

Breathing in the Risks: E-Cigs, Secondhand Exposure & Maternal Impact

APHA 2025 Annual Meeting and Expo

Abstract

Identifying risk profile for adolescent e-cigarette use: A sex-stratified machine learning analysis

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Background: Previous research has identified sex differences in the use of nicotine products, including e-cigarettes.

Objectives: To investigate the comprising key risk/protective factors associated with current e-cigarette use among adolescents, with particular attention to sex differences.

Methods: We developed supervised machine learning (ML) models to predict self-reported past 30-day e-cigarette use (yes/no) among high school students (N=1,829) in Southern California (M=14.6 years, SD=0.5) during February-June 2024. Gradient Boosting Machine was employed to develop three e-cigarette use prediction models: (1) a combined model including both male and female participants, (2) a male-only model, and (3) a female-only model. All three ML models used the same algorithm to systematically assess sex-specific factors. A total of 69 predictor variables were incorporated into the ML models, encompassing sociodemographic characteristics, substance use behaviors, mental health indicators, susceptibility to substance use, beliefs about e-cigarettes, phone use behaviors, and health diagnoses. From each model, we identified the top 10 most important predictors based on scaled importance scores.

Results: Among the 1,829 adolescents in the study sample (54.7% female, 48.4% Hispanic), 66 participants (3.6%; females[3.7%], males[3.5%]) reported current e-cigarette use. The primary ML model demonstrated a strong ability to predict e-cigarette use, with the area under the receiver operating characteristic curve of 0.939. In this combined model, the most influential predictors were primarily substance use behaviors and peer e-cigarette use. Sex-stratified analyses showed that two mental health diagnoses, depression and post-traumatic stress disorder, were among the top predictors in the female model but were not identified as key predictors in the male model. Cannabis vaping emerged as the strongest predictor in both the male and female models.

Conclusion: The findings of this study underscore the importance of considering sex differences when identifying risk profiles associated with e-cigarette use and developing targeted prevention and intervention programs for adolescents.

Epidemiology Planning of health education strategies, interventions, and programs Public health or related research Social and behavioral sciences

Abstract

Medical students' knowledge, attitudes, and behaviors toward vaping and e-cigarette use

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Background: The use of electronic cigarettes (e-cigarettes), commonly known as vaping, has surged exponentially over the past decade, becoming a popular alternative to traditional tobacco smoking. Alongside this rise, there has been a growing body of data highlighting the adverse health effects associated with vaping. It remains unclear, however, what medical students know, believe, and practice regarding vaping, as well as what they are being taught about this issue. This study explored medical students' knowledge, attitudes, and perceptions of the harm associated with e-cigarette use, as well as their evaluation of the education they receive on vaping.

Method: A cross-sectional online survey was conducted among all currently enrolled students at St. George's University's School of Medicine ($n = 5,794$) over a five-week period from February to March 2024. The survey focused on students' experiences, behaviors, attitudes, and perceptions towards e-cigarettes and vaping, the accessibility of e-cigarettes, and their assessment of the education they received on the health impacts of vaping.

Results: Out of 5,794 invitations sent out, 1,400 (24%) responded, with 1,193 (94%) consenting to take and complete the survey. While 82% of respondents had never tried conventional tobacco cigarettes, 29% reported having used e-cigarettes (vaping) at least once. A significant majority (97%) acknowledged that vaping carries some health risks, yet 75% had not encountered any information about vaping in their medical curriculum, and 68% rated their education on vaping's health effects as poor or very poor.

Conclusions: Although the majority of medical students recognize the health risks associated with vaping, a notable portion still engages in the practice. There is a pressing need for enhanced educational efforts within the medical curriculum to better prepare future physicians to effectively address vaping-related health issues.

Keywords: E-cigarettes, Electronic cigarette, Vaping, Medical student education, Medical school curriculum development

Advocacy for health and health education
Conduct evaluation related to programs, research, and other areas of practice
Epidemiology
Implementation of health education strategies, interventions and programs
Planning of health education strategies, interventions, and programs
Public health or related education

Abstract

Household Secondhand Aerosol Exposure and Its Association With Depression, Anxiety, and Both Conditions in Nonsmoking Youth

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Background: Children and adolescents exposed to secondhand smoke (SHS) are at increased risk for mental health disorders such as depression and anxiety. However, limited research has addressed the impact of secondhand aerosol (SHA) from emerging tobacco products like e-cigarettes. This study examines the association between household SHA exposure and mental health outcomes in nonsmoking youth.

