



## ELECTRONIC CIGARETTES AND YOUTH

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A significant number of youth are using electronic cigarettes (e-cigarettes)<sup>\*</sup>, which provide a relatively new way to deliver the addictive substance nicotine without burning tobacco. The number of youth using e-cigarettes is alarming and raises serious concerns that e-cigarettes could be an entryway to nicotine addiction and use of regular cigarettes for some kids. While it is still an open scientific question whether e-cigarettes might be able to help adult smokers give up cigarettes, kids should not be using any tobacco product, including e-cigarettes. A 2016 report of the Surgeon General stated that “e-cigarette use among U.S. youth and young adults is now a major public health concern.” The Surgeon General noted that while we continue to learn more about e-cigarettes, “we currently know enough to take action to protect our nation’s young people from being harmed by these products.”

### **E-Cigarette Use Among Youth**

Data from the National Youth Tobacco Survey (NYTS), released by the U.S. Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA), show that youth use of electronic cigarettes declined for the first time in 2016.<sup>1</sup> This finding is consistent with other national data from the Monitoring the Future survey which found a significant decline in vaping from 2015 to 2016 among 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> graders.<sup>2</sup> However, both surveys found that that e-cigarette use continues to exceed use of cigarettes and other tobacco products.

According to the NYTS, 11.3 percent of high schoolers and 4.3 percent of middle schoolers reported current use of e-cigarettes in 2016.<sup>3</sup> E-cigarette use among high school students declined significantly from 2015 to 2016, the first decline in youth e-cigarette use after it had increased ten-fold from 2011 to 2015 (it was just 1.5% in 2011).<sup>4</sup> According to the NYTS, over 1.6 million high school students and 500,000 middle school students currently use e-cigarettes. Since the survey also found that over 1.4 million youth smoke cigarettes, this means that at least 750,000 current e-cigarette users do not smoke cigarettes.<sup>5</sup>

The same survey found that among those students who had used e-cigarettes in the past 30 days in 2014, 15.5 percent of high schoolers and 11.8 percent of middle schoolers were frequent users of e-cigarettes, using e-cigarettes on at least 20 of the preceding 30 days. This amounts to an estimated 340,000 middle and high school students who were frequent users of e-cigarettes. More than a quarter of high school e-cigarette users had used e-cigarettes on at least ten days in the previous month.<sup>6</sup>

Data from the 2015 NYTS shows that 13.1 percent<sup>†</sup> of high school students who have never used another tobacco product have tried e-cigarettes.<sup>7</sup> Similar patterns exist for young adults; the 2014 NHIS data found that nearly 10 percent of 18 to 24 year olds who have never smoked cigarettes had tried an e-cigarette.<sup>8</sup> There is concern that use of e-cigarettes may function as an entryway to use of more dangerous, combustible tobacco products. The Surgeon General found that while more research is needed, evidence from several longitudinal studies suggests that e-cigarette use is “strongly associated” with the use of other tobacco products among youth and young adults, including conventional cigarettes.<sup>9</sup> In fact, two of these studies found that the link between e-cigarette use and smoking initiation was stronger for those who had *lower* risk factors for smoking at baseline.<sup>10</sup>

The e-cigarette marketplace is new and rapidly changing. According to the 2015 NYTS, the majority (53.4%) of youth e-cigarette users report using a rechargeable or refillable e-cigarette.<sup>11</sup> Some of these devices allow the user to modify the device and nicotine content of the e-liquid used. While national data is not available, a recent study found that more than a quarter (26.1%) of Connecticut high school students who have ever used e-cigarettes have tried “dripping,” a process by which the users drips e-

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<sup>\*</sup> The term “electronic cigarette” 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.”

