

ELECTRONIC CIGARETTES: AN OVERVIEW OF KEY ISSUES

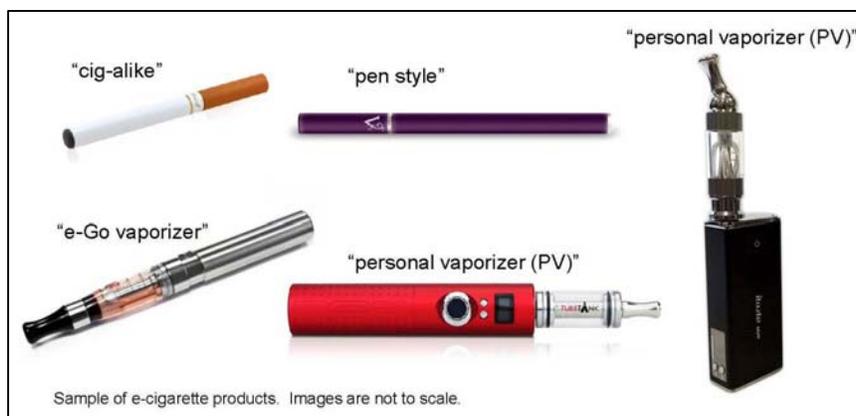
A growing number of adults and youth are using electronic cigarettes, which provide a relatively new way to deliver the addictive substance nicotine without burning tobacco. Many questions remain about the long-term health effects of these products for individual users. It is not clear whether these products will help people quit, discourage smokers from quitting completely, or become a gateway to nicotine addiction and smoking for new users, including kids.

What are Electronic Cigarettes?

The term “electronic cigarettes” covers a wide variety of products now on the market, from those that look like cigarettes or pens to somewhat larger products like “personal vaporizers” and “tank systems.”^{*} Instead of burning tobacco, e-cigarettes most often use a battery-powered coil to turn a liquid solution into an aerosol that is inhaled by the user. There are a wide range of reusable e-cigarettes, which enable users to replace a nicotine-containing cartridge or refill a tank with a liquid solution, and there are disposable e-cigarettes, which cannot be refilled. Also growing in popularity are “mods,” which are units that users assemble themselves from separate component parts, to allow variation in battery power, style, and size.¹

The liquid solution used in e-cigarettes typically contains nicotine, propylene glycol, glycerin or some other solvent, and other additives. E-cigarettes and refill liquids or cartridges often contain flavorings, including fruit and candy flavorings that are not permitted in regular cigarettes. Many e-cigarettes and their refill liquids also come in sweet flavors, such as chocolate, gummi bears, thin mint, and strawberry, which have long been considered attractive to kids. Thousands of “vape” shops have now opened throughout the country that allow consumers to sample and purchase refill liquids, including a combination of flavors chosen by the user and in varying levels of nicotine.

While the e-cigarette market was originally dominated by companies whose primary product was e-cigarettes, the three major U.S. tobacco companies – Altria/Philip Morris, Reynolds American, and Lorillard – have now entered the e-cigarette market. There are, however, hundreds of e-cigarette companies and thousands of “vape” shops in the U.S. market, leading to a wide variety of product characteristics, including ingredients and nicotine content. A large proportion of e-cigarettes in the US market are imported. For those that are domestically produced or assembled, certain components and ingredients are still manufactured abroad.²



*** The vaporizer products are considered “tank systems”.**

^{*} For the purposes of this factsheet, the term “e-cigarettes” will be used to represent the entire category of products.

E-Cigarette Marketing

An investigative report released in April 2014 by 11 members of Congress³ provides some of the most detailed evidence to date that electronic cigarette manufacturers have resurrected the marketing practices used by tobacco companies for decades to attract kids to smoking. These tactics include ads that reach youth audiences; sponsorships and free samples at youth-oriented events such as auto races and music festivals; celebrity spokespeople who depict e-cigarette smoking as glamorous; and sweet, kid-friendly flavors with names like Cherry Crush, Chocolate Treat, Peachy Keen and Grape Mint. The report finds that many of the e-cigarette companies examined in the report also use social media to promote their products.

