 0.006 , $p< .001$). Further analysis of psychosocial and tobacco-related variables revealed number of vapers in the home (Fisher's exact test, $p= 0.56$), number of smokers in the home (Fisher's exact test, $p= 0.52$), and number of children in the home (Fisher's exact test, $p= 0.47$) were also not significantly related to health risk perceptions associated with ENDS. Refer to Table 7 for more information regarding variables associated with health risk perceptions.

To further investigate variables associated with risk perceptions associated with secondhand vapor exposure, participants were dichotomized into High and Low secondhand vapor exposure risk perception groups and Fisher's exact tests were

conducted. No significant associations were found for exposure perceptions related to secondhand vapor and demographic/tobacco-related variables, including: number of smokers in the home (Fisher's exact test, $p= 1.00$), number of vapers in the home (Fisher's exact test, $p= 0.07$), diagnosis (Fisher's exact test, $p= 0.36$), gender (Fisher's exact test, $p= 0.83$), and number of children in the home (Fisher's exact test, $p= 1.00$). Refer to Table 8 for more information regarding specific variables related to exposure risk perceptions.

Table 7

Variables Associated with Health Risk Perceptions Among Adults with Mental Health Disorders

Variable	Health Risk Low (n= 18) <i>n (%)</i>	Health Risk High (n= 30) <i>n (%)</i>	Total <i>N= 48</i> <i>n (%)</i>	Fisher's
Gender				0.006*
Male	5 (27.8%)	0 (0%)	5 (10.4%)	
Female	13 (72.2%)	27 (90%)	40 (83.3%)	
Transgender	0 (0%)	2 (6.7%)	2 (4.2%)	
Race				0.71
White/Caucasian	14 (77.8%)	25 (83.3%)	39 (81.3%)	
Other	4 (22.2%)	5 (16.7%)	9 (18.8%)	
Ethnicity				0.64
Non-Hispanic	17 (94.4%)	26 (86.7%)	43 (89.6%)	
Hispanic/Latino	1 (5.6%)	4 (13.3%)	5 (10.4%)	
Education				0.34
High School or Less	4 (22.2%)	2 (6.7%)	6 (12.5%)	
Some College/College	8 (44.4%)	17 (56.7%)	25 (52.1%)	
Graduate Degree	6 (33.3%)	11 (36.7%)	17 (35.4%)	
Income (household)				0.71
<\$30,000	5 (27.8%)	11 (36.7%)	16 (33.3%)	
\$30,000-\$59,000	5 (27.8%)	8 (26.7%)	13 (27.1%)	
\$60,000-\$99,000	4 (22.2%)	3 (10%)	7 (14.6%)	

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>\$100,000	4 (22.2%)	8 (26.7%)	12 (25%)	
Partner Vape Status				0.603
Yes	0 (0%)	7 (23.3%)	7 (14.6%)	
No	0 (0%)	23 (76.7%)	23 (47.9%)	
Vapers in Home				0.56
0 Vapers	9 (50%)	18 (60%)	27 (56.3%)	
1 or More Vapers	9 (50%)	12 (40%)	21 (43.8%)	
Smokers in Home				0.52
0 Smokers	11 (61.1%)	22 (73.3%)	33 (68.8%)	
1 or More Smokers	7 (38.9%)	8 (16.7%)	15 (31.3%)	
Children in Home				0.47
0 Children	13 (72.2%)	25 (83.3%)	38 (79.2%)	
1 or More Children	5 (27.8%)	5 (16.7%)	10 (20.8%)	
Diagnosis				0.76
One Diagnosis	10 (55.6%)	19 (63.3%)	29 (60.4%)	
Two or More	8 (44.4%)	11 (36.7%)	19 (39.6%)	

Note. Frequencies may not add up to 100 due to missing data/participants' ability to choose more than one response option. * $p < .001$.

