Parent Perceptions of Electronic Nicotine Delivery Systems (ENDS) and Restrictions of Use

by

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We the undersigned committee, having examined the submitted doctoral research project, “Parent Perceptions of Electronic Nicotine Delivery Systems (ENDS) and Restrictions of Use” by Michael Martin, M.S. hereby indicate its unanimous approval.

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Abstract

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Prevalence rates of cigarette smoking are decreasing among U.S. adults, fewer people start smoking each year, and rates of cessation are increasing. However, the rates of Electronic Nicotine Delivery Systems (ENDS) use are on the rise. ENDS are battery operated devices that involve heating a liquid to create an aerosol or vapor that is then inhaled by the user. They are often referred to as Electronic Cigarettes, e-Cigs, Vaporizers, Vapes, and other terms. These devices are commonly believed to be a relatively harmless and risk-free means of reducing smoking behavior and an aid to smoking cessation. Although still in its early stages, there is scientific evidence to support the fact that ENDS use is not harmless. Short-term health effects of ENDS use include lung irritation, inflammation of the lung, and cardiovascular effects of increased heart rate and blood pressure.
These adverse health effects are not isolated to the ENDS user but may also occur in those passively exposed to toxic ENDS vapors, particularly children. Parents and caregivers are often the primary source of children’s exposure to environmental toxins from both ENDS vapors and traditional cigarettes in their home and vehicles. While prior studies have focused on parental adoption of smoke-free homes and vehicles to protect their child from tobacco smoke, no studies to date have examined whether parents use ENDS or vape in the presence of their child or take steps to protect their child from ENDS vapors in their normal environments. How these behaviors are related to parental perceptions about the risk associated with ENDS use, as well as other factors, has not been clearly been determined. The aim of this study was to address these gaps in the literature.

A total of 47 adult participants who were current smokers or current ENDS users and parents/guardians of children less than 18 years of age were enrolled in the study. Of the participants enrolled, 47% of the sample was male (n=22), 51% was female (n=24), and one participant identified as transgender. The mean age of the participants was 41 years old with a range from 18-56. Participants who were current smokers represented 51.1% (n=24) of the sample, current ENDS users represented 55.3% (n=26) of
the sample and 9 participants, 19% were dual users. Overall, parents reported low scores on a measure that assessed risk perceptions of ENDS products and ENDS users reported significantly lower perceptions of harm from use of these products than non-ENDS users, \( t(45)=3.58, p<.05 \). Examination of rates of bans of ENDS use showed that 21.3% of participants reported a complete ban in their home, 21.3% of participants reported a complete ban in their vehicle, and 19.1% of participants reported a complete ban on ENDS use in both home and vehicle. In contrast, a much higher rate of participants reported cigarette bans in the home, vehicle, and in both the home and vehicle at 63.8%, 57.4%, and 51.1% respectively. Parents who were more likely to implement ENDS bans were females, and those who reported greater perceptions of risks regarding ENDS products. These collective findings will be used to inform future interventions focused on reducing parental use of cigarettes and ENDS products and implementing smoking and vaping bans in their homes and vehicles to better protect their child’s health.
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Review of the Literature

Prevalence of Tobacco and ENDS Use Among Adults

Current cigarette smoking among adults in the United States has declined from 20.9% in 2005 to 15.5% in 2016 (Jamal, Phillips, & Gentzke, 2018). As cigarette smoking behaviors continue to decline, with increasing numbers of people who have ever quit, the use of Electronic Nicotine Delivery Systems (ENDS) products has increased in the US across nearly all demographic groups (Jamal, Phillips, & Gentzke, 2018). Electronic Nicotine Delivery Systems (ENDS) are battery operated devices which are used by heating a liquid to create an aerosol or vapor that is then inhaled by the user. They are often referred to as Electronic Cigarettes, e-Cigs, Vaporizers, Vapes, and other terms. Although typically referred to as ENDS throughout this paper, other sources and literature may use any of these terms interchangeably. It is important to note that not all ENDS users have nicotine in the devices (U.S. Department of Health and Human Services, 2016).

National data obtained from the National Health Interview Survey indicate that in 2016, 3.2% of US adults were current, regular users of ENDS and 15.4% of adults endorsed having ever
used ENDS (National Health Interview Survey, 2017). Overall, adults aged 18-24 were the most likely to have ever used ENDS (23.5%) with a lower frequency of ever use (4.5%) among adults aged over 65. Similarly, adults aged 18-24 and 25-44 were most likely to be current users of ENDS at 4.5% and 4.2%, respectively. Adults aged 45-64 were less likely to be current ENDS users at 2.9%. Across all age groups, among those adults who endorsed having ever used ENDS, fewer than 25% reported being a current user (National Health Interview Survey, 2017). In 2015, 58% of current ENDS users were dual users, defined as use of both ENDS and regular cigarettes.

Many adults believe ENDS to be a safer alternative to cigarette smoking (Brose, Brown, Hitchman, & McNeill, 2015; Delnevo, Giavenco, Steinberg, Villlanti, Pearson, Niaura, & Abrams, 2016). This belief has contributed to the large number of people switching from cigarettes to ENDS, as well as the large number of dual users, as people look to cut down on cigarettes while also using ENDS as a substitute. Despite this commonly cited reason for ENDS use, the current scientific evidence is insufficient to recommend use of ENDS for tobacco cessation among adults (U.S. Preventative Task Force, 2015). Delnevo et al. (2016) found that ENDS use was low among those who have never smoked cigarettes.
(0.4%) and was also low among former cigarette smokers who quit more than four years ago (0.8%). Although use or experimentation with ENDS is most common among current smokers and young adults, daily use of electronic cigarettes was found to be highest among former smokers who quit within the past year (13.0%) and, compared to daily cigarette smokers, recently quit smokers were four times as likely to utilize ENDS.

Health Effects from ENDS Use and Exposure to ENDS Products

Although a number of short-term health risks have been identified, the long-term effects of these devices remain largely unknown. In 2016, the Surgeon General released a report on e-cigarettes, e-cigarette liquids, and the liquids used in the devices to be heated and vaporized, and identified that these devices contain a variety of harmful substances including known carcinogens such as formaldehyde, acetaldehyde, and acrolein, as well as heavy metals such as lead and cadmium (U.S. Department of Health and Human Services, 2016). These chemicals have been found in ENDS liquid as well as in ENDS aerosols in laboratory tests when tests were conducted at temperatures within the range of most ENDS products. This means the vapor produced by the devices, when used in a
typical manner, was found to contain the same carcinogenic chemicals common in cigarettes. Some of the challenges inherent in studying the health risks of ENDS include the overall heterogeneity of ENDS devices as well as the tobacco products used with them. Specifically, the variety of ENDS products, temperatures, battery types, voltages, and puff durations of ENDS devices make it difficult to determine a consistent risk profile. Additionally, the chemical reactions present in ENDS devices may result in the formation of new, harmful compounds during ENDS use (U.S. Department of Health and Human Services, 2016).

One study by Olmedo, Goessler, Tanda, Grau-Perez, Jarmul, Aherrera, and Rule (2018) found significantly increased concentrations of metal in the aerosol vapors inhaled by users. Specifically, e-cigarettes were a relevant source of exposure to a wide variety of toxic metals including Chromium, Nickel, and Lead as well as to essential metals which are potentially toxic through inhalation such as Manganese and Zinc. This study determined these metal concentrations found significantly increased following the addition of ENDS liquid in the device. That is, the concentrations of these metals in the aerosol and the liquid tank in the device were significantly higher than in the refill liquid never put into the device. These findings support the hypothesis that metals are transferred
from the device (most likely the coil) to the e-liquid and from the e-liquid to the aerosol that is inhaled by the user (Olmedo, et al., 2018). This change in the composition of the substance from when it is sold to the user as a liquid to when it has been used in the device and heated, indicate that a simple analysis of the ENDS liquids and potential hazards in them may not be sufficient to fully identify the risks associated with ENDS. Further analysis of the hazards in the actual use of the devices rather than simple analysis of the liquid contents will likely highlight additional health risks.