Methods: We conducted a secondary analysis of the 2023 National Survey of Children's Health (NSCH), assessing the relationship between household SHA exposure and child mental health outcomes categorized as depression only, anxiety only, comorbid depression and anxiety, or no condition. Covariates included demographic characteristics, family environment, caregiver health, and child health behaviors. Multivariable multinomial logistic regression was used to estimate the odds of each outcome, using children with no condition as the reference group.

Results: Among the 55,162 children surveyed, 7.2% had anxiety only, 0.65% had depression only, and 3.5% experienced both. Children exposed to e-cigarette use inside the home reported higher rates of anxiety (10.05% vs. 7.12%), depression (1.63% vs. 0.61%), and comorbid conditions (8.97% vs. 3.22%) than those unexposed. After adjustment, high screen time was associated with elevated odds of depression (OR = 4.12), anxiety (OR = 2.52), and comorbid conditions (OR = 4.45). Poor adult physical and mental health were

also linked to increased odds of these outcomes.

Conclusion: Secondhand aerosol exposure is associated with significantly higher odds of depression, anxiety, and comorbid conditions among nonsmoking children. These findings reflect emerging risks from e-cigarette use in home settings. Targeted public health efforts are needed to reduce SHA exposure and support child mental health.

Keywords: Secondhand aerosol, Depression, Anxiety, Children, Adolescents, E-cigarettes

Advocacy for health and health education Implementation of health education strategies, interventions and programs Planning of health education strategies, interventions, and programs Social and behavioral sciences

Abstract

Exploring transitions in prenatal maternal tobacco use: Evidence from the prams data

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Tobacco use remains a leading cause of preventable morbidity and mortality, with smoking during pregnancy posing significant risks to the mother, fetus, and child. Limited research exists on transitions in tobacco use during pregnancy. This study aims to identify factors associated with behavioral shifts, including transitions from exclusive cigarette smoking to dual use or from non-smoking to smoking or e-cigarette use.

This study utilized national data from Phase 8 of the Pregnancy Risk Assessment Monitoring System (PRAMS) (2016–2021; N=216,035). Descriptive statistics and multivariable logistic regression analyses examined sociodemographic, health system, and geographic factors influencing transitions in tobacco use behaviors among pregnant women.

No smoking to smoking during the last three months of pregnancy was 85% less likely (OR: 0.15, 95% CI: 0.00-0.55, P<0.01) among individuals with a 4-year degree and 55% less likely (OR: 0.45, 95% CI: 0.25-0.80, P<0.01) among married women.

Smoking 3 months before pregnancy to only e-cigarette use last 3 months of pregnancy was 81% less likely (OR: 0.19, 95% CI: 0.07-0.49, P<0.001) among those with a 4-year degree and 64% less likely (OR: 0.36, 95% CI: 0.22-0.60, P<0.0001) among married women.

Smoking 3 months before pregnancy to dual smoking and e-cigarette use last 3 months of pregnancy was 63% less likely (OR: 0.370, 95% CI: 0.183-0.749, P<0.0057) among those with a 4-year degree and 52% less likely (OR: 0.48, 95% CI: 0.34-0.67, P<0.0001) among married women.

Mono smoking or e-cigarette use 3 months before pregnancy to dual smoking and e-cigarette use last 3 months of pregnancy was 65.9% less likely (OR: 0.34, 95% CI: 0.17-0.69, P<0.01) among those with a 4-year degree and 50% less likely (OR: 0.50, 95% CI: 0.36-0.70, P<0.0001) among married women.

These confirm that higher income and ethnicity are protective factors against smoking. Alcohol use and unintended pregnancy increase risk.

Administer health education strategies, interventions and programs Advocacy for health and health education Epidemiology Social and behavioral sciences

Abstract

Relation of smoking before conception and during last three months of pregnancy with low birth weight among women who gave birth in 2020

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Background: Cigarette smoking during pregnancy causes significant additional risk to both the mother and the infant including increased risk of preterm birth and low birth weight. A number of women quit smoking during their pregnancy to reduce the risk of adverse outcomes, but the risk of an adverse outcomes may persist.

Objective: To investigate the relationship of women who smoke before and during the last three months of pregnancy with the birth weight of the newborn.

Data and Methods: We used data from the Pregnancy Risk Assessment Monitoring System (PRAMS) for 2020 and 2021 (n=38,610). The independent variable, smoking, was categorized as no smoking, smoking before pregnancy only and smoking before pregnancy and during the last three months of pregnancy and the outcome variable was low birth weight (birth weight <2500g). In addition to descriptive analysis we constructed weighted unadjusted and adjusted logistic regression models. Maternal age, race, marital status, education, insurance, and BMI were treated as covariates.