<sup>†</sup> Based on earlier data, CDC researchers reported that the number of youth who had used e-cigarettes, *but had never smoked a regular cigarette*, increased from 79,000 in 2011 to more than 263,000 in 2013. These same data for 2015 have not been released for youth.

liquid directly onto the atomizer's coil and inhales the vapor produced. Youth who had tried dripping reported doing so to produce bigger clouds of vapor, make the flavor taste better, or create a stronger throat hit.<sup>12</sup>

### **Flavored E-Cigarettes Attract Youth**

The 2016 Surgeon General report stated that, "E-cigarettes are marketed by promoting flavors and using a wide variety of media channels and approaches that have been used in the past for marketing conventional tobacco products to youth and young adults."<sup>13</sup> Cigarettes with specific characterizing flavors were prohibited in the U.S. on September 22, 2009, as part of the Family Smoking Prevention and Tobacco Control Act. However, this prohibition did not apply to other tobacco products, including e-cigarettes, which come in flavors with obvious youth appeal such as gummy bear, cotton candy, and fruit punch.<sup>14</sup> As of January 2014, researchers had identified more than 7,700 unique e-cigarette flavors available online, with an average of more than 240 new flavors being added per month.<sup>15</sup> Among more than 400 available brands, 84 percent offered fruit flavors and 80 percent offered candy and dessert flavors.<sup>16</sup> In addition to the vast selection available online, 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.<sup>17</sup>

Research shows that flavored products are not only popular among youth, but may play a role in initiation and uptake of tobacco products. Data from FDA's 2013-2014 Population Assessment of Tobacco and Health (PATH) survey found that 81 percent of youth aged 12-17 who had ever used e-cigarettes had used a flavored e-cigarette the first time they tried the product, and that 85.3 percent of current youth e-cigarette users had used a flavored e-cigarette in the past month. Moreover, 81.5 percent of current youth e-cigarette users said they used e-cigarettes "because they come in flavors I like."<sup>18</sup> While the methodology is not comparable to the PATH study, an analysis of the 2015 NYTS found that 44.6 percent of middle and high school e-cigarette users—totaling 1.26 million youth—had used a flavored e-cigarette in the past month.<sup>19</sup>

### **E-Cigarette Marketing Reaches and Appeals to Youth**

The Surgeon General concluded that, "Themes in e-cigarette marketing, including sexual content and customer satisfaction, are parallel to themes and techniques that have been found to be appealing to youth and young adults in conventional cigarette advertising and promotion."<sup>20</sup> By mimicking the tobacco industry's strategies, including celebrity endorsements, slick TV and magazine advertisements, and sports and music sponsorships, e-cigarette advertising has effectively reached youth and young adults. The 2014 NYTS found that 68.9% of middle and high school students—18.3 million youth—had been exposed to e-cigarette advertisements from at least one source.<sup>21</sup> Another recent study found that 82 percent of 12-17 year olds and 88 percent of 18-21 year olds reported seeing e-cigarette advertising in 2015.<sup>22</sup> The investment in e-cigarette marketing has been coupled with an increase in use among youth and young adults. A 2016 study in Pediatrics, analyzing 2014 NYTS data, found that exposure to e-cigarette advertising is associated with current e-cigarette use among youth and that greater exposure to e-cigarette advertising is associated with higher odds of use.<sup>23</sup>

Unlike cigarette and smokeless tobacco companies, e-cigarette companies are not currently required to report their marketing and promotional expenditures to the U.S. Federal Trade Commission (FTC), so the exact amount spent to advertise and promote these products is uncertain. However, e-cigarette marketing expenditures are estimated to have increased dramatically in recent years, from \$12 million in 2011 to \$125 million in 2014.<sup>24</sup> Other studies have also documented this significant increase in spending.<sup>25</sup> These figures likely underestimate the true extent of e-cigarette advertising, as the available marketing data is not comprehensive (e.g., social media and sponsored events—strategies widely used by numerous e-cigarette companies—are not included).

