

E-Cigarette Use Among Florida Youth With and Without Asthma



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Introduction: Although prevalence of youth e-cigarette use has increased dramatically, little is known about e-cigarette use among youth with asthma and how it differs by metropolitan status. This study assessed the prevalence of e-cigarette use among youth by asthma and metropolitan status and examined the associations between e-cigarette use, susceptibility to cigarette smoking, and asthma attack.

Methods: High school student participants from the 2012 Florida Youth Tobacco Survey were included (N=36,085). Information on demographics, asthma status, ever and past 30-day use of e-cigarettes, cigarette smoking susceptibility, and having asthma attacks in the past 12 months were collected. Data were weighted to be representative of Florida high school students. Analyses were conducted in 2015.

Results: Overall, prevalence of ever and past 30-day e-cigarette use among students who reported having asthma were 10.4% and 5.3%, respectively, higher than those without asthma (7.2% and 2.5%, respectively, $p < 0.01$). Among students with asthma, e-cigarette use was more common among those in non-metropolitan and rural counties than those in metropolitan counties ($p < 0.05$). Ever and past 30-day e-cigarette use was associated with cigarette smoking susceptibility among participants with asthma and those who never tried cigarettes ($n=2,410$; ever use, AOR=3.96, 95% CI=1.49, 10.56; past 30-day use, AOR=422.10, 95% CI=50.29, > 999.99). Past 30-day e-cigarette use was associated with having an asthma attack in the past 12 months among participants with asthma ($n=5,865$, $p < 0.01$).

Conclusions: E-cigarette use is more common among Florida high school youth with asthma and is associated with susceptibility to cigarette smoking.

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Introduction

E-cigarette use is on the rise among youth in the U.S. Data from the National Youth Tobacco Survey (NYTS) showed that past 30-day use of e-cigarettes increased from 0.6% in 2011 to 3.9% in 2014 among middle school students, and from 1.5% to 13.4% among high school students.¹ The prevalence of past 30-day e-cigarette use surpassed the prevalence of past 30-day cigarette use in 2014 (2.5% among middle school students; 9.2% among high school students).¹ Although a

2014 systematic review suggested that e-cigarettes could be less harmful substitutes for cigarettes,² scientists criticized the weak methodologies employed in current research to evaluate the harm of e-cigarettes, the lack of evidence on long-term health effects of e-cigarette use, and the potential influence of “conflicts of interest surrounding its funding.”^{3,4} Additionally, e-cigarette use among youth may still pose health risks. For example, nicotine has known negative effects on brain development.^{5–7} Furthermore, cross-sectional and longitudinal data suggest that e-cigarettes may introduce youth to tobacco use, and youth who use e-cigarettes are more likely to progress to using cigarettes. The NYTS data showed that ever e-cigarette use was positively associated with susceptibility to smoking among youth who never smoked cigarettes.⁸ A cohort study of ninth-graders who had never used combustible tobacco products at baseline found that e-cigarette use at baseline predicted subsequent initiation of combustible tobacco use.⁹ Another

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cohort study of youth and young adults who were not susceptible to cigarette smoking at baseline found that e-cigarette use at baseline predicted cigarette smoking at follow-up.¹⁰

One youth subpopulation that is of particular concern is youth who have asthma. Individuals with asthma are more likely to smoke cigarettes than those without asthma, even though smoking is associated with poorer asthma control.^{11,12} Exposure to secondhand smoke among children with asthma also increases the risk of having an asthma attack.¹¹ Clinical trials and observational studies showed that common respiratory effects of e-cigarette use were coughing, throat irritation, and chest pain and tightening among non-asthmatic individuals.^{13–15} These symptoms may be more severe among youth with asthma who have sensitive airways. However, little is known about e-cigarette use among youth with asthma.