Results: The adjusted logistic regression results show women who smoked before conception are 19% (OR=1.19; 95% CI=1.02, 1.40; p=0.030) more likely and women who smoked before and during pregnancy are about two times (OR=1.94; 95%CI=1.65, 2.28; p<0.001) more likely to have low birth weight baby compared to the women who didn't smoke before and during last three months of pregnancy adjusted for the effect of socio-demographic and economic factors.

Conclusion: Smoking before pregnancy and during the last three months of pregnancy significantly increases the risk of low birth weight. However, even mothers who smoked prior to pregnancy and quit during their pregnancy are at increased risk.

Public Health Implications: Smoking cessation interventions are extremely important to implement during women' reproductive years and prior to conception. Even if mothers quit during pregnancy, there is still an increased risk of low birth weight.

Epidemiology Public health or related public policy Public health or related research

Abstract

E-Cigarette Use and Respiratory Diseases among Cancer Survivors in the United States.

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Background: Although some studies suggest a positive link between e-cigarette use and respiratory disorders in the general population, there is a scarcity of peer-reviewed literature assessing the respiratory consequences of vaping in the cancer survivor sub-population. This study examines the relationship between c-cigarette use and respiratory conditions; chronic obstructive pulmonary disease (COPD) and asthma in a sample of cancer survivors.

Methods: This study utilized the 2023 Behavioral Risk Factor Surveillance System (BRFSS), a large,

nationally representative, cross-sectional survey. A total of 42,987 cancer survivors with complete data on all key variables were included. The main exposure variable of interest e-cigarette was categorized into current user, former user or never user. Participants were classified as having COPD or asthma if they self-reported a history of clinically diagnosed COPD or asthma. Multivariable logistic regression was used to examine the independent relationships between e-cigarette and each of the two outcome variables: COPD and asthma, adjusting for age, education level, race/ethnicity, marital status, combustible cigarette smoking, heavy alcohol use and body mass index.

Results: Of the 42,987 cancer survivors in this study, 1,074 (3.6%) were current e-cigarette users, 5,940 (14.2%) reported a history of COPD diagnosis and 4,968 (11.6%) were currently living with asthma. Compared to survivors who had never used e-cigarettes, the odds of COPD were significantly greater for current users (OR=1.51, 95% CI:1.10-2.07) and former users (OR=1.35, 95% CI:1.09-1.66). Although we found statistically significant crude associations between e-cigarette use and asthma, the association was no longer significant after adjusting for the covariates.

Conclusions: E-cigarette use may exacerbate respiratory conditions including COPD and asthma in cancer survivors. Further studies are needed to explore the long-term impact of e-cigarette use on respiratory health outcomes in cancer survivors, to inform public health interventions, policies and programs aimed at preventing negative respiratory conditions in this population.

Advocacy for health and health education
Chronic disease management and prevention
Epidemiology
Public health or related research
Social and behavioral sciences

Abstract

Characterizing nicotine vaping by high school students in a large North Carolina school district: Project MARVEL

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Background. Vaping nicotine may impact adolescent health and well-being. **Methods.** Project MARVEL (Multidisciplinary Assessment of the Risks from Vaping in Early Life) assesses the relationship between nicotine vaping among high school students and psychosocial, neurocognitive, autonomic, and respiratory function. A school-based survey was administered in 12 high schools in a large North Carolina school district in 2023-2024. Participation required written parental consent (for those under 18); 3199 students out of 15103 enrolled in the district completed the survey. We assessed past-month vaping frequency, susceptibility to vaping (among those with no past month use), and self-reported addiction (0-100%). We also assessed use of other nicotine products, as well as non-nicotine vaping products. **Results.** Seven percent of participants reported past-month vaping. Among Current Vapers, 28% reported trivial use (1-2 days), 31% reported infrequent use (3-20 days), and 41% reported frequent use (21-30 days). Current Vapers reporting frequent use had higher levels of self-reported addiction (mean 55.0) and were more likely to currently use non-nicotine vaping products (64.5%) compared to those reporting infrequent nicotine vaping (mean 18.6 and 41.7%, respectively; p values $<.005$). Frequent Current Vapers also reported higher levels of self-reported addiction and were more likely to currently use other nicotine or tobacco products (43.0%) compared to those who reported trivial nicotine vaping (5.7 and 15.6%, respectively; p values $<.001$). 37% of Non-Vapers were susceptible to vaping nicotine on the susceptibility scale. **Conclusions.** Current vaping among high school students is highly heterogeneous. Frequency of nicotine vaping is positively related to self-reported level of addiction, likelihood of using non-nicotine vaping products, and likelihood of using other nicotine/tobacco products. Research on the impact of nicotine vaping on health and well-being must carefully consider the frequency of vaping and the potential impact of comorbid behaviors.