Table 8

Variables Associated with Risk Perceptions of Secondhand Vapor Exposure Among Adults with Mental Health Disorders

Variable	Exposure Risk		Total	Fisher
	Low (n= 18) <i>n (%)</i>	High (n = 30) <i>n (%)</i>	<i>N= 48</i> <i>n (%)</i>	
Gender				0.83
Male	2 (11.1%)	3 (10%)	5 (10.4%)	
Female	15 (83.3%)	25 (83.3%)	40 (83.3%)	
Transgender	0 (0%)	2 (6.7%)	2 (4.2%)	
Race				0.71
White/Caucasian	14 (77.8%)	25 (83.3%)	39 (81.3%)	
Other	4 (22.2%)	5 (16.7%)	9 (18.8%)	
Ethnicity				0.06
Non-Hispanic	14 (77.8%)	29 (96.7%)	43 (89.6%)	
Hispanic/Latino	4 (22.2%)	1 (3.3%)	5 (10.4%)	
Education				0.051
High School or Less	5 (27.8%)	1 (3.3%)	6 (12.5%)	
Some College/College	8 (44.4%)	17 (56.7%)	25 (52.1%)	
Graduate Degree	5 (27.8%)	12 (40%)	17 (35.4%)	
Income (household)				0.99
<\$30,000	6 (33.3%)	10 (33.3%)	16 (33.3%)	

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\$30,000-\$59,000	5 (27.8%)	8 (26.7%)	13 (27.1%)	
\$60,000-\$99,000	3 (16.7%)	4 (13.3%)	7 (14.6%)	
>\$100,000	4 (22.2%)	8 (26.7%)	12 (25%)	
Partner Vape Status				0.66
Yes	3 (16.7%)	4 (13.3%)	7 (14.6%)	
No	7 (38.9%)	16 (53.3%)	23 (47.9%)	
Vapers in Home				0.07
0 Vapers	7 (38.9%)	20 (66.7%)	27 (56.3%)	
1 or More Vapers	11 (61.1%)	10 (33.3%)	21 (43.8%)	
Smokers in Home				1.00
0 Smokers	12 (66.7%)	21 (70%)	33 (68.8%)	
1 or More Smokers	6 (33.3%)	9 (30%)	15 (31.3%)	
Children in Home				1.00
0 Children	14 (77.8%)	24 (80%)	38 (79.2%)	
1 or More Children	4 (22.2%)	6 (20%)	10 (20.8%)	
Diagnosis				0.36
One Diagnosis	9 (50%)	20 (66.7%)	29 (60.4%)	
Two or More	9 (50%)	10 (33.3%)	19 (39.6%)	

Note. Frequencies may not add up to 100 due to missing data/participants' ability to choose more than one response option. *All *p* values >.05.

Discussion

The literature, to date, has conclusively shown evidence for short-term and long-term health risks associated with tobacco and cigarette use among the U.S. general population (Kasza et al., 2017). Research is now beginning to show evidence of health risks associated with ENDS use, including respiratory and cardiac illnesses (USDHHS, 2016). Despite the emerging research, 12.6% of U.S. adults have experimented with ENDS and 40.5% of current smokers use ENDS daily (Wang et al., 2018). These numbers are even higher for adults with mental health disorders; 14.8% use ENDS daily compared to 6.6% of the general population (Pratt et al., 2016; Steinberg, Williams, & Li, 2015). Our study results are consistent with these higher figures as 42.9% of our sample were current smokers, 48.6% were current vapers, and 16.7% were dual users. In fact,

almost 72.9% of the study sample currently use e-cigarettes or ENDS products or had done so in the past. Among current smokers who did not use an ENDS product at the time of this survey, 26.7% reported intentions to use ENDS products within the next 3-6 months. These high rates of ENDS use among adults with mental health disorders suggest an at-risk population that warrants interventions to address their smoking and vaping behaviors.

The reasons adults with mental health disorders use ENDS products at high rates may partially be explained by their positive expectancies regarding ENDS use. Our study found that among participants who used ENDS products, 45.7% reported use of ENDS for psychological symptom management. Most participants reported attempting to manage their anxiety, depression, feelings of nervousness/unease, ADHD, and problems related to substance use by using ENDS. In fact, most of the participants in the sample reported self-diagnoses of a mood disorder (12.5%), an anxiety disorder (6.3%), or a mixed mood and anxiety disorder (16.7%). These diagnostic rates are higher than those cited in previous studies (Pratt et al., 2016; Steinberg, Williams, & Li, 2015), although a mood disorder has been most consistently associated with ENDS use (Cummins et al., 2014). The majority (66.7%) of our sample agreed e-cigarettes could help them/others quit smoking cigarettes, and 79.2% agreed e-cigarettes could help them/others reduce the number of cigarettes they smoke. Interventions should address the reasons for ENDS use in conjunction with providing alternative behavioral strategies (i.e., mood regulation and anxiety management) to reduce psychological symptoms that those with mental health disorders are attempting to manage through use of these products. Psychoeducation about

the lack of definitive evidence regarding ENDS as a cessation tool should also be provided (Siu & U.S. Preventive Services Task Force (USPSTF), 2015). In addition, facilities in which these individuals reside or receive treatment (i.e., psychiatrists and hospitals) can play a larger role in offering prevention and treatment services focused on smoking and ENDS use for this high-risk population.