The Surgeon General in his 2016 report on ENDS use highlighted some of the difficulties in examining the health risks of ENDS. The variety of types of devices, liquids used, nicotine concentrations, and even the “puff behavior” of individuals, that is, how each individual uses and inhales ENDS, can vary. Many studies were conducted using standardized devices to help mitigate some of these confounding variables and their results were discussed in the report (U.S. Department of Health and Human Services, 2016). Increased heartrate and diastolic blood pressure in the users were reported when ENDS use is accompanied by an increase in plasma nicotine concentration. Although more long-term data is needed, studies of short-term effects of ENDS use demonstrate the “typical cardiovascular effects exerted by nicotine are also exerted
by e-cigarettes” (U.S. Department of Health and Human Services, 2016). The nicotine effects of ENDS depend on levels of nicotine within the products, which vary widely, and the products themselves can often be mislabeled and not accurately reflect true nicotine concentrations (U.S. Department of Health and Human Services, 2016). One study in particular found a wide range of discrepancy between the labeled nicotine content and the true nicotine content of these liquids but determined the average liquid for use contained 1.2 times as much nicotine as its labeled content (Schober, et al., 2014).

An examination of the effects of ENDS use on human lung cells and tissues found that exposure to ENDS vapors and aerosols produced an oxidative and inflammatory response (Lerner, Sundar, Yao, Gerloff, Ossip, McIntosh, and Rahman, 2015). This response was found to vary depending on the products used. Some flavorings in the ENDS liquid, such as cinnamon, were found to produce a further increased inflammatory response in lung tissues. So, while some ENDS liquids may vary in the oxidative and inflammatory response produced, all products tested by Lerner and colleagues demonstrated this negative response in human lung cells and tissues and could, according to Lerner, “lead to unrealized health consequences.” Although difficult to determine a consistent effect and risk level due to the heterogeneity in ENDS, ENDS liquids, and
user behaviors, studies such as the ones reported above have regularly demonstrated the health risks and concerns related to ENDS usage. Having been demonstrated to produce inflammation and an oxidative response in lung cells, as well as increased heart rate and blood pressure in users, the health risks of ENDS use are becoming more apparent in the research. With documented risks to users, researchers have also examined the effects ENDS use on passive bystanders.

Geiss Bianchi, Barahona, and Barrero-Moreno (2015) conducted a study examining air quality following the use of varying ENDS devices and ENDS liquids. The aerosol expelled from the devices was found to be a source of many of the harmful chemicals indicated in the later 2016 Surgeon General report. Electronic cigarettes tested in this study proved to be sources of propylene glycol, glycerol, nicotine, carbonyls and aerosol particulates, all chemicals and compounds known through other research to be harmful to humans (Geiss, Bianchi, Barahona, & Barrero-Moreno, 2015). The extent to which someone could be exposed to these chemicals passively is dependent on a number of factors such as the ENDS device itself, the ENDS liquid, and the behavior of the ENDS user. Environmental factors such as ventilation, room size, climate, and number of ENDS users also play
a large role in the extent of second-hand exposure (Geiss, Bianchi, Barahona, & Barrero-Moreno, 2015). Bystanders have also been found to be exposed to nicotine via the exhalation of mainstream vapors generated by ENDS usage (Czongala, Goniewicz, Fidelus, Zielinska-Danch, Travers, & Sobczak, 2014).

Another study examined the concentration of various particles in the air following ENDS use. For this study, volunteer ENDS users were asked to use a variety of ENDS products in a well-ventilated room; the particulate matter in the room was assessed and breathing responses of volunteers were measured. Some carcinogenic compounds were found to increase in concentration by 20% and some metal compounds including aluminum concentration were found to increase 2.4 times the base rate following ENDS usage. The inflammatory response in the lungs was also found to be present in those passively exposed to the ENDS vapors. Further, the nicotine content of the ENDS liquids examined by the researches was found to be highly variable but was typically 1.2 times higher than the rate claimed by manufacturers (Schober, Szendrei, Matzen, Osiander, Heitmann, Schettgen, & Fromme, 2014). This study, unique in its inclusion of volunteer ENDS users, rather than a laboratory device set up, provides a more accurate portrayal of the effects of second-hand exposure to ENDS
usage than some past studies. The finding that consequences such as lung inflammation are still present supports the potential long-term harm of secondhand ENDS exposure. This is further indicative of the heterogeneity of these products and the difficulty presented in creating an accurate health risk profile; however, when combined, these studies begin to demonstrate that the risk posed by secondhand ENDS usage could be similar to that of firsthand ENDS use.

Despite the documented health risks, second-hand ENDS exposure is often perceived as much safer than second-hand cigarette exposure. An analysis conducted in 2017 found adults perceived that exposure to second-hand ENDS vapors posed minimal risks for children (Nguyen, Tong, Marynak, & King, 2017). In this study, 5.3% of adults responded that second-hand ENDS exposure caused “no harm” to children, 39.9% responded “little harm” or “some harm,” and 33.3% responded “don’t know.” Only 21.5% of adults responded with the belief that second-hand ENDS exposure caused “a lot of harm” to children. Perceptions of ENDS as less harmful both to the user and to others has been influential in predicting ENDS use among those who had never used ENDS. This finding is consistent with those from other studies that showed that perceptions of ENDS as a safer alternative predicted subsequent ENDS use in a cohort of smokers and past smokers (Brose, Brown,
Hitchman, & McNeill, 2015). This longitudinal study of 6165 participants examined the perceptions of smokers, both current and recently quit (within the past year), on ENDS usage. Perception of less harm from ENDS compared to cigarettes was predictive of ENDS use, reported at one and two years later, among current and former smokers (Brose, Brown, Hitchman, & McNeill, 2015). This study is important as there are few longitudinal studies regarding ENDS usage and it clearly demonstrates that people who perceive ENDS as less harmful than cigarettes, an increasingly popular perception, have more of a reason to initiate use. With limited knowledge on ENDS users, including the lack of an overall risk and protective factors profile, looking to similar groups of people, such as current cigarette smokers, could provide further data about ENDS use.

Risk and Protective Factors Associated with Tobacco and Ends Use in Adults

Identifying risk and protective factors for tobacco use allows interventions to be targeted towards populations more likely to use these products. Studies have examined prevalence rates among tobacco users in the United States in order to help determine these
factors. Most recently, risk factors were identified in a Morbidity and Mortality Weekly report for 2016. “In 2016, the prevalence of cigarette smoking was higher among adults who were male, aged 25–64 years, American Indian/Alaska Native or multiracial, had a General Education Development (GED) certificate, lived below the federal poverty level, lived in the Midwest or South, were uninsured or insured through Medicaid, had a disability/limitation, were lesbian, gay, or bisexual (LGB), or had serious psychological distress” (Jamal, Phillips, & Gentzke, 2018).

In 2016, the National Health Interview Survey (NHIS) was administered to 33,028 adults aged ≥18 years; the response rate was 54.3%. The data from this very large sample represents a large portion of the population and is representative of the overall, nationwide prevalence of cigarette smoking behaviors. Current cigarette smoking prevalence overall has been found to be higher among males than females (17.5% to 13.5%) and higher among adults aged 25-44 (17.6%) and 45-64 (18%) than among younger adults aged 18-24 (13.1%). Prevalence of cigarette smoking was found to be highest among American Indian/Alaska Native (31.8%) and lowest among non-Hispanic Asians (9.0%). Education also appeared to serve as a protective factor. Among adults aged ≥25 years, those with a graduate degree demonstrated the lowest
prevalence (4.5%) of smoking while the highest prevalence was among those with a GED (40.6%). Looking at socioeconomic status as risk or protective factor, smoking rates were higher among those living below the poverty level (25.3%) than those at or above this level (14.3%). Those living in the Midwest (18.5%) and the South (16.9%) demonstrated higher smoking prevalence rates than those living in the West (12.3%) or the Northeast (13.3%). Examining insurance status, prevalence was higher among Medicaid enrollees (25.3%) and the indigent population (28.4%) than among those covered by private insurance (11.8%), Medicare (10.2%), or other public insurance (19.8%). Adults with disability/limitation (21.2%) were found to exhibit higher rates of smoking than those without a disability/limitation (14.4%). Prevalence was found to be higher among LGB adults (20.5%) than heterosexual adults (15.3%). Finally, rates of smoking were found to be higher among adults with serious psychological distress (35.8%) than among those without serious psychological distress (14.7%) (Jamal, Phillips, & Gentzke, 2018).

Perceived risk of smoking has also been shown to influence an individual’s smoking behaviors. Using a longitudinal design, one study followed a group of 395 individuals over the course of two years with follow-ups conducted every sixth months. Results found
that those individuals who held the lowest perceived risk of smoking were 3.64 times more likely to start smoking than those who had greater perceptions of the risk of smoking (Song, Morrell, Cornell, Ramos, Biehl, Kropp, & Helpern-Felsher, 2009). Risk perceptions associated with smoking have also been shown to have a positive impact on successful smoking cessation with those adults who view smoking as more harmful being more likely to successfully quit smoking than those who view smoking as less harmful (Zhang, Liu, Wang, & Jia, 2014). These findings suggest that public health messaging that increases the public’s awareness of the risks of smoking may impact their adoption of this unhealthy habit and their interest in quitting.

