VAPING, SMOKING, DUAL USE, AND STEALTH VAPING/SMOKING 1 I. Introduction: Rates of Tobacco Use, Vaping, and Dual Use Among the General U.S. Population According to the Centers for Disease Control and Prevention (2018), "vaping" is the term for the utilization of an electronic smoking device, e-cigarette, and/or an electronic nicotine delivery system (ENDS) that produces an aerosol vapor to be inhaled or "vaped" by heating a liquid solution. This solution can contain nicotine, although the device may also contain other substances. These devices usually are designed to look like cigarettes, cigars, and/or pipes and were originally advertised as a way to stop smoking. It should be noted that the terms, "vaping", "e-cigarettes", and "ENDS" will be used interchangeably throughout this narrative.Findings by Soneji et. al (2017) suggest that vaping may activate cognitive, psychological and/or behavioral processes which increase the risk of smoking, by creating positive expectations about cigarette smoking, increasing affiliation with peers who smoke cigarettes, and through mimicking behavioral activities (i.e., hand to mouth movements, inhalation and exhalation, and puffing behaviors).Some studies have found that daily ENDS utilization enabled cigarette smokers to quit or reduce cigarette consumption (Berry, Reynolds, Collins, Siegel, Fetterman, Hamburg, Bhatnagar, Benjamin, & Stokes, 2019; Zhu, Zhuang, Wong, Cummins, Tedeschi, 2017), while others have found no association between ENDS utilization and smoking cessation (Brose, Hitchman, Brown, West, McNeill, 2015; Manzoli et al., 2015).Additionally, studies have found that individuals who vaped showed long-lasting traces of tobacco-specific nitrosamines (TSNAs) biomarkers in the body, as well as volatile compounds and metals which, although lower than in those who smoke only tobacco cigarettes, were at higher concentrations than those found in non-vapers (Goniewicz, Smith, Edwards, Blount, Caldwell, Feng et. al., 2018).Benefits and Risks of Vaping E-Cigarettes Benefits: Studies have shown that individuals prefer e-cigarettes due to an understanding of presumptive health benefits as well as the individual's perception that e- cigarettes are safer (less ingestion and exposure to toxic chemicals found in cigarette smoke) and aid in smoking cessation (Brikmanis, Peterson, & Doran, 2017; Coleman et. al., 2017; Pepper & Brewer, 2013; Rass et al, 2015; Zhu et al., 2013).Over the past few years, vaping has rapidly increased among adults and adolescents, with the adjusted national sales increasing from $11.6 million in 2010 to $751.2 million in 2016 (Cantrell, Huang, Greenberg, Willett, Hair, & Vallone, 2018; Kasza, Ambrose, Conway, Borek, Taylor, Goniewicz et. al 2017; Rass, Pacek, Johnson, & Johnson, 2015).Adult e-cigarette usage also varies by ethnic and racial groups with approximately 20.2% of American Indians/Alaska Natives and 14.8% of individuals identifying as non-Hispanic/white reporting having ever used ENDS (National Academies of Sciences, Engineering, and Medicine, 2018; Schoenborn and Gindi, 2015).While some studies suggest that individuals with a household income between $25,000 - $34,999 (3.0%) have higher rates of ENDS use compared to the general population (Sharapova, Singh, Agaku, Kennedy, & King, 2018), other studies have found adults with higher income to be more likely to have ever used e-cigarettes (27.4% of individuals with an income of $75,000-$124,000) (Huang et al., 2016), or have found no association VAPING, SMOKING, DUAL USE, AND STEALTH VAPING/SMOKING 4 between income and rates of ENDS use (King, Tael, Nguyen, & Dube, 2015).In contrast, Bullen and colleagues (2013) conducted a randomized-controlled trial in New Zealand and found that after 13 weeks of using e-cigarettes containing nicotine, smoking abstinence among

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participants at 6 months had increased; however, cessation rates were not significantly different when compared to participants who used nicotine replacement patches or e-cigarettes with nicotine-free cartridges.Utilizing data from the 2017 Behavioral Risk Factor Surveillance System, a random telephone survey collecting an array of health data from states around the United States, Kava, Hanna, and Harris (2020) found that rates of e-cigarettes and dual use among employed adults in the U.S. have steadily been rising, increasing from 3.2% in 2016 (NHIS, 2017) to 4.4% in 2017 (Kava et al., 2020).VAPING, SMOKING, DUAL USE, AND STEALTH VAPING/SMOKING 7 Health Risks: While it is often assumed by individuals utilizing e-cigarettes that vaping is less harmful than tobacco cigarettes, e-cigarettes have been shown to increase the risk for smoking initiation, escalation, and dependence (Dvorsky & Langberg, 2019; Pepper & Brewer, 2017; Sonji et al., 2017).Additional risks associated with ENDS use include introducing nicotine, fine particles, heavy metals, tobacco-specific nitrosamines (TSNAs) and other toxins into the immediate environment (Czogala, Goniewicz, Fidelus, Zielinska-danch, Travers, & Sobczak, 2014).Examination of rates of dual tobacco product use has found that approximately 70% - 84.1% of users utilized two different tobacco products with the most common combination being cigarettes and e-cigarettes (30.1%) (Coleman, Rostron, Johnson, Ambrose, Pearson, Stanton, et al., 2017; Kasza et al., 2017; NHIS, 2016).Further, studies have found that e-cigarette utilization decreases an individual's ability to abstain or reduce smoking when compared to not using a replacement product (Pepper & Brewer, 2013; Shi, Pierce, White, Vijayaraghavan, Compton, Conway et al., 2017).Some studies have found that individuals with some college education/associates degree had the highest rates of current ENDS use, compared to those who obtained a GED (39.2% vs. 9.7% respectively) (Coleman et al., 2017), while other studies suggest that those with a high school diploma had higher rates (36.1%) (Huang, Kim, Vera, & Emery, 2016).Prevalence rates for dual use determined by the 2017 Behavioral Risk Factor Surveillance System were highest among employed adults within the age range of 18-24-years (4.1%), males (2.6%), American Indian/Alaska Natives (3.3%), those with a high school diploma (3.4%), and those with an annual household income between $15,000 - $24,000 (3.9%).A recent meta-analysis of 65 studies (Romijnders, Osch, Vries, & Talhout, 2018) indicated that among adult smokers and e-cigarette users, e-cigarettes were used primarily for purposes of smoking cessation.Based on the NIHS (2014) VAPING, SMOKING, DUAL USE, AND STEALTH VAPING/SMOKING 3 data, 14.2% of men reported ever using e-cigarettes, significantly higher than the reported 11.2% of female users (National Academies of Sciences, Engineering, and Medicine, 2018; Schoenborn and Gindi, 2015).Of the cigarette smokers, 74.6% smoked cigarettes daily (CDC, 2018).

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