An investigative report released in April 2014 by 11 members of Congress<sup>26</sup> provides some of the most detailed evidence to date that e-cigarette manufacturers have resurrected the marketing practices used by tobacco companies for decades to attract kids to smoking. While cigarette advertising has been absent from TV and radio since 1971, TV advertising is the second highest tracked marketing expense among e-cigarette manufacturers. According to the Truth Initiative report, expenditures on e-cigarette television

advertising totaled \$25.5 million in 2014.<sup>27</sup> These ads were strategically targeted to reach youth through network placement on television stations with clear youth appeal such as Comedy Central, ABC Family and MTV.<sup>28</sup> A study in *Pediatrics* found that from 2011 to 2013, exposure of youth aged 12-17 to e-cigarette advertisements on TV increased by 256 percent.<sup>29</sup> This same study estimates that e-cigarette advertisements may reach an audience of up to 24 million youth. Research shows that these ads are effective—a recent randomized trial exposing adolescent e-cigarette non-users to such ads showed that they led to 50 percent higher intentions to use e-cigarettes.<sup>30</sup>

In addition, youth are exposed to e-cigarette marketing at the point of sale. In 2012, nearly one-third of retailers sold e-cigarettes, with availability greatest in convenience stores and drug stores.<sup>31</sup> According to the 2014 NYTS, over half of middle and high school students have been exposed to e-cigarette advertisements in retail stores, the most common source of exposure to e-cigarette marketing.<sup>32</sup>

Other tactics used by e-cigarette manufacturers to reach youth include magazine 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, Gummy Bear and Cotton Candy. The Congressional report found that many of the e-cigarette companies also use social media to promote their products. E-cigarette companies market extensively on product websites and maintain a strong presence on social media sites popular among youth, like Facebook, YouTube, Instagram, and Twitter.<sup>33</sup> One study found nearly 74,000 tweets about e-cigarettes in just a two month period, most of which were sent by a few commercial enterprises.<sup>34</sup> E-cigarette manufacturers also place ads on search engines and websites that focus on music, entertainment, and sports and which often have substantial youth and young adult audiences.<sup>35</sup> The companies rarely take steps to effectively prevent access to these websites by minors, as evidenced by data from the 2014 YTS, which found that 42.9% of high school students had been exposed to e-cigarette advertisements online.<sup>36</sup> Another research study found that 40 percent of teens (ages 13-17) had seen e-cigarette advertisements online always, most or some of the time.<sup>37</sup>

### **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 long-term health effects of these products for individual users and about the population-wide effects of these products. At this point, it is still unclear whether these products will help people quit, discourage smokers from quitting completely, or lead to nicotine addiction and tobacco use for new users, including kids.

***Poisoning and Exposure to Liquid Nicotine.*** Delivered in high doses, nicotine can be lethal. The Surgeon General found that, “Ingestion of e-cigarette liquids containing nicotine can cause acute toxicity and possibly death if the contents of refill cartridges or bottles containing nicotine are consumed.”<sup>38</sup> Exposure to liquid nicotine found in e-cigarettes has resulted in thousands of calls to poison control centers in recent years, peaking in 2014, according to the American Association of Poison Control Centers (AAPCC).<sup>39</sup> In 2014, more than half of these calls to poison hotlines were to report exposures among children under the age of six.<sup>40</sup> To begin to address the poisoning risk that e-cigarettes and liquid nicotine pose to young children, in 2016 Congress passed the Child Nicotine Poisoning Prevention Act, which gave the Consumer Product Safety Commission authority to enforce child resistant packaging standards for e-cigarette products. This law went into effect in July 2016.

**Number of calls to poison control centers involving exposures to e-cigarette devices and liquid nicotine.**

2011	271
2012	460
2013	1,543
2014*	4,024
2015*	3,744
2016*	2,886
Through Sept. 2017*	1,797

\* Preliminary data, as poison centers continue to update their reports.