Other psychosocial risk factors have also been linked to adult smoking. One study involving over 12,000 participants from a variety of different work environments examined the relationship between perceived stress and a variety of health-related behaviors (Ng & Jeffery, 2003). Results showed that high levels of perceived stress, in both men and women, were associated with a number of unhealthy behaviors, particularly tobacco use. Those with a high level of perceived stress were more likely to be a smoker, have increased smoking during the past year, have less confidence in their ability to quit smoking, and less confidence in their ability to not
smoke when feeling stressed (Ng & Jeffery, 2003). Similarly, in a meta-analysis of studies that involved close to 120,000 working adults, those adults who reported no job strain had a healthier lifestyle than those adults who reported job strain. (Heikkilä, Fransson, Nyberg, Zins, Westerlund, Westerholm, & Kivimäki, 2013). Those with high job strain were found to be significantly more likely to be current smokers. Whether employees who experience high job strain will adopt ENDS use as a method to manage their job-related stress is a topic of interest that should be pursued in future research.

In addition, poor mental health status has been consistently and positively associated with smoking behaviors. Smoking prevalence has been determined to be significantly higher among people who have been diagnosed with a mental health condition when compared to the prevalence of smoking among adults without a mental health diagnosis. Rates of smoking further increase with the severity of the illness and the number of comorbid diagnoses (McClave, McKnight-Eily, Davis, & Dube, 2010). In some cases, the prevalence rates of smoking among those with mental illness have been found to be as high as twice that of the general population (Lasser, Boyd, Woolhandler, Himmelstein, McCormick, & Bor, 2000). A recent systematic review of 148 longitudinal studies
evaluated the association between depression and anxiety and smoking over time (Fluharty, Taylor, Grabski, Munafo, 2017). Nearly half of the studies reviewed reported that baseline depression and anxiety was associated with later smoking while one third of the studies found that smoking was associated with later depression and anxiety. On the basis of this review, it appears that the evidence for the directionality of this association remains mixed.

Similar to cigarette use, data from two national representative surveys suggest that adults with mental health conditions report higher rates of ENDS use than those with no mental health condition (Cummins, Zhu, Tedeschi, Gamst, & Myers, 2014; Spears, Jones, Weaver, Pechacek, & Eriksen, 2017). In a 2015 survey, former smokers with a mental health condition were more likely to have used ENDS than those without a mental health condition (Spears et al, 2017). Although those with mental health diagnoses attempt to quit smoking at rates that are similar to those without mental health conditions, those without a mental health diagnosis are more likely to successfully quit when compared to those with a mental health condition (McClave, McKnight-Eily, Davis, & Dube, 2010). Studies also suggest that smokers with mental health issues view e-cigarettes as an option to help them quit smoking (Chen, Baker, & Brownson et al., 2017) and are twice as
likely to have used ENDS in a past smoking quit attempt than those without a mental health condition (Spears, et al., 2017).

Building on this earlier work, investigators attempted to understand the motives behind ENDS use among those with mental health conditions (Jamal, Phillips, & Gentzke, 2018; Spears, Jones, Weaver, Pechacek, & Eriksen, 2018). Spears and colleagues (2018) conducted a study of 550 participants and examined the motives and perceptions of ENDS use among current, former, and nonsmokers and those with and without a mental health condition. Results showed that current smokers with a mental health condition reported more thought about how ENDS use might improve their health and former smokers with a mental health condition reported less thought about how ENDS might harm their health when compared to their counterparts without a mental health condition. Further, former smokers with a mental health condition rated several reasons for ENDS use (e.g., less harmful than regular cigarettes; to quit smoking; appealing flavors) as more important when compared to ratings by those without a mental health condition on these same factors. There was no significant association between mental health condition status and ENDS perceptions in the overall sample. More importantly, results suggest that both former and current smokers had generally positive perceptions about the ENDS use, suggesting
the need for better health education efforts on the risk and benefits of ENDS use.

Currently, there is limited data regarding the demographics of ENDS users. Although overall age ranges of users are known and have been identified earlier in this review, the extensive data available for cigarette smoking behavior is currently absent from the ENDS literature. There is clear overlap among smokers and ENDS users in that 58% of current ENDS users concurrently use tobacco (dual users) and use of ENDS products is often cited as a means to aid smokers in quitting (Spears, Jones, Weaver, Pechacek, & Eriksen, 2018; National Health Interview Survey, 2017). Therefore, information about smoking behaviors can likely be extrapolated to explain trends in ENDS use. It should be noted that although mental health status of participants will not be evaluated in the current study, it is covered in this review as the bulk of the literature on e-cigarette use among adults has been conducted in those with mental health difficulties and should be considered as a potential risk factor to be considered in future studies of adult ENDS use. Achieving a better understanding of the characteristics of ENDS users, including the risk and protective factors known in cigarette smokers, is an area that warrants further investigation.
Children’s Exposure to Second Hand Smoke

Exposure Rates

Children’s exposure to second hand smoke is most frequently caused by parental smoking, and in the United States alone, over 20 million children experience daily secondhand smoke exposure (SHSe) in a family home or vehicle (Baxi, Sharma, Roseby, Polnay, Priest, & Waters, 2014; Klerman, 2004). Although there are policies in effect, specifically in workplaces and public areas such as restaurants which offer some protection from SHSe, these policies do not extend to private properties such as a family home or car where children remain exposed to SHS (Centers for Disease Control and Prevention, 2015). Younger children (between age 3 and 11), who spend the majority of their time with parents or caregivers, have even higher rates of SHSe due to their increased time spent in proximity to a smoker (Pirkle, Bernert, Caudill, Sosnoff, & Pechacek, 2006). Nationally, nearly one fourth of middle and high school students who do not smoke, report being exposed in the past week to smoking in a car (King, Dube, & Tynan, 2012). In Florida, children are exposed at even higher rates of SHS, with 38% of children between age 11 and 17 reporting SHSe in a room or car in the past week (Florida Department of Health, 2014).
Health Effects

As a known environmental hazard, the U.S. Health Department has long recognized SHSe as associated with disease and premature death in adults and children who have never smoked (U.S. Department of Health and Human Services, 2006; U.S. Department of Health and Human Services, 2010). Due to being known to contain toxic and carcinogenic chemicals, SHSe has frequently been linked to serious diseases such as lung cancer and coronary heart disease, even in nonsmoking adults (U.S. Department of Health and Human Services, 2006; U.S. Department of Health and Human Services, 2010). In Florida, over 2,500 nonsmokers die annually from SHSe (Campaign for Tobacco-Free Kids, 2010).

Exposure to SHS also poses a considerable risk to the health of children. In children, SHSe can result in an increased risk of a variety of illnesses including exacerbation of asthma symptoms, slowed lung growth, respiratory and ear infections, reduced pulmonary function, and sudden infant death syndrome (Jaakkola & Jaakkola, 2002; U.S. Department of Health and Human Services, 2006).

Although there are serious health risks and consequences of SHSe in children, further concern is driven by the effect SHSe can
have on a child’s intentions to smoke and future smoking behaviors. Children who are exposed to secondhand smoke are found to have greater intentions to smoke and a higher likelihood of beginning and maintaining smoking behaviors than children who do not experience SHSe (Becklake, Ghezzo, & Ernst, 2005; Centers for Disease Control and Prevention, 2007). Exposure to secondhand smoke in a vehicle has been significantly associated with children engaging in smoking behaviors as early as preadolescence (Glover, Scragg, Min, Kira, Nosa, & McCool 2011), as well as more frequent smoking behaviors among adolescents (Belanger, et al., 2008; Seo, Bodde, & Torabi, 2009; Seo, Torabi, & Weaver, 2008). Therefore, elimination of SHSe is an important first step in discouraging the adoption of a life-long smoking habit.

