

From The JAMA Network

Youth Experimentation With e-Cigarettes

Another Interpretation of the Data

Raymond S. Niaura, PhD; Thomas J. Glynn, PhD; David B. Abrams, PhD

JAMA PEDIATRICS

Electronic Cigarettes and Conventional Cigarette Use Among US Adolescents: A Cross-sectional Study

Lauren M. Dutra, ScD; Stanton A. Glantz, PhD

IMPORTANCE Electronic cigarette (e-cigarette) use is increasing rapidly among adolescents, and e-cigarettes are currently unregulated.

OBJECTIVE To examine e-cigarette use and conventional cigarette smoking.

DESIGN, SETTING, AND PARTICIPANTS Cross-sectional analyses of survey data from a representative sample of US middle and high school students in 2011 (n = 17 353) and 2012 (n = 22 529) who completed the 2011 and 2012 National Youth Tobacco Survey.

EXPOSURES Ever and current e-cigarette use.

MAIN OUTCOMES AND MEASURES Experimentation with, ever, and current smoking, and smoking abstinence.

RESULTS Among cigarette experimenters (≥ 1 puff), ever e-cigarette use was associated with higher odds of ever smoking cigarettes (≥ 100 cigarettes; odds ratio [OR] = 6.31; 95% CI, 5.39-7.39) and current cigarette smoking (OR = 5.96; 95% CI, 5.67-6.27). Current e-cigarette use was positively associated with ever smoking cigarettes (OR = 7.42; 95% CI,

5.63-9.79) and current cigarette smoking (OR = 7.88; 95% CI, 6.01-10.32). In 2011, current cigarette smokers who had ever used e-cigarettes were more likely to intend to quit smoking within the next year (OR = 1.53; 95% CI, 1.03-2.28). Among experimenters with conventional cigarettes, ever use of e-cigarettes was associated with lower 30-day (OR = 0.24; 95% CI, 0.21-0.28), 6-month (OR = 0.24; 95% CI, 0.21-0.28), and 1-year (OR = 0.25; 95% CI, 0.21-0.30) abstinence from cigarettes. Current e-cigarette use was also associated with lower 30-day (OR = 0.11; 95% CI, 0.08-0.15), 6-month (OR = 0.11; 95% CI, 0.08-0.15), and 1-year (OR = 0.12; 95% CI, 0.07-0.18) abstinence. Among ever smokers of cigarettes (≥ 100 cigarettes), ever e-cigarette use was negatively associated with 30-day (OR = 0.61; 95% CI, 0.42-0.89), 6-month (OR = 0.53; 95% CI, 0.33-0.83), and 1-year (OR = 0.32; 95% CI, 0.18-0.56) abstinence from conventional cigarettes. Current e-cigarette use was also negatively associated with 30-day (OR = 0.35; 95% CI, 0.18-0.69), 6-month (OR = 0.30; 95% CI, 0.13-0.68), and 1-year (OR = 0.34; 95% CI, 0.13-0.87) abstinence.

CONCLUSIONS AND RELEVANCE Use of e-cigarettes was associated with higher odds of ever or current cigarette smoking, higher odds of established smoking, higher odds of planning to quit smoking among current smokers, and, among experimenters, lower odds of abstinence from conventional cigarettes. Use of e-cigarettes does not discourage, and may encourage, conventional cigarette use among US adolescents.

JAMA Pediatr. doi:10.1001/jamapediatrics.2013.5488.

Dutra and Glantz¹ reported that, in US school students, those who used e-cigarettes were also likely to be smoking conventional (combustible) cigarettes. Despite the associational, rather than causal, nature of the study design, the authors concluded that "Use of e-cigarettes does not discourage, and may encourage, conventional cigarette use among US adolescents" and "e-cigarette use is aggravating rather than ameliorating the tobacco epidemic among youths."

Do the data support these conclusions?

The authors appropriately acknowledged that their cross-sectional study could not determine directionality of influence, that is, whether youths are initiating smoking with combustible cigarettes and then moving on to e-cigarettes or vice versa. There are at least 3 possible explanations for their findings: use of e-cigarettes

(as the authors concluded) causes use of conventional cigarettes; use of conventional cigarettes causes use of e-cigarettes; or there are as-yet unidentified common causes of e-cigarette and lethal combustible cigarette use. The study cannot rule out any of these explanations, but are they equally plausible?

The authors do not explain how they can conclude that e-cigarettes encourage conventional cigarette use or that using e-cigarettes makes a person less likely to quit combustible cigarettes. For e-cigarettes to be a starter product, they would have to hold a special allure for youth—something different or better than lethal cigarettes. It's possible: e-cigarettes are a new "high-tech" product, and they may be perceived as less harmful than cigarettes. If e-cigarettes were a gateway product, additional numbers of youth, who otherwise would never have used any tobacco, would first have

to try e-cigarettes and then turn to combustible cigarettes, for some reason. Better taste? More efficient nicotine delivery? The survey data are limited and do not document movement from e-cigarettes to combustible cigarettes.

It is equally plausible that use of combustible cigarettes leads to use of e-cigarettes, because they are perceived as a less harmful alternative for smokers who are addicted to nicotine. The cross-sectional survey data do not prove that this is the process that explains the association, but they are just as consistent with it as with the authors' proposed explanation.