***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.<sup>41</sup> According to the Surgeon General, “E-cigarette aerosol is not harmless. It can contain harmful and potentially harmful constituents, including nicotine.”<sup>42</sup> The nicotine present in e-cigarette aerosol is absorbed by users and bystanders.<sup>43</sup> Studies have found other chemicals and toxins present in some e-

cigarettes, including formaldehyde, acrolein, volatile organic compounds like toluene, tobacco-specific nitrosamines, and metals like nickel and lead.<sup>44</sup> These compounds are generally present at levels much lower than in cigarette smoke, although the compounds themselves are found on FDA's list of harmful or potentially harmful substances.<sup>45</sup> Because FDA has just begun to regulate e-cigarettes, which are available in hundreds of different brands<sup>46</sup>, there is no way for consumers to know for sure yet what is in the products or the aerosol.<sup>47</sup>

In addition, while some of the other substances, such as flavorings, used in e-cigarettes might be labeled as "generally recognized as safe," some researchers as well as the organization primarily responsible for granting that designation<sup>48</sup> have noted that it applies to ingestion, not for other exposures such as inhalation. In its 2016 report, the Surgeon General stated that, "while some of the flavorings used in e-cigarettes are generally recognized as safe for ingestion as food, the health effects of their inhalation are generally unknown" and noted that some of the flavorings found in e-cigarettes have been shown to cause serious lung disease when inhaled.<sup>49</sup> An article in the *Journal of the American Medical Association* raised concerns that the chemical flavorings found in some e-cigarettes and e-liquids could cause respiratory damage when the e-cigarette aerosol is inhaled deeply into the lungs.<sup>50</sup>

**Impact of Nicotine.** E-cigarettes and refill liquids contain widely varying levels of nicotine. While e-cigarettes can be used for non-nicotine products, including marijuana, more than two-thirds of youth e-cigarette users report using e-cigarettes exclusively for nicotine-containing products.<sup>51</sup> Nicotine is a highly addictive drug that can have lasting damaging effects on adolescent brain development and has been linked to a variety of adverse health outcomes for the developing fetus.<sup>52</sup> Nicotine also impacts the cardiovascular system.<sup>53</sup> The Surgeon General concluded that, "The use of products containing nicotine poses dangers to youth, pregnant women, and fetuses. The use of products containing nicotine in any form among youth, including in e-cigarettes, is unsafe."<sup>54</sup>

#### ***Campaign for Tobacco-Free Kids, October 4, 2017 / Laura Bach***

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<sup>1</sup> U.S. Centers for Disease Control and Prevention (CDC), "Tobacco Use Among Middle and High School Students — United States, 2011-2016," *Morbidity and Mortality Weekly Report (MMWR)* 66(23):597-603, June 16, 2017, <https://www.cdc.gov/mmwr/volumes/66/wr/pdfs/mm6623a1.pdf>.

<sup>2</sup> University of Michigan, Monitoring the Future Study, "Trends in Annual and 30-Day Prevalence of Use of Other Tobacco Products for Grades 8, 10, and 12," <http://www.monitoringthefuture.org/data/16data/16cigtbl1.pdf>.

<sup>3</sup> CDC, "Tobacco Use Among Middle and High School Students — United States, 2011-2016," *MMWR*, 66(23):597-603, June 16, 2017, <https://www.cdc.gov/mmwr/volumes/66/wr/pdfs/mm6623a1.pdf>.

<sup>4</sup> CDC "Tobacco Use Among Middle and High School Students — United States, 2011-2015," *MMWR*, 65(14):361-367, April 14, 2016, <http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6514a1.pdf>.

<sup>5</sup> U.S. CDC, "Tobacco Use Among Middle and High School Students — United States, 2011-2016," *MMWR*, 66(23):597-603, June 16, 2017, <https://www.cdc.gov/mmwr/volumes/66/wr/pdfs/mm6623a1.pdf>.

<sup>6</sup> CDC, "Frequency of Tobacco Use Among Middle and High School Students — United States, 2014," *MMWR*, 64(38):1061-1065, October 2015 <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6438a1.htm>

<sup>7</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.

<sup>8</sup> Schoenborn, CA & Gindi, RM, "Electronic Cigarette Use Among Adults: United States, 2014," National Center on Health Statistics (NCHS) Data Brief, No. 217, October 2015, <http://www.cdc.gov/nchs/data/databriefs/db217.htm>.