Smoking Bans

Methods and interventions aimed at reducing the SHSe of children have typically focused on the behavior of the parent or caregiver by requiring caregivers to quit smoking or alter their behavior around their child (i.e. such as smoking outdoors or in another room (Baxi, et al., 2014; Kegler, Escoffery, Bundy, Haardorfer, & Yembra, 2012; Rosen, Myers, Hovell, Zucker, & Noach, 2014). Despite the benefits smoking cessation confers on
both the smoker and the child (through reduction or elimination of SHSe), many caregivers are unable or unwilling to stop smoking. Interventions focused on caregiver smoking cessation have resulted in short-term smoking abstinence and only small reductions in SHSe for the child (Rosen, Noach, Winickoff, & Hovell, 2012). Children continue to experience SHSe due to their caregivers being uninterested and largely unable to participate in smoking cessation programs (Baxi, et al., 2014; Rosen, Noach, Winickoff, & Hovell, 2012). The number of caregivers with no interest in quitting smoking at (39%) outnumber the caregivers who report a desire to quit in the next three months (27%) (Farber, Knowles, Brown, Caine, Luna, & Qian, 2008). With many adults viewing ENDS usage as a means to help quit smoking, it is likely that children will subsequently be exposed to the hazardous secondhand vapor exposure from ENDS products that replace their cigarettes.

In addition to smoking cessation efforts, adopting smoke-free homes and vehicles is another option for parents who want to protect their child from SHSe. Yet, national figures show that close to 29% of adults do not have voluntary smoke-free rules in their home and only 27.0% of smoking adults in the US report voluntary adoption of smoke-free vehicle rules (King, Dube, & Homa, 2013). Similarly, less than one-third (28.7%) of Florida smokers restrict
smoking in their vehicles (Centers for Disease Control and Prevention, 2015). According to the 2016 Surgeon General’s report on e-cigarette use among youth and young adults, use of both conventional cigarettes and e-cigarettes should be prohibited in all indoor areas (U.S. Department of Health and Human Services, 2016) but not all states have enacted laws that specifically prohibit ENDS use. Although most states have specific laws restricting the use and/or purchase of ENDS devices by age, very few states have enacted bans of ENDS use in public places. Some states such as California have laws in place regulating ENDS use that mirror the bans on cigarettes in public places. However, such states are in the minority in regards to regulation of ENDS usage. Presently, the rates of home and vehicle bans among families in the US with regards to ENDS use has not been examined.

Establishing complete smoking restrictions in homes and vehicles has led to lower exposure to SHS for children as well as reduced daily consumption of cigarettes by caregivers and increased numbers of attempts at cessation among smokers (Gerham & Hovell, 2003; Gilpin, White, Farkas, & Pierce, 1999). Interventions found to be most effective in the reduction of SHSe in children are those which are more intensive and repeated with families over time (Baxi, et al., 2014; Priest, et al., 2008; Rosen, Myers, Hovell,
Zucker, & Noach, 2014). However, even brief education for caregivers has been shown to increase caregiver adoption of smoking bans in the home and car (Kegler, Escoffery, Bundy, Haardorfer, & Yembra, 2012; Priest, et al., 2008; Rosen, Myers, Hovell, Zucker, & Noach, 2014). Creating similar targeted interventions to educate and help parents and caregivers create vaping bans in the house and car could help mitigate the health risks related to second hand ENDS vapors.

Study Rationale and Justification

As rates of ENDS use are steadily increasing, researchers examining the impact of these devices are struggling to match this pace. As extensive literature has conclusively demonstrated the harmful effects of second-hand cigarette smoke exposure (SHSe) among children who are also at increased risk for future tobacco use and addiction if exposed. Although not yet fully explored and understood, a growing body of literature has similarly begun to identify and quantify the potential health risks associated with exposure to ENDS products (U.S. Department of Health and Human Services, 2016). Secondhand inhalation of toxic particles and vapors associated with ENDS use has been found to pose at least short-term health risks and problems such as lung inflammation,
increased metal concentrations, and mouth and throat irritations (Lerner, et al., 2015; Olmedo, et al., 2018; U.S. Department of Health and Human Services, 2016). Similar to the risks posed by SHSe to combustible cigarettes, there is considerable concern regarding the potential health hazards of passive exposure to ENDS products among children.

The rising popularity of ENDS devices is evidenced by overall increasing prevalence rates across many demographics, including adults, and many adult ENDS users concurrently use another tobacco product. According to the CDC, in 2015, 58.8% of current ENDS users were also current cigarette smokers. As the public often views ENDS use as a healthy and safe alternative to smoking cigarettes or as a means to aid in smoking cessation, parents are likely to use these devices around their children, particularly if they perceive them to pose no significant health risks. Even more disturbing is the finding that a large number of adults view ENDS as causing little to no harm to children (Nguyen, Tong, Marynak, & King, 2017). Consequently, many children who live with ENDS users may not be completely protected in their homes and family vehicles where they can be involuntarily exposed to dangerously high levels of toxins from secondhand ENDS exposure.
Interventions have largely targeted parent behavior by requiring parents to quit smoking or alter their smoking behavior around their child (i.e. smoking outdoors, smoking in another room) and have been moderately effective in reducing child SHSe to cigarettes (Baxi, et al., 2014; Priest, et al., 2008; Rosen, Myers, Hovell, Zucker, & Noach, 2014). With the exception of quitting smoking, establishing a complete smoking ban, where no smoking is allowed in the child’s environment, is one of the most effective strategies for reducing a child’s SHSe. In fact, complete home and vehicle smoking restrictions (bans in the home and vehicle) have been shown to lower SHSe for both children and nonsmokers (Gerham & Hovell, 2003). Many parents have responded to the known risks of SHSe from cigarettes and taken action to implement a personal smoking ban in the home or car environment (King, Dube, & Homa, 2013). Therefore, understanding whether parents similarly restrict use of ENDS products in the presence of their child, and what factors influence their use of home and car ENDS use, is an important next step in this line of research.

Unlike previous studies that have focused on child SHSe to parent cigarette smoking, the proposed study is the first to examine parental use of ENDS products/vaping around their children in their homes and vehicles. While national studies have generally included
any adults as respondents to their surveys, this study is unique in its inclusion of only smoking/vaping parents who have at least one child residing in their home. The current study addresses the gap in the current literature by inquiring about ENDS bans and restrictions in the child’s primary exposure sites. It also investigated the perceptions of adult ENDS users who have children and the impact of their attitudes on adoption of vaping bans or behavioral changes. The information obtained in this study will be helpful in modifying the behavior of ENDS users and designing targeted interventions to ban ENDS use/vaping in children’s homes and cars. Protecting children from exposure to ENDS/vaping toxins as well as tobacco smoke is an important public health issue and a pediatric health concern. Making homes and vehicles smoke-and vapor-free has the potential to reduce children’s exposure and related adverse health effects.
Study Objectives and Hypothesis

**Objective 1:** To examine health risk perceptions of ENDS among parent ENDS users and cigarette smokers

*Hypothesis 1.* The majority of parents will perceive low health risks associated with ENDS use.

**Objective 2:** To determine rates of smoking and vaping bans implemented in family homes and vehicles by parents

*Hypothesis 2.1* Rates of smoking bans in homes and vehicles will be comparable to rates reported in previous studies.

*Hypothesis 2.2* Rates of vaping bans in homes and vehicles will be lower than rates for smoking bans reported in previous studies.

**Objective 3:** To determine factors associated with vaping bans in homes and vehicles of parent ENDS users; Primary variables examined included demographic factors, health risk perceptions, parent vaping status.

*Hypothesis 3.1* Parents who are lower socioeconomic status, who endorse fewer negative health perceptions of ENDS use,
and who currently vape, will less likely report vaping bans in their homes and vehicles.

**Methods and Procedures**

Parents were asked to complete an online survey that asks about their tobacco and/or ENDS use, their perceptions of risk regarding use, and about smoking/vaping restrictions in their homes and vehicles. The online survey was published using the Qualtrics software program. This survey was available through FIT’s partnership with Qualtrics, and the survey was maintained on the Qualtrics website. The survey took approximately 10 minutes to complete. Information about the survey was distributed via the internet (Facebook, twitter, email, etc.). Informed consent was obtained from all participants on the first page of the survey prior to study enrollment.

Participant names were not collected as part of this study. The information collected was entered into a HIPAA-compliant database and all personally identifying information was de-identified with minimal risk of breaching confidentiality. Participants had the option to enter into a drawing for a $50 gift card after completing the survey, this entry was separated from their data with no means of identifying participant responses in relation to the gift card entry.
Participants

Study participants were adults recruited from the general community who are parents/guardians of children < 18 years. A total of 47 participants were enrolled in the study. Participants were recruited via the internet, in order to have participants from a variety of regions within the United States and represent a variety of demographic groups. Children did not participate in the study.