Although rates of ENDS use among adults with mental health disorders are higher than the general population and are steadily increasing, study results found most participants (91.7%) perceived that use of ENDS products *could be* harmful to their health. However, adults with mental health disorders were more likely to perceive e-cigarettes as less harmful than traditional cigarettes. Furthermore, when examining risk perceptions regarding secondhand vapor exposure to adults and children, participants perceived secondhand vapor exposure as less harmful to others than traditional cigarette smoke. However, no significant associations were found between ENDS use and perceptions of health risk or secondhand exposure risk compared to traditional cigarettes. It should be noted that participants identified as non-ENDS users in our study may have also been current or past smokers. Therefore, lower perceptions of risk are not surprising given the demonstrated inverse relationship between product use and perceived risk. Future studies that employ a larger sample size and compare current product users to those who have never smoked or vaped may lead to a better understanding of the relationship between risk perception and product use.

This study also sought to determine risk factors associated with health risk perceptions and perceptions of harm related to secondhand vapor exposure. However, the

results indicated very few significant associations between demographic, psychosocial, and tobacco-related variables and risk perceptions that are common in the literature (Cummins et al., 2014; Glover et al., 2018; Hefner et al., 2017 Wang et al., 2018).

Interestingly, females in our study were more likely to have higher health risk perceptions about ENDS use than males and transgender individuals, suggesting that males and transgender individuals should be targeted for messaging about health risks associated with use of ENDS products. Although a variable of interest in our study, we were unable to evaluate the impact of mental health diagnoses on selected outcome measures, such as health risk perceptions, due to the limited variability in diagnostic groups and the presence of comorbid disorders in a small sample. Additionally, the diagnoses provided were based on the participants' self-report and could not be objectively verified. In light of these limitations, it is difficult to determine whether smoking/vaping interventions designed for the general population will be equally effective with those with mental health disorders or whether tailored interventions may be necessary to address those unique factors that impact their perceptions and associated smoking/vaping behaviors.

To our knowledge, no studies to date have examined bans on ENDS products in the homes and vehicles of adults with mental health disorders, even though previous research has shown smoking restrictions in the home/vehicle reduce exposure of secondhand smoke to non-smokers and children (Tyc et al., 2013). Although study participants generally agreed ENDS vapors can harm adults (66.7%) and children (81.3%) around them, only 52.1% of participants had a complete ban on ENDS use in the home, and 43.8% had a complete ban on ENDS use in the vehicle. Over half of the

sample (58.3%) had partial/no bans on ENDS use in the home and the vehicle.

Consequently, adults with mental health disorders are likely to expose children and others to secondhand vapors within their homes and vehicles. In fact, our study found those with mental health disorders have significantly lower complete bans on ENDS use in the home when compared to the general population (King, Patel, & Babb, 2014). In addition, rates of complete vaping bans in the vehicles of those with mental health disorders are significantly lower than complete smoking bans in the vehicles of the general population (Kruger, Jama, Homa, Babb, & King, 2015). Furthermore, adults with mental health disorders are more likely to have complete smoking bans in their homes and cars, when compared to complete vaping bans (Nahhas et al., 2019).

The tendency for adults with mental health disorders to not implement vaping bans within their homes and vehicles (i.e. expose others to secondhand vapors) places adults and children who reside and travel with them at risk for future health problems, although the long-term health effects of ENDS use are not yet fully known. Therefore, establishment of restrictions or bans in one's homes and vehicles is necessary to protect the health of others and should be a topic of focus included in ENDS education programs and public health messaging. In addition, restrictions on ENDS use in facilities where many adults with mental health disorders reside may help reduce the number of individuals who initiate ENDS use, as well as decrease their exposure to secondhand vapors.