<sup>9</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016. See also, Leventhal, AM, et al., "Association of Electronic Cigarette Use With Initiation of Combustible Tobacco Product Smoking in Early Adolescence," *Journal of the American Medical Association*, 314(7): 700-707, 2015. Wills, Thomas A, et al., "Longitudinal study of e-cigarette use and onset of cigarette smoking among high school students in Hawaii," *Tobacco Control*, published online first January 25, 2016. Wills, TA, et al., "E-cigarette use is differentially related to smoking onset among lower risk adolescents," *Tobacco Control*, published online August 19, 2016. Barrington-Trimis, JL, et al., "E-Cigarettes and Future Cigarette Use," *Pediatrics*, 138(1), published online July 2016.

<sup>9</sup> Barrington-Trimis, JL, et al., "E-Cigarettes and Future Cigarette Use," *Pediatrics*, 138(1), published online July 2016. Wills, TA, et al., "E-cigarette use is differentially related to smoking onset among lower risk adolescents," *Tobacco Control*, published online August 19, 2016.

<sup>10</sup> Barrington-Trimis, JL, et al., "E-Cigarettes and Future Cigarette Use," *Pediatrics*, 138(1), published online July 2016. Wills, TA, et al., "E-cigarette use is differentially related to smoking onset among lower risk adolescents," *Tobacco Control*, published online August 19, 2016.

<sup>11</sup> CDC, "Characteristics of Electronic Cigarette Use Among Middle and High School Students—United States, 2015," *MMWR*, 65(50-51): 1425-1429, <https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm650501a2.pdf>.

