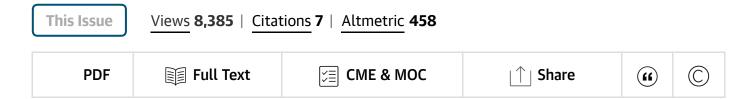
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## **Original Investigation**

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## Association Between Initial Use of e-Cigarettes and Subsequent Cigarette Smoking Among Adolescents and Young Adults

A Systematic Review and Meta-analysis

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## **Key Points**

**Question** Is there an association between e-cigarette use and cigarette smoking among adolescents and young adults?

**Finding** A systematic review and meta-analysis showed strong and consistent evidence of an association between initial e-cigarette use and subsequent cigarette smoking initiation, as well as between past 30-day e-cigarette use and subsequent past 30-day cigarette smoking.

**Meaning** To minimize the potential public health harm from e-cigarette use, the US Food and Drug Administration, as well as state and local agencies, will need to engage in effective regulatory actions to discourage youths' use of e-cigarettes and prevent the transition from e-cigarettes to other combustible tobacco products.

## **Abstract**

**Importance** The public health implications of e-cigarettes depend, in part, on whether e-cigarette use affects the risk of cigarette smoking.

**Objective** To perform a systematic review and meta-analysis of longitudinal studies that assessed initial use of e-cigarettes and subsequent cigarette smoking.

**Data Sources** PubMed, EMBASE, Cochrane Library, Web of Science, the 2016 Society for Research on Nicotine and Tobacco 22nd Annual Meeting abstracts, the 2016 Society of Behavioral Medicine 37th Annual Meeting & Scientific Sessions abstracts, and the 2016 National Institutes of Health Tobacco Regulatory Science Program Conference were searched between February 7 and February 17, 2017. The search included indexed terms and text words to capture concepts associated with e-cigarettes and traditional cigarettes in articles published from database inception to the date of the search.

**Study Selection** Longitudinal studies reporting odds ratios for cigarette smoking initiation associated with ever use of e-cigarettes or past 30-day cigarette smoking associated with past 30-day e-cigarette use. Searches yielded 6959 unique studies, of which 9 met inclusion criteria (comprising 17389 adolescents and young adults).

**Data Extraction and Synthesis** Study quality and risk of bias were assessed using the Newcastle-Ottawa Scale and the Risk of Bias in Non-randomized Studies of Interventions tool, respectively. Data and estimates were pooled using random-effects meta-analysis.

**Main Outcomes and Measures** Among baseline never cigarette smokers, cigarette smoking initiation between baseline and follow-up. Among baseline non-past 30-day cigarette smokers who were past 30-day e-cigarette users, past 30-day cigarette smoking at follow-up.

**Results** Among 17389 adolescents and young adults, the ages ranged between 14 and 30 years at baseline, and 56.0% were female. The pooled probabilities of cigarette smoking initiation were 23.2% for baseline ever e-cigarette users and 7.2% for baseline never e-cigarette users. The pooled probabilities of past 30-day cigarette smoking at follow-up were 21.5% for baseline past 30-day e-cigarette users and 4.6% for baseline non-past 30-day e-cigarette users. Adjusting for known demographic, psychosocial, and behavioral risk factors for cigarette smoking, the pooled odds ratio for subsequent cigarette smoking initiation was 3.50 (95% CI, 2.38-5.16) for ever vs never e-cigarette users, and the pooled odds ratio for past 30-day cigarette smoking at follow-up was 4.28 (95% CI, 2.52-7.27) for past 30-day e-cigarette vs non-past 30-day e-cigarette users at baseline. A moderate level of heterogeneity was observed among studies ( $I^2$ =56%).

**Conclusions and Relevance** e-Cigarette use was associated with greater risk for subsequent cigarette smoking initiation and past 30-day cigarette smoking. Strong e-cigarette regulation could potentially curb use among youth and possibly limit the future population-level burden of cigarette smoking.