Limitations and Areas for Future Research

There are several limitations regarding the current study. First, the study was based on convenience sampling within a local outpatient community mental health center, as well as via the internet, in which the results relied upon self-report. Similarly, the sample size of the study was small, thus compromising the generalizability of the study. Methodologically, the cross-sectional design of the study limited the evaluation of ENDS use over time, as well as the association between sustained use and the participants' continued perceptions of ENDS use. Furthermore, items utilized for perceptions of secondhand vapor exposure, as well as for smoking bans within the home and vehicle of this population are widely understudied, such that the items utilized in this study have not been extensively tested in prior research. Likewise, due to the non-normal distribution of scores, non-parametric analyses had to be conducted and statistical power may have been reduced. Similarly, the grouping of ENDS users vs. non-ENDS users included a varied smoking/vaping status within the groups, limiting the sensitivity of analyses comparing current smokers, current vapers, dual users, etc. Lastly, as discussed in prior research, the heterogeneity in the use and design of ENDS combined with the various behaviors by ENDS users may have impacted the primary outcomes. Future research is needed to address these limitations with studies that include larger sample sizes across mental health facilities, more standardized procedures on exposure to secondhand vapor, and assessment of perceptions of ENDS use by psychiatric and psychological professionals who work with these vulnerable populations. This study

addressed some gaps within the literature and sets the stage for future studies on risk factors associated with ENDS use for those most at risk.

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Appendix

ENDS Survey

INFORMED CONSENT

Attitudes and Risk Perceptions of Electronic Nicotine Delivery Systems (ENDS) Use Among Adults with Mental Health Disorders

Principal Investigator: Alexis L. Booth
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Co-Investigator: Vida L. Tyc, Ph.D.

Please read this consent document carefully before you decide to participate in this study.

Purpose of the Study

This study is being conducted to learn more about whether adults, age 18 years or older, with a mental health diagnosis, use e-cigarettes and to identify factors related to their use. E-cigarettes are battery-operated devices that are like a cigarette, but do not involve the burning of tobacco. They are also known as vape pens, e-cigars, vapes, e-cigs, and other names. If you do not use e-cigarettes, we will ask for your opinions about them. This information will be used to design future interventions to help adults with mental health problems to learn ways to prevent smoking and the use of e-cigarettes.

Procedures involved in the Research

This study will ask you to complete a survey which consists of questions about your past and current smoking/vaping behaviors, reasons for your use of these products, and your perceptions of health risks related to these products. In addition, the survey will ask about your rules about smoking/vaping in your home and vehicle. It is estimated that this survey will take approximately 15-20 minutes to complete.

Potential Harms, Risks, or Discomforts

The risks of participating in this study are minimal and unlikely. However, you will be asked questions about your smoking and vaping behaviors, which you may find stressful. You are free to discontinue the survey at any time. While it is unlikely, there is a risk of loss of privacy. We will keep your study records private and confidential. The data you enter will be kept in a database that only the current researchers will have access to. Since personal, identifiable information is not collected, there will be no way of identifying you personally. We have taken steps in this study to help you feel safe and willing to report sensitive behaviors related to

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tobacco and e-cigarette use. By signing this consent form, you are agreeing to participate in this study after being informed of the potential harms, risks, or discomforts.

Potential Benefits

There may be no direct benefits to you by taking part in this study. However, the information received from this study will be used to develop interventions that may help you and others in the future.

Payment or Reimbursement

You will be given the choice at the end of the survey to be entered into a drawing to win one \$50 gift card.

Confidentiality

Your name will not be collected as a part of this study. The information collected from this survey will be entered into a HIPAA-compliant database and all personal information will be de-identified. The data will be saved in a way such that there will be minimal risk of breaching confidentiality.

Participation

Participation in this study is **voluntary** and there is no penalty for not participating. You may refuse to answer any of the questions we ask you. You have the right to withdraw from the study at any time without consequences to you. If you decide to withdraw, the information provided by you will not be retained.

Information about Participating as a Study Subject

If you have questions or require more information about the study itself, please contact Alexis Booth (principal investigator) via email (aboorth2016@my.fit.edu).

This study has been reviewed and approved by the Institutional Review Board. If you have concerns or questions about your rights as a participant or about the way the study is conducted, you may contact:

Institutional Review Board Office

Dr. Jignya Patel, Chair IRB

School of Psychology

150 West University Blvd

Melbourne, FL 32901

(Phone): 321- 674-8104

jpatel@fit.edu<http://www.fit.edu/research/committees/irb/index.html>

CONSENT

In order to keep your information confidential, your name or signature is not required. Please

indicate your choice below. Should you choose to participate, you will be directed automatically to the survey.