- <sup>12</sup> Krishnan-Sarin, S, et al., "E-Cigarettes and "Dripping" Among High-School Youth," *Pediatrics*, 139(3), 2017.
- <sup>13</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.
- <sup>14</sup> See U.S. Food and Drug Administration's Flavored Tobacco webpage at <http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/FlavoredTobacco/default.htm>.
- <sup>15</sup> Zhu, S-H, et al., "Four Hundred and Sixty Brands of E-cigarettes and Counting: Implications for Product Regulation," *Tobacco Control*, 23(Suppl 3):iii3-iii9, 2014.
- <sup>16</sup> Zhu, S-H, et al., "Four Hundred and Sixty Brands of E-cigarettes and Counting: Implications for Product Regulation," *Tobacco Control*, 23(Suppl 3):iii3-iii9, 2014.
- <sup>17</sup> Johnson, A, "Up in smoke? Alamanca e-cigarette store operators concerned about proposed regulations," *Times-News*, April 30, 2014, <http://www.thetimesnews.com/news/top-news/up-in-smoke-alamance-e-cigarette-store-operators-concerned-about-proposed-regulations-1.313005>. The website for VapeRite ATL also notes that customers can "mix well over 100,000 possible flavor and mix type combinations" [<https://atlanta.vaperite.com/#vape-bar>, accessed May 30, 2014].
- <sup>18</sup> Ambrose, BK, et al., "Flavored Tobacco Product Use Among US Youth Aged 12-17 Years, 2013-2014," *Journal of the American Medical Association*, published online October 26, 2015.
- <sup>19</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.
- <sup>20</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.
- <sup>21</sup> CDC, Vital Signs: Exposure to Electronic Cigarette Advertising Among Middle School and High School Students—United States, 2014," *Morbidity and Mortality Weekly Report*, 64(52): 1403-1408, January 8, 2016.
- <sup>22</sup> Truth Initiative, *Vaporized: Youth and Young Adult Exposure to E-Cigarette Marketing*, November 2015, <http://truthinitiative.org/sites/default/files/VAPORIZED%20-%20FINAL%20VERSION.pdf>.
- <sup>23</sup> Singh, T, et al., "Exposure to Advertisements and Electronic Cigarette Use Among US Middle and High School Students," *Pediatrics*, published online April 25, 2016. See also Dai, H and Hao, J, "Exposure to Advertisements and Susceptibility to Electronic Cigarette Use Among Youth," *Journal of Adolescent Health*, published online August 12, 2016.
- <sup>24</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.
- <sup>25</sup> Kornfield, R, et al., "Rapidly increasing promotional expenditures for e-cigarettes," *Tobacco Control*, Published Online First, doi: 10.1136/tobaccocontrol-2014-051580, April 30, 2014. See also: Dutra, L, *Adolescent E-cigarette Use: What We Already Know*. 2014 data from Kantar Media. Presentation at the FDA "Electronic Cigarettes and the Public Health: A Public Workshop," June 1, 2015. Legacy, *Vaporized: E-Cigarettes, Advertising, and Youth*, April 2014, [http://legacyforhealth.org/content/download/4542/63436/version/1/file/LEG-Vaporized-E-cig\\_Report-May2014.pdf](http://legacyforhealth.org/content/download/4542/63436/version/1/file/LEG-Vaporized-E-cig_Report-May2014.pdf). Truth Initiative, *Vaporized: Youth and Young Adult Exposure to E-Cigarette Marketing*, November 2015, <http://truthinitiative.org/sites/default/files/VAPORIZED%20-%20FINAL%20VERSION.pdf>.
- <sup>26</sup> "Gateway to Addiction? A Survey of Popular Electronic Cigarette Manufacturers and Marketing to Youth," April 14, 2014, <http://democrats.energycommerce.house.gov/sites/default/files/documents/Report-E-Cigarettes-Youth-Marketing-Gateway-To-Addiction-2014-4-14.pdf>
- <sup>27</sup> Truth Initiative, *Vaporized: Youth and Young Adult Exposure to E-Cigarette Marketing*, November 2015, <http://truthinitiative.org/sites/default/files/VAPORIZED%20-%20FINAL%20VERSION.pdf>.
- <sup>28</sup> Duke, JC, et al., "Exposure to Electronic Cigarette Television Advertisements Among Youth and Young Adults," *Pediatrics* 134(1):e29-36, July 2014.
- <sup>29</sup> Duke, JC, et al., "Exposure to Electronic Cigarette Television Advertisements Among Youth and Young Adults," *Pediatrics* 134(1):e29-36, July 2014.
- <sup>30</sup> Farrelly, M. *A Randomized Trial of the Effect of E-cigarette Television Ads on Intentions to Use E-Cigarettes*. Presentation at the FDA "Electronic Cigarettes and the Public Health: A Public Workshop," June 1, 2015.
- <sup>31</sup> Giovenco, DP, et al., "E-Cigarette Market Trends in Traditional U.S. Retail Channels, 2012–2013," *Nicotine & Tobacco Research* advance access, doi:10.1093/ntr/ntu282, January 15, 2015; Rose, SW, et al., "The availability of electronic cigarettes in US retail outlets, 2012: results of two national studies," *Tobacco Control*, 23:iii10-iii16, 2014.
- <sup>32</sup> CDC, Vital Signs: Exposure to Electronic Cigarette Advertising Among Middle School and High School Students—United States, 2014," *MMWR*, 64(52): 1403-1408, January 8, 2016.
- <sup>33</sup> "Gateway to Addiction? A Survey of Popular Electronic Cigarette Manufacturers and Marketing to Youth," April 14, 2014, <http://democrats.energycommerce.house.gov/sites/default/files/documents/Report-E-Cigarettes-Youth-Marketing-Gateway-To-Addiction-2014-4-14.pdf>. See also, Noel, JK, Rees, VW, & Connolly, GN, "Electronic cigarettes: a new 'tobacco' industry?" *Tobacco Control* 20:81, 2011.
- <sup>34</sup> Huang, J, et al., "A cross-sectional examination of marketing of electronic cigarettes on Twitter," *Tobacco Control* 23:iii26-iii30, 2014.
- <sup>35</sup> Richardson, A, et al., "Tobacco on the web: surveillance and characterization of online tobacco and e-cigarette advertising," *Tobacco Control*, Published Online First: February 14, 2014.
- <sup>36</sup> CDC, Vital Signs: Exposure to Electronic Cigarette Advertising Among Middle School and High School Students—United States, 2014," *MMWR*, 64(52): 1403-1408, January 8, 2016.

