

# Research on novel E-cigarette products

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E-cigarette use is relevant for health research because of its substantial prevalence among younger populations. E-cigarette use has been increasing and combustible cigarette smoking decreasing in several national populations (e.g., the United States and the United Kingdom) but the reasons for this remain unclear. The prevalence of e-cigarette use is influenced by several factors, including product characteristics (e.g., flavorings), perceived harm, and governmental regulation on price and accessibility. In addition, new tobacco products are coming on the market<sup>1</sup> and their possible impact on the prevalence of nicotine exposure is a significant issue for health policy and clinical practice.

In this issue of *Lancet Regional Health—Europe*, Tattan-Birch et al.<sup>2</sup> investigated trends in e-cigarette use and cigarette smoking following a rise in the acceptance of disposable e-cigarettes, which started becoming popular in England around 2021. The study arose from a concern, raised by some data on increased e-cigarette prevalence, about whether a novel and convenient device such as disposables might increase rates of nicotine exposure in the population. The investigators used data from interviews conducted monthly from 2016 through 2023 with representative samples of the population of England aged 18 years and older. Each of the assessments obtained data on e-cigarette use and smoking, with a different sample (N = 1700) obtained at each assessment. Results for pre- and post-2021 comparisons showed that e-cigarette use increased significantly for all age groups (e.g., for 18–24 year olds, odds ratio (OR) = 1.99), while cigarette smoking declined modestly in younger age groups but increased for those aged 45 and over (OR = 1.12). Consequently, the prevalence of overall inhaled nicotine use increased significantly after 2021. The present results are in line with other studies done using different methods, in which the introduction of current-generation e-cigarettes with new forms of nicotine was associated with increases in nicotine dependence,<sup>3</sup> and changes in prevalence of e-cigarette use were unrelated to changes in prevalence of cigarette smoking.<sup>4</sup>

The study has a large sample size (overall N = 132,252) and takes advantage of a natural

experiment—the introduction of disposable e-cigarettes—to test a health policy question: Should disposables be regulated? By using one clearly defined event (year 2021) as the dividing line separating pre-disposable years from post-disposable years, it reduces concern about possible influence from external events, such as changes in price or governmental regulation; this strengthens the interpretation of the results.

However, a limitation of the study is that different samples were obtained at each assessment and the authors used aggregated data rather than individual data. A study using aggregate data would be defined as an ecological design, which examines associations between descriptive properties of groups rather than descriptive properties of individuals. A body of prior research has shown that while ecological studies are not inherently flawed, instances can be noted where ecological studies produce results that differ in magnitude, and sometimes in direction, from individual-level studies.<sup>5</sup>

In an example for e-cigarette research, studies using aggregated data had suggested that imposing age restrictions on e-cigarette sales increased state-level rates of adolescent cigarette smoking. However, individual-level studies found that laws restricting e-cigarette sales to persons over 21 years tended to reduce smoking.<sup>6–8</sup> For the present case, a correlation between population estimates for e-cigarette use and smoking (e.g., declines in smoking were largest in groups with the greatest increase in e-cigarette use) cannot be generalized to an individual-level causal effect (i.e., using e-cigarettes causes a person to decrease smoking). Accordingly, potential differences between individual and ecological studies should be carefully kept in mind when interpreting the results.

In sum, the Tattan-Birch study<sup>2</sup> provide an example of how to leverage existing data to address a question about how disposable e-cigarettes influence prevalence of e-cigarette use. Additional questions could be addressed using a similar design with data for other populations; for example, how is the introduction of disposables associated with prevalence of e-cigarette use and smoking among adolescents, a vulnerable population from a public health standpoint. Studies using a similar approach to the Tattan-Birch study<sup>2</sup> could be conducted using “hybrid” or multi-level designs<sup>7</sup> to clarify important findings on large-scale social factors in health such as differences in e-cigarette prevalence by socioeconomic status. Data from different methods are desirable for policy formation, and individual-level (cross-sectional and/or cohort) studies are needed to test for replication of effects; these could include



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additional covariates to provide insight into some of the intriguing results (e.g., age differences) that were noted in the Tattan-Birch et al. study.<sup>2</sup> More policy research is still needed to determine how to proceed when findings of ecological studies and individual-level studies differ.<sup>6,8,9</sup> Finally, prospective epidemiological studies are needed to clarify questions about how increases or decreases in prevalence of tobacco product use are linked to different types of health outcomes.<sup>10</sup>

#### Declaration of interests

There are no conflicts of interest with regard to this article.

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