Eligibility criteria for study participants included:  

a) current user of ENDS products defined as “Electronic cigarettes, or e-cigarettes, or electronic vapor products (e-cigars, vape pens, personal vaporizers), or current smoker (b) the ability to read and complete the questionnaires (c) are current parents/caregivers with children < 18 years of age who currently live with them in their household and (d) willingness to participate by completing the online survey. If more than one parent in a household was an ENDS user or smoker, either parent was eligible to participate but only one parent/caregiver who smokes/vapes per household completed the study survey. All participants provided informed consent prior to study enrollment. Approval from the Florida Institute of Technology Institutional Review Board was
obtained prior to recruitment. At the completion of data collection, there were a total of 59 responses of which 47 were deemed usable based on the inclusion/exclusion criteria. The response rate for the survey was 80%.

Outcome Measures

Parents completed an online survey that consisted of 47 items, although based on the respondent’s answers some questions may have been skipped if they do not apply (i.e. such as questions about smoking behavior for a non-smoker). Participants first verified their eligibility by responding to a set of questions as described in Appendix A.

Core components of the survey will include the following:

Demographics. Demographic information obtained included, age, gender, race/ethnicity, annual household income, education level, and smoking/vaping status. Child information obtained included gender of the child.

Smoking/ENDS status and history. (Parent). Parents were asked about their past and current smoking/ENDS status. Due to the number of participants, participants were grouped as either a current
user or not a current user for both ENDS and cigarette smoking. “Current smokers” were defined as those who smoked at least 100 cigarettes in their lifetime and currently smoke cigarettes on ‘some days’ or ‘every day.’ For the current analysis, “Current ENDS users” were defined as those who use e-cigarettes or vapor products on ‘every’ day and this group was compared with those who only use e-cigarettes on ‘Some days’ or ‘Never’. Only current ENDS users or current smokers were eligible to participate in the study. For those parents who use ENDS, a question regarding the level of nicotine they typically use in their device was included, however due to the limited response to this question, no analysis was completed regarding this information.

Perceptions of Health Risks Associated with ENDS.
Participants were asked about their perceptions of harm from ENDS and about their use of ENDS as an aid to smoking cessation. Items were taken from the literature (Spears, Jones, Weaver, Pechacek, & Eriksen, 2018) and previous smoking research (Tyc, Lensing, Vukadinovich, & Hovell, 2013) and adapted for the current study, with permission from the authors. Risk perception items (9 items) and items related to smoking cessation (2 items) were variably rated on either a 4-point scale ranging from “Strongly Disagree to Strongly Agree” or on a 3-point scale with response options of “less
harmful”, “as harmful,” or “more harmful.” A total risk perception score ranging from 11-34 was computed. Higher risk perception scores are indicative of greater perceptions of harm from e-cigarettes/vapor products. The proportion of parents who endorse individual items is also reported.

Smoking/Vaping Bans. Parents/caregivers were additionally asked to report on the smoking rules or policies in the family home and vehicle as done in prior studies. For the purpose of this study, a complete ban was defined as a 100% smoke-free/vape-free home and car (defined as absolutely no smoking of any tobacco product, or e-cigarettes, inside the family home and car/truck at any time); a partial ban was defined as smoking/use of e-cigarettes is only allowed by certain people or at specific times (i.e., when child is not present) or no bans (defined as smoking/use of e-cigarettes is allowed anywhere in the home and car/truck at any time). Ban status in the home and vehicle will be determined separately for smoking and vaping and then combined. Scoring for this outcome was dichotomized as complete vs. partial/absent ban in the home and vehicle.

Communication about Smoking and ENDS Use.

Parents/caregivers were asked if they ever talked with their child
about the effects of smoking/vaping or SHSe/vapor exposure on their child’s health. Items were scored yes/no. Items related to smoking provided descriptive data. Items pertaining to vaping were added to calculate a composite communication score. Scores ranged from 0-2; a score of 0 identified poor communicators, a score of 1 identified moderate communicators, and a score of 2 identified good communicators.

Design/Plan of Analysis

This study utilized a cross-sectional design. Descriptive statistics, including means, standard deviations, and frequencies, were calculated for parent demographics, the primary outcomes (prevalence of tobacco/ENDS use/dual use, health risk perceptions, communication, smoking/vaping bans) and all covariates. When possible, differences between smoking and vaping parents on study outcomes were evaluated. Chi Square tests were used to assess for differences between groups for categorical variables. When some cells in the cross-tabulation were smaller than 5 and assumptions for chi square analyses were violated, a Fisher’s exact test was performed. Independent t-tests were conducted to compare risk perception scores between those parents who reported a complete
ban on ENDS in both the home and vehicle and those who reported a partial or no ban. Given the exploratory nature of this study, all analyses were considered significant at the $p<.05$ level. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) –version 25.
Results

Demographics and Rates of Smoking and ENDS Use

A total of 47 participants were enrolled in the study out of 59 respondents (response rate 79.7%). Respondents not included in the final sample included two who did not agree to the informed consent and did not proceed any further, and 10 respondents who reported they did not have children. Demographic data for the total sample is indicated in Table 1. Of the participants enrolled, 46.8% of the sample was male (n=22), 51.1% was female (n=24), and one (2.1%) participant identified as transgender. The mean age of the participants was 41 years old with a range from 18-56 years. The majority of the sample was White (80.9%). Participants who were current smokers represented 51.1% (n= 24) of the sample; current ENDS users who used ENDS products every day represented 55.3% (n= 26) of the sample, 29.8% (n=14) used ENDS on some days and 10.6% (n=5) of the sample never used ENDS products. Nine participants, (19%), were dual users. Frequencies for demographic and ENDS-related variables among ENDS users and Non–ENDS users are shown in Table 2. There was a significant association between ENDS use and gender, $\chi^2 (1, n=26) = 7.39, p<.01$ such that males were more likely to use ENDS than females. No significant relationship between ENDS use and other parent demographic
variables including race, marital status, education, and income level were found as shown in Table 2. Participants who used ENDS and those who did not use ENDS products did not differ by age, $t(42)=1.41, p>0.05$.

Risk Perceptions

Risk perceptions of ENDS devices was assessed through nine questions with total scores ranging from 11 (minimum) to 34 (maximum). The mean risk perception score was 20.11 (SD=5.66). This indicates an overall low risk perception of ENDS devices with a tendency to disagree with statements asserting risk of ENDS devices. Overall, a majority of respondents endorsed the belief ENDS could be harmful to themselves with, 70.2% (n=33) indicated ‘Agree’ or ‘Strongly agree’ with the statement “Using electronic cigarettes is harmful to my health.” However, 61.7% (n=29) disagreed there could be harm to others, indicating ‘Disagree’ or ‘Strongly disagree’ with the statement “Using electronic cigarettes around others is harmful to their health.”

Further analysis compared risk perception for current ENDS users compared to non-ENDS users. For this analysis, current ENDS users, defined as those who used ENDS products “every day,” were
compared to non-ENDS users defined as those who used ENDS on “some days” or “never”. There was a significant difference in parental perception of risk regarding harm to children between ENDS users (M=2.31, SD=0.68) and non-ENDS users (M=3.10, SD=0.83), t(45)=3.58, p<0.05, with non-ENDS users endorsing greater perceptions of risk. Additionally, there were significant differences in parental perception of risk for children inhaling vapors from ENDS devices between ENDS users (M=2.62, SD=0.57) and non-ENDS users (M=3.05, SD=0.87); t(45)=2.06, p<0.05, as well as for the perception of risk associated with breathing air in a car where someone uses ENDS being harmful to those around them between ENDS users (M=2.08, SD=0.63) and non-ENDS users (M=2.86, SD=0.79), t(45)=3.77, p<0.05. Further results for responses to specific risk perception questions can be found in Table 4.

Rate of Bans

The rates of bans were assessed by asking parents to report about rules in households and vehicles regarding restrictions on smoking or vaping behaviors, as done in prior studies (Tyc, Lensing, Vukadinovich, & Hovell, 2013). For analyses, responses were categorized into one of two groups, as either a complete ban or
a partial/no ban. A “complete ban” was defined as allowing absolutely no smoking/vaping and a “partial/no ban” was defined as having no restrictions or some specific rules such as only smoking with the windows open. Descriptive frequencies for rates of bans in the home and vehicle are presented in Table 3.

A majority of participants (n=30, 63.8%) reported a complete ban on cigarette smoking in their home; a slightly lower majority, (n=27, 57.4%) reported a complete ban on cigarette smoking in their vehicle. This is compared to 10 participants (21.3%) who had a complete ban on ENDS in the home and also 10 participants (21.3%) with a complete ban on ENDS in their vehicle. When examining an overall complete ban, defined as total ban in both the home and vehicle, 24 participants (51.1%) completely banned cigarette smoking in both the home and car, and 9 individuals (19.1%) completely banned ENDS use in the home and car. It is worth noting that no participants endorsed having a complete ENDS ban but not a complete cigarette ban; every participant with a complete ban on ENDS devices also had a complete ban on cigarette smoking.