Other factors may explain the association. Although demographic factors were controlled statistically in the study, any number of other unmeasured factors that distinguish e-cigarette experimental users from nonusers could explain the association between use of combustible cigarettes and e-cigarettes. Consistent with this, the National Youth Tobacco Survey (NYTS)² on which the study was based shows that most users of e-cigarettes were also using combustible cigarettes. Especially likely as explanatory factors are those, such as impulsivity and sensation-seeking, that incline youth toward experimentation and risky behavior—that is, to use of combustible cigarettes and other tobacco products.³ It would be natural to observe that youth who are sensation-seeking and rebellious would be inclined to try both combustible cigarettes and novel e-cigarettes. This subset of youth who choose to try e-cigarettes may be different from those who have not tried e-cigarettes.

A number of unmeasured factors could also predispose youth to nicotine dependence, heavier smoking, difficulty quitting, or simply having greater curiosity to explore novel products. These factors may accompany clusters of other risky behaviors such as use of alcohol and marijuana. The data in the article do not address these alternative relationships, because they cannot disentangle common factors that lead to use of both products. More informative surveys, and, ideally, longitudinal data following the same individuals over time, are needed to help address these issues.

The context in which the study results were observed also should be considered. In the NYTS,² overall tobacco use, including use of

combustible cigarettes, declined from 2011 to 2012. Another major national survey⁴ also shows a steady annual decline of about 10% in combustible cigarette smoking by teens from 2010 to 2013, even as e-cigarette use was doubling. This is consistent with the idea that some youth who would otherwise have taken up combustible cigarettes may have taken up e-cigarettes instead. For uptake of e-cigarettes to threaten public health, it would need to be as dangerous as smoking combustible cigarettes (most unlikely)⁵ and to occur in millions of youth who would never otherwise have smoked combustible cigarettes. The uptake of e-cigarettes should be monitored within a nationally representative longitudinal study, and the Food and Drug Administration is already doing so.⁶

In addition, the authors noted the association of use of e-cigarettes with more time spent using tobacco products, which they believe "...call[s] into question claims that e-cigarettes are effective as smoking cessation aids." Users of e-cigarettes also had higher intention to quit. This connection may indicate that e-cigarette users are more health-concerned than those who only use combustible cigarettes. In any case, the survey did not report information about motives for e-cigarette use; users may have adopted e-cigarettes for harm reduction. Therefore, e-cigarettes may become a gateway out of smoking regular cigarettes.

Cross-sectional surveys provide valuable descriptive information that should encourage careful monitoring of how many youth are using tobacco products and e-cigarettes but do not provide explanations for use. If properly regulated, e-cigarettes have the potential to greatly improve the public health, by providing users of combustible cigarettes who cannot "just quit" a way to get nicotine without experiencing the devastating health consequences associated with inhaling cigarette smoke, with its numerous toxins.⁷

The introduction of e-cigarettes raises concerns about possible risks, and these risks need to be watched and managed, but favoring one causal explanation over any other in the absence of sufficient and informative data risks distracting the health care community from focusing on speeding the decline of combustible cigarettes.

ARTICLE INFORMATION

Author Affiliations: Schroeder Institute for Tobacco Research and Policy Studies, Legacy, Washington, DC (Niaura, Abrams); Department of Oncology, Georgetown University Medical Center, Washington, DC (Niaura, Abrams); Cancer Prevention and Control Program, Lombardi Comprehensive Cancer Center, Washington, DC (Niaura, Abrams); Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland (Niaura, Abrams); American Cancer Society, Washington, DC (Glynn).

Corresponding Author: David B. Abrams, PhD, Schroeder Institute at Legacy Foundation, 1724 Massachusetts Ave NW, Washington, DC 20036 (dabrams@legacyforhealth.org).

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

REFERENCES

1. Dutra LM, Glantz SA. Electronic cigarettes and conventional cigarette use among US adolescents: a cross-sectional study [published online March 6, 2014]. *JAMA Pediatr*. doi:10.1001/jamapediatrics.2013.5488.
2. National Youth Tobacco Survey (NYTS). Centers for Disease Control and Prevention. http://www.cdc.gov/TOBACCO/data_statistics/surveys/NYTS/index.htm. Accessed May 22, 2014.
3. Fix BV, O'Connor RJ, Vogl L, et al. Patterns and correlates of polytobacco use in the United States over a decade: NSDUH 2002-2011. *Addict Behav*. 2014;39(4):768-781.
4. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. Teen smoking continues to decline in 2013 [press release]. University of Michigan News Service. http://www.monitoringthefuture.org/pressreleases/13cigrpr_complete.pdf. Accessed May 22, 2014.
5. Cervellati F, Muresan XM, Sticcozi C, et al. Comparative effects between electronic and cigarette smoke in human keratinocytes and epithelial lung cells [published online May 5, 2014]. *Toxicol In Vitro*. doi:10.1016/j.tiv.2014.04.012.
6. Population Assessment of Tobacco and Health (PATH) study overview. National Institutes of Health. <http://www.pathstudyinfo.nih.gov/UI/StudyOverviewMobile.aspx>. Accessed May 22, 2014.
7. US Dept of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Atlanta, GA: US Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014.