<sup>37</sup> Truth Initiative, *Vaporized: Youth and Young Adult Exposure to E-Cigarette Marketing*, November 2015, <http://truthinitiative.org/sites/default/files/VAPORIZED%20-%20FINAL%20VERSION.pdf>.

<sup>38</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.

<sup>39</sup> American Association of Poison Control Centers, "Electronic Cigarette and Liquid Nicotine," <http://www.aapcc.org/alerts/e-cigarettes/>.

<sup>40</sup> American Association of Poison Control Centers (AAPCC), E-Cigarette Devices and Liquid Nicotine, <http://www.aapcc.org/alerts/e-cigarettes/>, accessed July 13, 2016. Data from 2014-2016 are considered preliminary and the numbers may change as cases are closed and additional information is received. See also: 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>.

<sup>41</sup> CDC, "Dual Use of Tobacco Products." <http://www.cdc.gov/tobacco/campaign/tips/diseases/dual-tobacco-use.html#en>. Accessed November 19, 2015.

<sup>42</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.

<sup>43</sup> CDC, "Dual Use of Tobacco Products." <http://www.cdc.gov/tobacco/campaign/tips/diseases/dual-tobacco-use.html#en>. Accessed November 19, 2015.

<sup>44</sup> Cheng, T, "Chemical Evaluation of Electronic Cigarettes," *Tobacco Control* 23:ii11-ii17, May 2014.

[http://tobaccocontrol.bmj.com/content/23/suppl\\_2/ii11.full](http://tobaccocontrol.bmj.com/content/23/suppl_2/ii11.full). 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>.

<sup>45</sup> 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 FDA, "Harmful and Potentially Harmful Constituents in Tobacco Products and Tobacco Smoke: Established List," March 2012, <http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm297786.htm>.

<sup>46</sup> Zhu, S-H, et al., "Four Hundred and Sixty Brands of E-cigarettes and Counting: Implications for Product Regulation," *Tobacco Control*, 23(Suppl 3):iii3-iii9, 2014, [http://tobaccocontrol.bmj.com/content/23/suppl\\_3/iii3.full](http://tobaccocontrol.bmj.com/content/23/suppl_3/iii3.full).

<sup>47</sup> CDC, "Dual Use of Tobacco Products." <http://www.cdc.gov/tobacco/campaign/tips/diseases/dual-tobacco-use.html#en>. Accessed November 19, 2015.

<sup>48</sup> Flavor and Extract Manufacturers Association of the United States (FEMA), *The Safety Assessment and Regulatory Authority to Use Flavors – Focus on E-Cigarettes*, Revised March 3, 2015, <http://www.femaflavor.org/safety-assessment-and-regulatory-authority-use-flavors-focus-e-cigarettes>.

<sup>49</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.

<sup>50</sup> Barrington-Trimis, JL, Samet, JM, & McConnell, R, "Flavorings in Electronic Cigarettes: An Unrecognized Respiratory Health Hazard?" *The Journal of the American Medical Association*, doi:10.1001/jama.2014.14830, published online November 10, 2014.

<sup>51</sup> CDC, "Characteristics of Electronic Cigarette Use Among Middle and High School Students—United States, 2015," *MMWR*, 65(50-51): 1425-1429, <https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm655051a2.pdf>.

<sup>52</sup> 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>. See also: CDC Office on Smoking and Health, "Electronic Nicotine Delivery Systems: Key Facts," July 2015. Accessed November 19, 2015. <http://www.cdc.gov/tobacco/stateandcommunity/pdfs/ends-key-facts2015.pdf>

<sup>53</sup> HHS, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General*, Centers for Disease Control and Prevention, Office on Smoking and Health, 2010 <http://www.ncbi.nlm.nih.gov/books/NBK53017/>.

<sup>54</sup> HHS, *E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General*. Atlanta, GA: U.S. Department 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, 2016.