



E-cigarettes: addressing gaps in knowledge

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Introduction of e-cigarettes to the European and North American markets in 2006–2007 has triggered intense debate about their risks and benefits (Künzli 2014). On the one hand, advocates claim that e-cigarettes offer a viable alternative to combustible tobacco products that reduce harm (e.g., Fluhalt and Etter 2014). On the other, opponents fear potential harm from e-cigarette vapor, weakening of anti-tobacco social norms, and that e-cigarettes are a gateway to cigarette smoking in youth (e.g., Fairchild et al. 2014; McKee 2014).

Given the aggressive marketing and completely avoidable health risks of cigarette smoking, several countries have already declared that e-cigarettes fall under the rubric of traditional tobacco products, and in spite of limited evidence on risks and benefits, instituted restrictions on their sale and marketing (CASAA 2011–2012) that parallel those applied to combustible tobacco products (Islami et al. 2015). But efforts to restrict promulgation of electronic nicotine delivery systems (ENDS) have met with resistance from groups claiming a right to “smoke-free alternatives” (e.g., the Consumer Advocates for Smoke-free Alternatives

Association (CASAA); CASAA 2015). In fact, recent analyses by the tobacco industry suggest that ENDS offer favorable “market opportunities” globally (BIS Research 2014) and they project “staggering growth until 2017, when most of the regulatory and policy framework will fall into place,” after which the rate of growth will increase significantly through 2025 (BIS Research 2015).

In this issue of IJPH, we address a number of knowledge gaps about e-cigarettes. Several themes emerge. First, dual use of combustible and e-cigarettes is common, although whether dual users decrease their consumption of combustibles when using e-cigarettes is unclear. Second, the correlates of e-cigarette use mirror those of traditional tobacco smoking, binge drinking and other risky behaviors. Third, e-cigarette marketing affects judgment in both never and current users. In particular, adolescents are well aware of the existence of e-cigarettes and their availability in various flavors. Fruit flavors in particular make e-cigarettes appealing to young people and reduce perceptions of harmfulness. Fourth, e-cigarette use may encourage use of combustible tobacco by both adolescent and adult never smokers. This raises alarm bells in light of recent evidence that, among 14-year-old never smokers in California, e-cigarette use was associated with a 3/4-fold increase in the odds of initiating use of any combustible tobacco product including cigarettes, cigars and hookah (Leventhal et al. 2015). Fifth, public beliefs do not align well with the science in regard to the efficacy of e-cigarettes as a smoking cessation aid. Importantly, the authors of a recent review reached three conclusions: (1) there are no data showing that e-cigarettes are a healthier alternative to conventional cigarettes in the long term; (2) some smokers may reduce the number of cigarettes they consume by substituting with e-cigarettes, but most continue to smoke cigarettes daily; and (3) two studies suggest that

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e-cigarettes do not aid in smoking cessation (Drummond and Upson 2014). Indeed, a recent meta-analysis of 38 studies found that smokers who also used e-cigarettes were 28 % less likely to quit than nonusers (Kalkhoran and Glantz 2016). The papers in this issue addressing cessation tell a cautionary tale. Italian healthcare providers hold generally positive views on e-cigarettes and believe they help smokers quit. Over $\frac{3}{4}$ of tweets express positive views about e-cigarettes as cessation aids, and most tweets are generated by *Twitter* users with ties to the tobacco industry. Yet, similar to others, Khodigian et al. in this issue found no evidence that e-cigarettes aid in cessation. It appears that the public is exposed to significant amounts of misinformation as well as promotional material in the guise of unbiased advice, and that marketing has greatly outpaced the science.

While this issue of *IJPH* addresses several knowledge gaps, many remain. We anticipate the results of randomized controlled trials on the efficacy of e-cigarettes as cessation aids, especially compared to regulated nicotine replacement therapies. Globally, data for countries in Africa, Asia, Latin America and Oceania where e-cigarette marketing is fierce, are not yet available (Islami et al. 2015). A 2014 report, by the Southeast Asia Tobacco Control Alliance for example, concluded that despite bans in many jurisdictions, e-cigarettes are widely promoted throughout the region, are freely available in shops and online, and pose a serious risk to health (SEATCA 2014). Surveillance data that monitor e-cigarette use across countries outside North America and Europe are still needed, as is monitoring of use in vulnerable populations. The gateway issue needs to be addressed in longitudinal studies among never users of combustible tobacco. Perhaps the most important remaining gaps concern policy and education. What balance of regulation, pricing, taxation and public health campaigns will best ensure that the potential for good posed by e-cigarettes, if any, can be maximized, while minimizing the potential for harm? Will a strategy facilitating “transfer of addiction” from combustible to ENDS (e.g., Benowitz 2014) be effective? Can differential taxation based on differential risks (e.g., Chaloupka et al. 2015) actually reduce harm? Or are e-cigarettes “a triumph of wishful thinking over science” (Leone and Douglas 2014)?

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