Use of E-Cigarettes is Growing

Sales of e-cigarettes have grown dramatically, leading Wall Street analysts to project that e-cigarettes could eventually have sales comparable to, or even greater than, cigarettes.⁴

Adult Use. A study from the Centers for Disease Control and Prevention (CDC) found that between 2010 and 2011, the number of adults who had ever used e-cigarettes doubled to 6.2 percent among the general population and 21.2 percent among smokers.⁵ Another more recent study conducted in early 2012 found that 8.1 percent of adults had tried e-cigarettes, including 32.2 percent of current smokers.⁶

Youth Use. Increasing use of e-cigarettes by youth is of particular concern. Data released by the CDC show that the number of high school and middle school students who have ever tried e-cigarettes doubled between 2011 and 2012. Among all students in grades 6-12, the percentage of students who reported ever using e-cigarettes increased from 3.3 percent to 6.8 percent. Among high school students alone, the percentage increased from 4.7 percent to 10 percent.⁷ This doubling of e-cigarette experimentation and recent use among middle and high school students translates into an estimated 1.78 million youth who had used e-cigarettes as of 2012.⁸

In addition, the 2012 data from CDC show that among current middle and high school users of e-cigarettes (used in the past 30 days), 76% had also smoked conventional cigarettes in the same time period.⁹

Health and Public Health Concerns

Under the right circumstances, e-cigarettes could benefit public health if they help significantly reduce the number of people who use conventional cigarettes and die of tobacco-related disease. However, many questions remain about the potential risks to public health posed by these products.

E-cigarette ingredients and constituents. There is insufficient research on the long-term effects of using e-cigarettes, which involves regular inhalation of nicotine, glycerin or some other solvent, and other additives. Some of the few studies available thus far that look at the vapor generated by e-cigarettes show that e-cigarettes produce more than just nicotine vapor and water. Instead, the vapors have been found to contain toxins, including formaldehyde, acetaldehyde, acrolein, volatile organic compounds like toluene, tobacco-specific nitrosamines, and metals like nickel and lead.¹⁰ These compounds are generally produced at levels much lower than in cigarette smoke, although the compounds themselves are found on FDA's list of harmful or potentially harmful substances.¹¹

Impact of Nicotine. E-cigarettes and refill liquids contain widely varying levels of nicotine. Nicotine is a highly addictive drug that impacts the cardiovascular system. In addition, nicotine has been linked to a variety of adverse health outcomes for the developing fetus and can have lasting damaging effects on adolescent brain development.¹²

Several of the products themselves include warnings that inhaled nicotine is “very toxic.” Product packaging for at least three e-cigarettes (NJOY, MarkTen, and Mystic) have included warnings that state nicotine is “very toxic by inhalation.”

Poisonings. Delivered in high doses, nicotine can be lethal. Liquid nicotine found in e-cigarettes has caused a burgeoning number of calls to poison control centers, the CDC reported earlier this year. The number of e-cigarette exposure calls per month to poison centers rose from one per month in September 2010 to 215 per month in February 2014. More than half of these calls to poison hotlines were to report incidents involving children aged five and under.¹³

Dual Use of E-cigarettes and Conventional Cigarettes. There is a lack of evidence that e-cigarettes are a safe and effective smoking cessation device. According to researchers from the CDC, “There is currently no conclusive scientific evidence that e-cigarettes promote long-term cessation, and e-cigarettes are not included as a recommended smoking cessation method by the U.S. Public Health Service.”¹⁴ One study shows that e-cigarettes show no more success as a cessation aid than the FDA-approved patch (which has undergone safety review).¹⁵

The currently available data indicate that many e-cigarette users report using both e-cigarettes and cigarettes: a national consumer survey of adults showed that more current smokers had ever used e-cigarettes compared to former and never smokers. In fact, in 2012, nearly one in three (32.2%) current smokers reported having ever used e-cigarettes.¹⁶

E-cigarettes could reduce the number of smokers who quit if smokers use them in addition to, and not instead of, regular cigarettes. This would have a significant negative impact on public health. Several Surgeon General’s Reports have indicated that the risk of lung cancer and other smoking-related diseases depends largely on the length of time a person smokes, not just the number of cigarettes smoked. Thus, prolonging smoking, despite smoking fewer cigarettes from using e-cigarettes, will continue to put that person’s health at greater risk than if he or she had quit smoking entirely.¹⁷

Important unanswered questions.

- *As discussed above, instead of replacing cigarettes completely, do e-cigarettes lead to dual use by cigarette smokers by providing a way to satisfy their nicotine addiction in places they cannot smoke?*
- *If e-cigarettes continue to be irresponsibly marketed, could they make smoking look glamorous again and undermine decades of work to reduce youth smoking?*
- *Do e-cigarettes serve as a gateway to nicotine addiction and use of other tobacco products for new users, including kids?*
- *Do e-cigarettes draw former smokers back into nicotine addiction and potentially back to cigarette smoking?*

There are many important unanswered questions regarding the short and long-term impact that e-cigarettes may have on public health. Effective regulation is needed to minimize the potential harms of e-cigarettes and maximize any potential benefits.