This study examined the prevalence of e-cigarette use among youth with asthma compared with that of youth without asthma. It further investigated whether the association between asthma status and e-cigarette use differed by metropolitan status, given the higher prevalence of tobacco use in non-metropolitan/rural areas than metropolitan areas.¹⁶ Additionally, it assessed the associations between e-cigarette use; susceptibility to cigarette smoking (a known predictor of future smoking initiation among youth¹⁷); and asthma attacks.

Methods

Study Population

The Florida Youth Tobacco Survey (FYTS),¹⁸ conducted statewide annually by the Florida Department of Health, tracks indicators of tobacco use and exposure to secondhand smoke among public middle and high school students in Florida. During even years, county-level demographic data of the sampled schools were also ascertained. It used a two-stage cluster probability sample design. In the first stage, a sample of public middle and high schools was randomly selected to participate in the survey. In the second stage, a sample of classrooms was randomly selected within each selected school. All students in those classes were then asked to complete a self-administered scannable paper-and-pencil survey. The 2012 FYTS was administered in spring 2012. A total of 75,428 students within 746 selected public schools completed the survey, resulting in response rates of 77% among middle school students and 73% among high school students. Data were collected from 66 of 67 counties in Florida, with the exclusion of Osceola County owing to the county's abstention in the survey. Data from Hardee County were suppressed because of an "unrepresentative sampling methodology."¹⁸ In this study, only high school participants were included (N=36,085) because of the low prevalence of e-cigarette use among middle school participants. The study was a secondary data analysis on de-identified data and therefore exempted from IRB approval.

Measures

Demographic information was collected, including age, gender, race/ethnicity, and metropolitan status. Race/ethnicity was assessed by asking the participants to indicate if they were Hispanic/Latino (*yes/no*), and the best ethnic category describing them (*American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or other Pacific Islander, white, or other*). Responses were recoded into Hispanic; non-Hispanic white; non-Hispanic Asian; non-Hispanic black; Native American (including American Indian, Alaska Native, Native Hawaiian or other Pacific Islander); and other. County-level metropolitan status associated with the sampled schools, developed by the U.S. Department of Agriculture Economic Research Service, was dichotomized into metropolitan (Codes 1–3) and non-metropolitan/rural (Codes 4–9, which include completely rural counties).¹⁹

Participants' asthma status was assessed by asking them to indicate if they currently have asthma (*never diagnosed, currently has asthma, does not currently have asthma, and unsure about current asthma status*). Participants were also asked if they had an asthma attack during the past 12 months (*yes/no*). E-cigarette use was assessed by asking the participants if they had ever tried using an e-cigarette (*yes/no*), and if they had used an e-cigarette during the past 30 days (*yes/no*). E-cigarettes were described to the participants as *battery-operated devices that look, feel, and taste like a tobacco cigarette*. Participants reported the number of days they had smoked cigarettes during the 30 days prior to the survey. Participants who had never tried smoking a cigarette were asked four questions:

1. *Do you think you will try a cigarette soon?*
2. *Do you think you will smoke a cigarette at any time during the next year?*
3. *Do you think you will be smoking cigarettes 5 years from now?*
4. *If one of your best friends offered you a cigarette, would you smoke it?*

If participants responded anything other than *no* to the first question and *definitely not* to the other three questions, they were classified as susceptible to cigarette smoking.¹⁷ Participants were asked if anyone in their home smokes cigarettes now (*yes/no*). Positive social norms toward smoking were assessed by asking the participants if they have seen students, teachers, staff, or other adults smoking on school property (*yes/no*). Exposure to secondhand smoking was assessed by asking if participants were in the same room with someone who was smoking cigarettes in the past 7 days (0–7 days, dichotomized into 0 days versus ≥ 1 days) and if they rode in a car with someone who was smoking cigarettes in the past 7 days (0–7 days, dichotomized into 0 days versus ≥ 1 days).

Statistical Analysis

Analyses were weighted to be representative of high school students in Florida and account for clustered sampling. Demographic characteristics and e-cigarette use behaviors were compared between the youth attending high schools located in metropolitan versus non-metropolitan/rural counties using chi-square tests. Because youth in metropolitan areas were more

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