I have read the information presented about a study being conducted by Alexis Booth (principal investigator) of the School of Psychology and the Scott Center at Florida Institute of Technology. I am 18 years or older, and I understand that I may withdraw from the study at any time. I agree to participate in this study.

I have read the information presented about this study and I do not wish to participate in this study.

You are invited to participate in this study about your tobacco use, use of e-cigarettes, your attitudes towards smoking/vaping, your perceptions of harm regarding tobacco and/or e-cigarette use, and your rules about smoking and vaping in your home and vehicle. Thank you very much for your time and support.

Please answer the following questions:

Have you smoked at least 100 cigarettes in your entire life? (5 packs= 100 Cigarettes)

- Yes
- No

Do you CURRENTLY smoke cigarettes, including cigarillos, cigars, blunts, biddies, or other tobacco product?

- Every Day
- Some Days
- Never

Have you ever used an electronic nicotine delivery system (ENDS) product including electronic cigarettes, e-cigarettes, e-cigs, vapes, e-hookahs, hookah pens, vape pens, or electronic vapor product even one time in your lifetime?

- Yes
- No
- No, but I currently smoke cigarettes

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

Have you used an electronic nicotine delivery system (ENDS) product including electronic cigarettes, e-cigarettes, e-cigs, vapes, e-hookahs, hookah pens, vape pens, or other electronic vapor product within the last 30 days?

- Yes, Every Day
- Yes, Some Days
- No, I have not used any of these products in the last 30 days

Do you intend to use e-cigarettes/vapes within the next 3-6 months?

- Yes
- No

What is the highest level of education you have completed or the highest degree you have received?

- Less than a high school degree
- High school graduate (high school diploma or equivalent including GED)
- Some college, but no degree
- College degree
- Graduate degree

What is your gender?

- Male
- Female
- Transgender
- Other:

What is your current age?

- Age:

What is your race?

- White/Caucasian

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

- Asian
- American Indian/Alaskan Native
- Black/African American
- Pacific Islander/Hawaiian Native
- Biracial/Multiracial
- Other:

What is your ethnicity?

- Hispanic/Latino
- Non-Hispanic/Latino

Please indicate (choose your best guess) the answer that includes your entire household income in (previous year) before taxes.

- Less than \$10,000
- \$10,000 - \$19,000
- \$20,000 - \$29,000
- \$30,000 - \$39,000
- \$40,000 - \$49,000
- \$50,000 - \$59,000
- \$60,000 - \$69,000
- \$70,000 - \$79,000
- \$80,000 - \$89,000
- \$90,000 - \$99,000
- \$100,000 - \$149,000
- More than \$150,000

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

Have you ever been formally diagnosed with a mental health disorder by a psychiatrist, psychologist, or other qualified medical professional?

- Yes
- No (If not KICKED OUT OF SURVEY)

If yes, please select your formal diagnosis from the following:

- Psychotic Disorder and/or another mental health disorder
- Mood Disorder (Example: Depression or Bipolar Disorder)
- Anxiety Disorder
- Mixed Anxiety and Mood Disorder
- Substance Use Disorder
- Substance Use Disorder and/or another mental health disorder
- Other

I smoke/vape to help manage my physical problems/pain.

- Yes
- No
- N/A; I do not have physical problems/pain
- N/A; I do not smoke/vape

If yes, please list the physical problems/pains you are attempting to manage:

I smoke/vape to help manage my psychological symptoms.

- Yes
- No
- N/A; I do not smoke/vape

If yes, please list the psychological symptoms you are attempting to manage:

The **MOST IMPORTANT** reason I smoke/vape is to manage my: *(please choose one)*

- Physical problems/pain

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

- Psychological symptoms
- N/A; I do not smoke/vape to manage my physical problems/pains or psychological symptoms
- N/A; I do not smoke/vape

Are you aware that e-cigarettes/vapes may contain nicotine?

- Yes
- No

If you use or have used e-cigarettes/vapes, does your e-liquid usually contain nicotine?

- Yes
- No
- Don't Know/Not Sure
- I do not use e-cigarettes/vapes

How much nicotine is typically in your e-liquid?

- Nicotine amount:
- Don't Know/Not Sure
- N/A; I do not use e-cigarettes/vapes

Does your spouse/partner CURRENTLY use e-cigarettes/vapes?