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- ¹ Wells Fargo, *Vape Shops – Springing Up Across The Country*, April 14, 2014.
- ² Chang, H, “Research gaps related to the environmental impacts of electronic cigarettes,” *Tobacco Control*, 2014; 23:ii54-ii58.
- ³ “Gateway to Addiction? A Survey of Popular Electronic Cigarette Manufacturers and Marketing to Youth,” April 14, 2014, http://www.durbin.senate.gov/public/index.cfm/files/serve?File_id=a85bb717-ac5d-4835-a584-206dbdb1f856
- ⁴ Wells Fargo, *Tobacco--Nielsen C-Store Data Incl. E-Cigs--\$ Sales Stay Strong*, February 4, 2014.
- ⁵ King, BA, et al., “Awareness and Ever Use of Electronic Cigarettes Among U.S. Adults, 2010-2011,” *Nicotine & Tobacco Research*, 15(9):1623-7, 2013.
- ⁶ Zhu, S, et al., “The Use and Perception of Electronic Cigarettes and Snus among the U.S. Population,” *PLOS ONE*, 8(10), October 2013.
- ⁷ U.S. Centers for Disease Control and Prevention (CDC), “Electronic Cigarette Use Among Middle and High School Students – United States, 2011-2012,” *Morbidity and Mortality Weekly Report (MMWR)* 62(35), September 6, 2013.
- ⁸ CDC, “Electronic Cigarette Use Among Middle and High School Students — United States, 2011 – 2012,” *MMWR*, 62(35), September 6, 2013.
- ⁹ CDC. “Electronic Cigarette Use Among Middle and High School Students — United States, 2011 – 2012,” *Morbidity and Mortality Weekly Report*, 62(35), September 6, 2013.
- ¹⁰ Goniewicz, ML, et al., “Levels of selected carcinogens and toxicants in vapour from electronic cigarettes,” *Tobacco Control* 23(2):133-9, March 6, 2013. Williams, M., et al., “Metal and Silicate Particles Including Nanoparticles Are Present in Electronic Cigarette Cartomizer Fluid and Aerosol,” *PlosOne*, 8(3), March 2013. See also Williams, M., “Electronic Cigarette Liquids and Vapors: Is It Harmless Water Vapor,” presented October 3, 2013 at TRDRP Electronic Cigarette Webinar, <http://www.trdrp.org/docs/Williams%20ecig%20vapor%20this%20time%20slides%202013.pdf>.
- ¹¹ Goniewicz, et al., “Levels of selected carcinogens and toxicants in vapour from electronic cigarettes,” *Tobacco Control* 23(2):133-9, March 6, 2013. Williams, M, et al., “Metal and Silicate Particles Including Nanoparticles Are Present in Electronic Cigarette Cartomizer Fluid and Aerosol,” *PlosOne*, 8(3), March 2013. See also FDA, “Harmful and Potentially Harmful Constituents in Tobacco Products and Tobacco Smoke: Established List,” March 2012. <http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm297786.htm>
- ¹² U.S. Department of Health and Human Services (HHS), *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General*, CDC, Office of Smoking and Health (OSH), 2014, <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/index.html>.
- ¹³ CDC, “Notes from the Field: Calls to Poison Centers for Exposures to Electronic Cigarettes — United States, September 2010–February 2014,” *MMWR* 63(13):292-293, April 4, 2014, <http://www.cdc.gov/mmwr/pdf/wk/mm6313.pdf>.
- ¹⁴ King, BA, et al., “Awareness and Ever Use of Electronic Cigarettes Among U.S. Adults, 2010-2011,” *Nicotine & Tobacco Research*, 15(9):1623-7, 2013. See also, Fiore, MC, et al., *Treating Tobacco Use and Dependence: 2008 Update*, U.S. Public Health Service Clinical Practice Guideline, May 2008, http://www.surgeongeneral.gov/tobacco/treating_tobacco_use08.pdf.
- ¹⁵ Bullen, C, et al., “Electronic cigarettes for smoking cessation: a randomised controlled trial,” *The Lancet* 382(9905):1629-37, November 16, 2013.
- ¹⁶ Zhu, S, et al., “The Use and Perception of Electronic Cigarettes and Snus among the U.S. Population,” *PLOS ONE*, 8(10), October 2013.
- ¹⁷ HHS, *The Health Consequences of Smoking: A Report of the Surgeon General*, CDC, OSH, 2004. HHS, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease*, CDC, OSH, 2010. HHS, *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General*, CDC, OSH, 2012 <http://www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/index.html>. HHS, *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General*, CDC, OSH, 2014. <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/index.html>.