Rates of cigarette bans in the homes of parents in our sample were found to be significantly higher than rates reported in previous
studies, $\chi^2(1, N=47)=9.19$, $p<0.01$. For this analysis, our study rate of 63% of participants who completely banned smoking in the home was compared to a published rate of 42% of households banning smoking [averaged across prior studies that examined ban rates; Hennesey et. al. (2014) and Tyc et. al (2013) at 41% and 43% respectively]. Additionally, rates of ENDS bans in the home were found to be significantly lower than would be expected when compared to these published rates of cigarette bans in the home, $\chi^2(1, N=47)=8.29$, $p<0.01$.

Further analyses were conducted to determine associations between demographic factors and ban of ENDS. Participants were grouped into categories defined as those who completely banned ENDS in both their homes and vehicles vs. those who implemented partial bans/no bans in the home and vehicle. Descriptive information for the ban groups across demographic variables are listed in Table 5. Results indicated a significant association between ENDS use and type of bans in the home and vehicle (Fisher’s exact test, $p<.01$; medium effect size of phi =0.43); fewer ENDS users completely banned ENDS in their homes and vehicles ($n=1$, 11.1%) than non-users ($n=8$, 88.9%) ($p<0.01$, Fisher’s exact test) with a medium effect size (phi = 0.43). Additionally, a significant association was found between gender and ENDS bans (Fisher’s
exact test, \( p<0.05; \phi = 0.36 \) with males being less likely to enact a complete ENDS ban (\( n=11.2\% \)) than females (\( n=88.9\% \)). As indicated by the frequencies in Table 5, there were no significant associations between types of ENDS bans and other demographic variables of race, marital status, parent education level or income level (all Fisher’s exact tests; \( p>0.05 \)). Family income approached significance (\( p=0.06 \)) with higher income parents (defined as income of $100,000 or more) more likely to report a ban than lower income parents (defined as income under $100,000). Likewise, there was no significant difference in participant’s age for those who did or did not implement a complete ban in the home and vehicle, \( t(22) = 0.88, p >.05 \).

When examining risk perceptions and their association to the ban status for ENDS use in both the home and vehicle, participant’s perception of risk was significantly associated with the types of bans they had in the home and vehicle. Overall, higher mean scores of perceived risk of ENDS use were found among participants who completely banned ENDS in their homes and vehicles (\( M = 3.48, SD = 0.59 \)) when compared to participants who did not completely ban ENDS in their homes and vehicles (\( M = 2.29, SD =0.49 \)), \( t(45)=6.29, p<0.001 \). Additionally, specific items on the risk perception measure were examined to identify their association.
with bans. For these analyses, question responses were
dichotomized into two categories, “Agree” and “Strongly agree” vs.
“Disagree” with “Strongly disagree.” Additionally, when asked to
endorse the potential harm of ENDS as less harmful than regular
cigarettes, as harmful as regular cigarettes, or more harmful than
regular cigarettes, responses were combined into “less harmful” and
“as harmful,” compared to “more harmful.” In these analyses, risk
perception was significantly related to ENDS ban status. Across
survey items, parents who endorsed agreement with risk of harm
were more likely to implement complete ENDS bans in their homes
and vehicles. Endorsements regarding the degree of harm associated
with ENDS products compared to cigarettes showed no significant
relationship with ban status. Responses to the survey items and their
association with ban status can be found in Table 4.
Discussion

As extensive literature has conclusively demonstrated the harmful effects of second-hand smoke exposure (SHSe) from cigarettes among children who are also at increased risk for future tobacco use and addiction if exposed. Similar risks are beginning to emerge for those exposed to secondhand vapor form ENDS use. Despite these increased health risks, results from this pilot study indicated that 55% of parent participants were current daily ENDS users and 19% were dual ENDS users and smokers, although it is difficult to determine use of which product came first. While this study included a small sample size, rates of vaping among parents in our sample are higher than rates reported in national surveys (Centers for Disease Control and Prevention, 2015; U.S. Department of Health and Human Services, 2016). Parents who used ENDS products were most likely to be male suggesting that educational efforts and interventions be targeted to male users who may be most at risk. The increased rates of ENDS use noted in this study may be due to the study eligibility criteria that included current smokers and ENDS users, in order to capture a high-risk sample that could potentially expose their children to secondhand smoke and vapors. Although our results also likely reflect trends in increased rates of
ENDS use over time, collective findings suggest that despite having a child residing in the home with the potential to be exposed to ENDS products, many parents are not discouraged from using ENDS products.

To our knowledge, this is the first study to examine bans on ENDS products in participant’s homes and vehicles. Although half of the sample reported bans on cigarette smoking in the home and car, only 19% implemented complete vaping bans in the home and car settings. In general, most parents who banned smoking and ENDS use in the home also banned smoking and ENDS use in the vehicle. Of note is that no parent who banned use of ENDS devices in the home and vehicle allowed cigarette smoking, yet some parents who banned cigarette smoking allowed ENDS use. Furthermore, rates of home smoking bans were at least comparable to those reported in prior studies (Hennesey et al., 2014; Tyc et al, 2013). Females were also found to be more likely to report having banned ENDS devices. Whether this is due to the fact that mothers may be responsible for establishing rules about smoking/vaping in the household or differences in gender rates for ENDS use was not determined in the current study. However, based on the current findings of males being more likely to use ENDS, it is expected males are, therefore, less likely to restrict use.
Of concern is the finding that perceptions of harm associated with ENDS use were generally low in the study sample and close to 79% of participants endorsed perceptions of reduced harm from ENDS products compared to cigarettes. More importantly, only about 21% of participants responded that exposure to secondhand vapors was ‘as harmful’ or ‘more harmful’ to infants and children as cigarettes, a finding that was consistent with other studies that assessed adult perceptions of harm to children exposed to secondhand vapors (Nguyen et al., 2017). In addition, participants who used ENDS products endorsed significantly lower perceptions of harm from these products than non-users. Likewise, parents in our study who viewed ENDS devices as potentially harmful to themselves and others, particularly children, were more likely to ban these devices in their homes and vehicles. Of note is that differences in the phrasing of survey questions may have further impacted participant responses. For example, more participants ‘agreed’ or ‘strongly agreed’ that “inhaling vapors from” ENDS is harmful to children than ‘agreed’ or ‘strongly agreed’ that simply using ENDS around children could be harmful. The inclusion of the phrase, “inhaling vapors” resulted in perceptions that ENDS devices confer a greater risk to children than the phrasing of “using [ENDS devices] around children.”
Considering the current study enrolled participants who were current users of either ENDS or cigarettes, lower perceptions of risk are not surprising given the demonstrated inverse relationship between product use and perceived risk. Those participants identified as non-ENDS users were still current smokers and yet significant differences in risk perceptions between ENDS users and non-ENDS users were found. The differences in risk perceptions between current ENDS users and non-ENDS in our sample are likely of a lower magnitude than what would be expected if one were to compare current ENDS users to those who never smoked or used ENDS products on risk ratings. These collective results combined with an overall lower frequency of bans found in this study when comparing rates of ENDS bans to cigarette bans, lends support to the idea that ENDS devices are viewed as safer alternatives to traditional cigarettes (Nguyen, Tong, Marynak, & King, 2017).

The combined findings from this study show that ENDS use is frequent among participants who live with children, ENDS devices are viewed as less harmful than traditional cigarettes, ENDS devices are banned in homes and vehicles at a lower rate than traditional cigarettes, and establishment of bans on ENDS devices are related to participants’ perception of risk associated with these
products. Children, residing with parents who use these products, will continue to be exposed to ENDS vapors in their home and car environments. As the surgeon general has recently declared use of ENDS devices an epidemic, especially due to the rapid rise in use by youth and more recently in adults (U.S. Department of Health and Human Services, 2016), proper public education about the risks associated with ENDS use and interventions that encourage parents to ban use of these products around their children becomes abundantly important. As approximately half of the study participants rated themselves as “good communicators” about ENDS use with their children, ensuring parents have access to accurate information would have a critical outreach impact on their children and protect their future health. This study addressed some of the gaps in the literature to date and sets the stage for future research on risk factors associated with ENDS use in order to help guide future intervention delivery to those most at risk.