- Yes
- No
- N/A; I do not have a spouse/partner

How many people CURRENTLY use e-cigarettes/vape in your household? (Including yourself)

- 0 e-cigarette users
- 1-2 e-cigarette users
- 3 or more e-cigarette users

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

How many people CURRENTLY smoke in your household? (Including yourself)

- 0 smokers
- 1-2 smokers
- 3 or more smokers

How many children live in your household? (Less than 18 years of age)

- 0 children
- 1-2 children
- 3 or more children

Please answer the following questions even if you **do not** smoke **and/or** vape:

Using electronic cigarettes or electronic vapor products **could be** harmful to my health.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

E-cigarettes or electronic vapor products **could** help me/others quit smoking regular cigarettes.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

E-cigarettes or electronic vapor products **could** help me/others reduce the number of cigarettes smoked.

- Strongly Disagree
- Disagree
- Agree

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

- Strongly Agree

Using electronic cigarettes or electronic vapor products around adults is harmful to their health.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Using electronic cigarettes or electronic vapor products around infants and children is harmful to their health.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Inhaling vapors from electronic cigarettes or electronic vapor products can harm the health of adults and children.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Breathing air from a room where people vaped yesterday can harm the health of adults and children.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Breathing air in a car where people vape can harm the health of adults and children.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Please choose **one** of the following that you believe is true: Use of e-cigarettes or electronic vapor products is:

- Less harmful to me than regular cigarettes
- As harmful to me as regular cigarettes
- More harmful to me than regular cigarettes

Please choose **one** of the following that you believe is true: Use of e-cigarettes or electronic vapor products is:

- Less harmful to adults and children around me than regular cigarettes
- As harmful to adults and children around me as regular cigarettes
- More harmful to adults and children around me than regular cigarettes

Which best describes the rules about smoking in your home? (*Mark all that apply*)

- Smoking is not allowed anywhere, anytime, or by anyone in the home (no exceptions).
- Smoking is only allowed in some rooms of the house.
- Smoking is only allowed in the home when others/children are not present.
- Smoking is only allowed sometimes. If so, when:
- Smoking is only allowed in the home when the windows are open and/or the fans are on.
- Smoking is only allowed by some people (e.g., family, friends, or guests) in the home.
- Smoking is allowed in the home anywhere, at any time; there are no rules about smoking in the home.

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

- I live in a residence where smoking is prohibited (e.g., group home, half-way house, mental health facility, substance abuse recovery program, etc.)

Which best describes the rules about smoking in your car/truck? (*Mark all that apply*)

- Smoking is not allowed anywhere, anytime, or by anyone in the car/truck (no exceptions).
- Smoking is only allowed in the car/truck when others/children are not present.
- Smoking is allowed sometimes. If so, when:
- Smoking is only allowed under certain conditions (e.g., with the windows down, or on long trips).
- Smoking is allowed by some people (e.g., family, friends, or guests) in the car/truck.
- Smoking is allowed in the car/truck anywhere, at any time; there are no rules about smoking in the car/truck.
- I do not own a car or truck.

Which best describes the rules about the use of e-cigarettes/vaping in your home? (*Mark all that apply*)

- Vaping is not allowed anywhere, anytime, or by anyone in the home (no exceptions).
- Vaping is only allowed in some rooms of the house.
- Vaping is only allowed in the home when others/children are not present.
- Vaping is only allowed sometimes. If so, when:
- Vaping is only allowed in the home when the windows are open and/or the fans are on.
- Vaping is only allowed by some people (e.g., family, friends, or guests) in the home.
- Vaping is allowed in the home anywhere, at any time; there are no rules about smoking in the home.
- I live in a residence where vaping is prohibited (e.g., group home, half-way house, mental health facility, substance abuse recovery program, etc.)

ELECTRONIC NICOTINE DELIVERY SYSTEMS AND MENTAL HEALTH DISORDERS

Which best describes the rules about the use of e-cigarettes/vaping in your car/truck?
(Mark all that apply)

- Vaping is not allowed anywhere, anytime, or by anyone in the car/truck (no exceptions).
- Vaping is only allowed in the car/truck when others/children are not present.
- Vaping is allowed sometimes. If so, when:
- Vaping is only allowed under certain conditions (e.g., with the windows down, or on long trips).
- Vaping is allowed by some people (e.g., family, friends, or guests) in the car/truck.
- Vaping is allowed in the car/truck anywhere, at any time; there are no rules about smoking in the car/truck.
- I do not own a car or truck.

If you would like to be entered into a drawing to win one \$50 gift card, please send an email to:

PiratesRwe2019@gmail.com

Thank you. This completes the survey.