Social and behavioral sciences

Abstract

A 20-Year Overview of Trends in Secondhand Smoke Exposure Among Cardiovascular Disease Patients in the U.S.: 1999–2020

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Background

Cardiovascular disease (CVD) is the leading cause of death in the U.S., rising from 271 million in 1990 to 523 million in 2019. Whereas secondhand smoke exposure (SHSe) is a major public health threat, particularly for individuals with CVD. This study aims to examine 20-year trends in SHSe among U.S. adults diagnosed with CVD and identify patterns across sociodemographic subgroups.

Methods

Participants in the National Health and Nutrition Examination Survey (NHANES) from 1999 to 2020 who self-reported CVD conditions- namely, heart disease, congestive heart failure, coronary heart disease, heart attack, stroke, and angina- were included in the study. SHSe was determined if the respondents reported who had never smoked or used any nicotine-containing product within the preceding five days and had Serum Cotinine concentration ≤ 10 ng/mL measured by LCMS (Liquid Chromatography – Mass Spectrometry). Multivariable logistic regression was employed to identify how age, sex, race, insurance availability, education levels, and the poverty income ratio (PIR) were associated with SHSe.

Results

Using a complex survey design and weighting, 34,238,530 self-reported CVD patients were identified, among whom 9,357,424 had SHSe. The crude weighted prevalence of SHSe among CVD patients gradually decreased from 44.62% in the 1999-2000 cycle to 16.67% in the 2017 cycle. Crude-weighted trends indicated a declining trend in SHSe across all demographic and socioeconomic groups, with a smaller decline observed among non-Hispanic black individuals and those with low income (PIR: 0-1.30) when considering the differences from 1999 to 2020. Factors impacting SHSe include males (Odds Ratio (OR): 1.49), non-Hispanic blacks (OR: 1.92), and lower-income individuals (OR: 2.14), who were more likely to have SHS.

Conclusions

Even after ongoing efforts to reduce secondhand smoke exposure, SHSe continues to persist, particularly among vulnerable populations. Strengthening smoke-free laws and promoting education for CVD patients and their families can support smoke-free environments.

Chronic disease management and prevention Epidemiology Public health or related research

Abstract

E-Cigarette Use and Depression Among Young Adults in Virginia: A Cross-Sectional Analysis of BRFSS 2023 Data

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Background: The rise of e-cigarette use among young adults has paralleled increasing mental health

concerns, including depression. While numerous studies have explored this relationship nationally, region-specific insights remain sparse. Virginia has reported increasing e-cigarette use and mental health concerns among its youth, warranting detailed state-level epidemiologic assessment.

Objective: To examine the association between current e-cigarette use and self-reported depression among young adults aged 18–34 years in Virginia using 2023 BRFSS data.

Methods: A cross-sectional secondary analysis of the 2023 Virginia BRFSS dataset was conducted. The final analytic sample included 5,006 respondents aged 18–34 after data cleaning. The exposure variable was e-cigarette use (daily, some days, former, never), and the outcome was self-reported diagnosis of depression. Covariates included age, sex, education, income, marital status, trauma history (ACEHURT1, ACETOUCH), and binge drinking. Frequencies, chi-square tests, and logistic regression models were applied.

Results: Daily e-cigarette users had significantly lower odds of depression compared to never users (Unadjusted OR = 0.59; 95% CI, 0.50–0.69; $p < 0.001$). After adjusting for sociodemographics and trauma variables, the association remained significant (AOR = 0.66; 95% CI, 0.56–0.79; $p < 0.001$). The chi-square test showed a significant overall association between e-cigarette use and depression ($\chi^2 = 88.57$, $p < 0.001$). Trauma history and marital status were also significantly associated with depression.

Conclusion: Among young adults in Virginia, daily e-cigarette use was associated with reduced odds of depression. This finding challenges prevailing assumptions and suggests the need to explore underlying mechanisms through longitudinal and mixed-methods research.

Keywords: e-cigarettes, depression, BRFSS, young adults, Virginia, logistic regression, trauma, public health

Biostatistics, economics Epidemiology