Limitations and Areas for Future Research

There are several limitations for the current study inherent to tobacco research. First, the primary outcomes in this study were based solely on participant self-report. Self-report studies of smoking have been shown to be valid (Caraballo, Giovino,
Pechacek, & Mowery, 2001), however, the validity of self-reported ENDS use has not been well established. Inclusion of objective measures such as salivary cotinine from the parents or urinary cotinine from the child (Benowitz, 1996; Matt, Wahlgreen, Hovel, Zakarian, Bernert, & Meltzer, 1999) would improve the validity of participant reports and should be considered in future studies.

Methodologically, the study’s cross-sectional design also limited the evaluation of sustained use of tobacco or ENDS over time and its association with parental perceptions and behaviors. Lastly, the sample size for this study was relatively small and limited in diversity which may limit its generalizability to the general population. As noted in the literature review, the heterogeneity in the use and design of ENDS devices combined with differing behaviors among ENDS users may differentially impact secondhand exposure outcomes. Although this study does not directly measure children’s secondhand exposure to ENDS products, future studies will need to consider isolating user behavior type, content of ENDS product, and device design in order to better quantify the impact of ENDS use on children.
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established smoking for 2 representative cohorts of Indiana

influencing openness to future smoking among nonsmoking

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consequences of involuntary exposure to tobacco smoke: a


Table 1. Frequencies and Percentages for Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22 (46.8%)</td>
</tr>
<tr>
<td>Female</td>
<td>24 (51.1%)</td>
</tr>
<tr>
<td>Transgender</td>
<td>1 (2.1%)</td>
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<td>Age (yrs)</td>
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<tr>
<td>18-24</td>
<td>3 (6.4%)</td>
</tr>
<tr>
<td>25-34</td>
<td>9 (19.1%)</td>
</tr>
<tr>
<td>35-44</td>
<td>16 (34.0%)</td>
</tr>
<tr>
<td>45-54</td>
<td>16 (34.0%)</td>
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<tr>
<td>55-64</td>
<td>3 (6.4%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
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<tr>
<td>White/Caucasian</td>
<td>38 (80.9%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>9 (19.1%)</td>
</tr>
<tr>
<td>Ethnicity</td>
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</tr>
<tr>
<td>Hispanic/Latino</td>
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</tr>
<tr>
<td>Non-Hispanic/Latino</td>
<td>45 (95.7%)</td>
</tr>
<tr>
<td>Missing Data</td>
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</tr>
<tr>
<td>Marital Status</td>
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</tr>
<tr>
<td>Married</td>
<td>28 (59.6%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>1 (2.1%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>4 (8.5%)</td>
</tr>
<tr>
<td>Separated</td>
<td>3 (6.4%)</td>
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<tr>
<td>Never Married</td>
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<tr>
<td>Education</td>
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<tr>
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<td>4 (8.5%)</td>
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<td>Some College</td>
<td>11 (23.4%)</td>
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<tr>
<td>College Degree</td>
<td>21 (44.7%)</td>
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<tr>
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<td>Income</td>
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<td>Less than $30,000</td>
<td>3 (6.4%)</td>
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<td>$30,000-59,999</td>
<td>11 (23.4%)</td>
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<td>$60,000-99,999</td>
<td>12 (25.5%)</td>
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<td>$100,000 or greater</td>
<td>21 (44.7%)</td>
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<tr>
<td>Current Smoking Status</td>
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<tr>
<td>Everyday</td>
<td>10 (21.3%)</td>
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<tr>
<td>Some Days</td>
<td>14 (29.8%)</td>
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<tr>
<td>Never</td>
<td>23 (48.9%)</td>
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<tr>
<td>Current ENDS Use</td>
<td></td>
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<tr>
<td>Everyday</td>
<td>26 (55.3%)</td>
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<tr>
<td>Some Days</td>
<td>14 (29.8%)</td>
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<td>Never</td>
<td>5 (10.6%)</td>
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<tr>
<td>Missing Data</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>Communication Score</td>
<td></td>
</tr>
<tr>
<td>0: Poor Communicator</td>
<td>12 (25.5%)</td>
</tr>
<tr>
<td>1: Moderate Communicator</td>
<td>10 (21.3%)</td>
</tr>
<tr>
<td>2: Good Communicator</td>
<td>22 (46.8%)</td>
</tr>
<tr>
<td>Missing Data</td>
<td>3 (6.4%)</td>
</tr>
</tbody>
</table>

Total Sample N=47
Table 2. Demographic Variables by ENDS Users Compared to Non-ENDS Users

<table>
<thead>
<tr>
<th>Variable</th>
<th>ENDS Users (n=26)</th>
<th>Non-Users (n=21)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>M=39.27 (SD=12.1)</td>
<td>M=43.29 (SD=7.27)</td>
<td>1.41</td>
<td>-</td>
</tr>
<tr>
<td>Frequency (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17 (65.4%)</td>
<td>5 (23.8%)</td>
<td>7.39**</td>
<td>0.40</td>
</tr>
<tr>
<td>Female</td>
<td>9 (34.6%)</td>
<td>15 (71.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing Data</td>
<td>1 (4.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>22 (84.6%)</td>
<td>16 (76.2%)</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td>4 (15.4%)</td>
<td>5 (23.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>18 (69.2%)</td>
<td>10 (47.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Married</td>
<td>8 (30.8%)</td>
<td>11 (52.4%)</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>College Degree or Higher</td>
<td>17 (65.4%)</td>
<td>15 (71.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No College Degree</td>
<td>9 (34.6%)</td>
<td>6 (28.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Less than $100,000</td>
<td>15 (57.7%)</td>
<td>11 (52.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100,000 or greater</td>
<td>11 (42.3%)</td>
<td>10 (47.6%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01

Table 3. Rate of ENDS and Cigarette Bans in the Home and Vehicle

<table>
<thead>
<tr>
<th>Location</th>
<th>ENDS Ban (N=47)</th>
<th>Cigarette Ban (N=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Home</td>
<td>10 (21.3%)</td>
<td>30 (63.8%)</td>
</tr>
<tr>
<td>Vehicle</td>
<td>10 (21.3%)</td>
<td>27 (57.4%)</td>
</tr>
<tr>
<td>Complete (Home and Vehicle)</td>
<td>9 (19.1%)</td>
<td>24 (51.1%)</td>
</tr>
</tbody>
</table>

Note: Participants could endorse both an ENDS ban and a cigarette ban as well as a home ban and a cigarette ban; therefore, percentages could exceed 100%
Table 4. Frequencies and Percentages for Risk Perception Item Responses and Association with Complete ENDS Ban

<table>
<thead>
<tr>
<th>Statement</th>
<th>Sample (N=47)</th>
<th>% with complete ENDS ban (n=9)</th>
<th>Fisher’s Exact Test p value</th>
<th>Phi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using electronic cigarettes or electronic vapor products is harmful to my health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>p=0.04*</td>
<td>0.32</td>
</tr>
<tr>
<td>Disagree</td>
<td>14 (29.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>24 (51.1%)</td>
<td>9 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>9 (19.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using electronic cigarettes or electronic vapor products around others is harmful to their health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>5 (10.6%)</td>
<td>1 (11.1%)</td>
<td>p=0.00**</td>
<td>0.51</td>
</tr>
<tr>
<td>Disagree</td>
<td>24 (51.1%)</td>
<td>8 (88.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>12 (25.5%)</td>
<td>9 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>6 (12.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using electronic cigarettes or electronic vapor products around infants or children is harmful to their health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>4 (8.5%)</td>
<td>0 (0%)</td>
<td>p=0.01**</td>
<td>0.40</td>
</tr>
<tr>
<td>Disagree</td>
<td>15 (31.9%)</td>
<td>9 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>21 (44.7%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>7 (14.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhaling vapors from electronic cigarettes or electronic vapor products can harm the health of infants and children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>2 (4.3%)</td>
<td>0 (0%)</td>
<td>p=0.04*</td>
<td>0.32</td>
</tr>
<tr>
<td>Disagree</td>
<td>12 (25.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>26 (55.3%)</td>
<td>9 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>7 (14.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breathing air in a room where people vaped yesterday can harm the health of infants and children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>15 (31.9%)</td>
<td>3 (33.3%)</td>
<td>p=0.00**</td>
<td>0.59</td>
</tr>
<tr>
<td>Disagree</td>
<td>23 (48.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>3 (6.4%)</td>
<td>6 (66.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>6 (12.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breathing air in a car where people vape can harm the health of those around me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>5 (10.6%)</td>
<td>1 (11.1%)</td>
<td>p=0.01**</td>
<td>0.43</td>
</tr>
<tr>
<td>Disagree</td>
<td>21 (44.7%)</td>
<td>8 (88.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>17 (36.2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>4 (8.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breathing air in a car where people vape can harm the health of infants and children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>4 (8.5%)</td>
<td>1 (11.1%)</td>
<td>p=0.00**</td>
<td>0.48</td>
</tr>
<tr>
<td>Disagree</td>
<td>24 (51.1%)</td>
<td>8 (88.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>15 (31.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>4 (8.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Use of electronic cigarettes or electronic vapor products is:

<table>
<thead>
<tr>
<th></th>
<th>Less harmful to me than regular cigarettes</th>
<th>As harmful to me as regular cigarettes</th>
<th>More harmful to me than regular cigarettes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>37 (78.8%)</td>
<td>8 (17.0%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>p=0.35</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use of electronic cigarettes or electronic vapor products is:

<table>
<thead>
<tr>
<th></th>
<th>Less harmful to infants and children around me than regular cigarettes</th>
<th>As harmful to infants and children around me as regular cigarettes</th>
<th>More harmful to infants and children around me than regular cigarettes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>37 (78.8%)</td>
<td>8 (17.0%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>p=0.35</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Responses were combined into Disagree/Strongly Disagree and Agree/Strongly Agree for analyses; Ban status was categorized as Complete ban vs. Partial/No ban.

*p<0.05, **p<0.01
Table 5. Demographic Variables by Complete ENDS Ban Compared to Partial/No Ban

<table>
<thead>
<tr>
<th>Variable</th>
<th>Complete Ban (n=9)</th>
<th>Partial/No Ban (n=38)</th>
<th>t</th>
<th>Fisher’s Exact p value</th>
<th>Phi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>M=43.0 (SD=6.14)</td>
<td>M=40.6 (SD=11.10)</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>p=0.02*</td>
<td>0.36</td>
</tr>
<tr>
<td>Male</td>
<td>1 (11.1%)</td>
<td>21 (55.3%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8 (88.9%)</td>
<td>16 (42.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td>p=0.67</td>
<td>0.10</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>8 (88.9%)</td>
<td>30 (78.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td>1 (11.1%)</td>
<td>8 (21.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td>p=0.45</td>
<td>0.15</td>
</tr>
<tr>
<td>Married</td>
<td>4 (44.4%)</td>
<td>24 (63.2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Married</td>
<td>5 (55.6%)</td>
<td>14 (36.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td>p=0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>College Degree or Higher</td>
<td>5 (55.6%)</td>
<td>27 (71.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No College Degree</td>
<td>4 (44.4%)</td>
<td>11 (28.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td>p=0.06</td>
<td>0.32</td>
</tr>
<tr>
<td>Less than $100,000</td>
<td>2 (22.2%)</td>
<td>24 (63.2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100,000 or greater</td>
<td>7 (77.8%)</td>
<td>14 (36.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01
Appendix A

Tobacco Assessment

You are invited to participate in this study about your tobacco use, use of e-cigarettes, attitudes toward smoking/vaping, and rules about smoking and vaping in your family home and vehicle. You do not have to be a biological parent of the child to participate. If you are a primary caregiver for the child, you are invited to participate. The survey is designed to focus on parents/caregivers of children less than 18 years of age. The items marked with and asterisk* MUST be completed to determine eligibility to participate in the study. Thank you very much for your time and support.

In order to determine your eligibility to participate, please answer the following questions.

Do you have at least one child who is less than 18 years of age currently living in your household?

- ○ Yes
- ○ No

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

- ○ Yes
- ○ No

Do you NOW smoke cigarettes?

- ○ Everyday
- ○ Some Days
- ○ Never

Have you ever used an electronic cigarette, or e-cigarette, or electronic vapor product even one time in your life?

- ○ Yes
- ○ No

Do you NOW use electronic cigarettes, e-cigarettes, or electronic vapor products every day, some days, or not at all?

- ○ Every day
- ○ Some days
- ○ Not at all

What is your marital status?

- ○ Married
- ○ Widowed
- ○ Divorced
Separated
Never married
What is your current parenting situation?
- I am parenting with my spouse
- I am a single parent, living with a partner, and my child or children
- I am a single parent, living with my own parents
- I am a single parent, living with my child or children only
What is the highest level of school you have completed or the highest degree you have received?
- Less than 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 age?
- Age: [ ]
What is your race?
- White/Caucasian
- American Indian/Alaskan Native
- Black/African American
- Pacific Islander/Hawaiian Native
- Biracial/Multiracial
- Other
What is your ethnicity?
- Hispanic/Latino
- Non-Hispanic/Latino
Information about income is very important to understand. Would you please give your best guess?
Please indicate the answer that includes your entire household income in (previous year) before taxes.
- Less than $10,000
• $10,000 to $19,999
• $20,000 to $29,999
• $30,000 to $39,999
• $40,000 to $49,999
• $50,000 to $59,999
• $60,000 to $69,999
• $70,000 to $79,999
• $80,000 to $89,999
• $90,000 to $99,999
• $100,000 to $149,999
• $150,000 or more

What is the gender of your child?
• Female
• Male
• Transgender
• Other

Does your spouse/partner currently smoke cigarettes?
• Yes
• No
• N/A (no spouse/partner)

How many smokers currently live in your household?
• 0 Smokers
• 1-2 smokers
• 3 or more smokers

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 or vapes

How much nicotine is typically in your e-liquid?
• Nicotine amount: [ ]
• Don't know/not sure
Does your spouse/partner currently use e-cigarettes/vape?

- ☐ Yes
- ☐ No
- ☐ N/A (no spouse/partner)

How many people current use e-cigarettes/vape in your household?

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

Using electronic cigarettes or electronic vapor products is harmful to my health

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree

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

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree

Using electronic cigarettes or electronic vapor products around infants or 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 infants and children

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree

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

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree

Breathing air in a car where people vape can harm the health of those around me
Breathing air in a car where people vape can harm the health of infants 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 infants and children around me than regular cigarettes
- [ ] As harmful to infants and children around me as regular cigarettes
- [ ] More harmful to infants and children around me than regular cigarettes

E-cigarettes or electronic vapor products could help me quit smoking regular cigarettes

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Agree
- [ ] Strongly agree
- [ ] N/A (I do not smoke regular cigarettes)

E-cigarettes or electronic vapor products could help me reduce the number of cigarettes I smoke

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Agree
- [ ] Strongly agree
- [ ] N/A (I do not smoke regular cigarettes)

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

- [ ] Smoking is absolutely 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 the children are not present.
• ☐ Smoking is only allowed at some times. If so, When?
• ☐ Smoking is only allowed in the home when the windows are open and/or 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.

Which best describes the rules about smoking in your car/truck? (Mark all that apply)
• ☐ Smoking is absolutely not allowed anywhere, anytime, or by anyone in the car/truck (no exceptions).
• ☐ Smoking is only allowed in the home when the children are not present.
• ☐ Smoking is only allowed at some times. If so, When?
• ☐ Smoking is only allowed under certain condition (e.g. with the windows down, on long trips)
• ☐ Smoking is only 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 home.

How many adults 18 years of age or older living in your household currently smoke?
• ☐ How many?

How many children <18 years of age living in your household currently smoke?
• ☐ How many?

Which best describes the rules about use of e-cigarettes/vaping in your home? (Mark all that apply)
• ☐ Vaping is absolutely 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 the children are not present.
• ☐ Vaping is only allowed at some times. If so, When?
• ☐ Vaping is only allowed in the home when the windows are open and/or 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.

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

- □ Vaping is absolutely not allowed anywhere, anytime, or by anyone in the car/truck (no exceptions).
- □ Vaping is only allowed in the home when the children are not present.
- □ Vaping is only allowed at some times. If so, When?
- □ Vaping is only allowed under certain condition (e.g. with the windows down, on long trips)
- □ Vaping is only 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 home.

How many adults 18 years of age or older living in your household currently use e-cigarettes/vape?

- □ How many?

How many children <18 years of age living in your household currently use e-cigarettes/vape?

- □ How many?

Have you ever talked with your child about the effects of smoking on his/her health?

- □ Yes
- □ No

Have you ever talked with your child about the effects of second-hand smoke on his/her health?

- □ Yes
- □ No

Have you ever talked with your child about the effects of e-cigarettes/vaping on his/her health?

- □ Yes
- □ No

Have you ever talked with your child about the effects of second-hand vapors from e-cigarettes/vaping on his/her health?

- □ Yes
- □ No

Thank you. This completes the survey.