

THE TRUTH ABOUT: ELECTRONIC NICOTINE DELIVERY SYSTEMS

Since their introduction in the United States market, awareness, interest and use of electronic cigarettes (e-cigarettes) or Electronic Nicotine Delivery Systems (ENDS) has steadily grown. ENDS, also called vape pens, personal vaporizers, e-hookahs, e-pipes and e-cigars, among other names, are battery-operated devices that produce an aerosol (vapor) instead of smoke.

We've summarized the existing science on patterns of use of ENDS, the health and safety of ENDS, and the effectiveness of ENDS as a method for smoking cessation. We also address common perceptions of ENDS, the appeal and impact of flavors, marketing and advertising of ENDS, and public policy measures proposed and currently in effect to regulate their use.

ENDS are a rapidly changing technology. As the products and regulatory environment develop, so may the facts around their usage, health effects and public health impact. We will continue to monitor those developments and update this review to reflect the current state of knowledge.

BACKGROUND

WHAT ARE E-CIGARETTES OR ENDS?

ENDS are typically comprised of a cartridge containing fluid, a heating element and a battery.

- ENDS are available in three main types:
 1. Disposable "cigalike."
 2. Rechargeable "cigalike."
 3. Rechargeable and refillable vaporizers or tank-like products that do not look like cigarettes, have larger and adjustable voltage batteries and heating coils, sometimes called "Mods."
- Of these three types, evidence suggests that the larger tank-like or Mod devices deliver nicotine more efficiently and therefore are more popular among experienced users.¹⁻⁵



- Fluid for ENDS comes in many different flavors and nicotine concentrations (including no nicotine) and is sometimes called “juice” or “e-juice.”
- The U.S. federal government does not currently regulate ENDS, but under the Family Smoking Prevention and Tobacco Control Act, the U.S. Food and Drug Administration (FDA) has released a draft rule asserting regulatory authority over ENDS and fluids. As of December 1, 2015, this rule, proposed in April 2014, has yet to be finalized.
- Currently, there are no enforceable, universal product standards that ENDS manufacturers must adhere to, although some claim to follow voluntary product standards.⁶ This means that there are no enforceable standards to ensure that all devices and fluids on the market are as safe as they can be for all consumers using them or exposed to them. There are also currently no national standards for child-resistant packaging.

WHERE WE STAND: ENDS

Regulation of Electronic Nicotine Delivery Systems (ENDS) is essential to ensure they are as safe as possible, that individual and population benefits are maximized while harms are minimized, and that youth do not use ENDS. One of the conclusions of the 2014 Surgeon General’s Report on The Health Consequences of Smoking stated, “the burden of death and disease from tobacco in the U.S. is overwhelmingly caused by cigarettes and other combusted tobacco products; rapid elimination of their use will dramatically reduce this burden.”⁷ If prudently regulated, we believe ENDS hold promise as one means to move smokers to a less harmful product and reduce the devastating death and disease burden caused by combustible tobacco products such as cigarettes, cigars or hookah.⁸

TRUTH INITIATIVE’S VISION IS A FUTURE WHERE TOBACCO IS A THING OF THE PAST.

- Our mission is to achieve a culture where all youth and young adults reject tobacco. Those who do not use tobacco, particularly young people, should never start using any tobacco or nicotine-containing product, including ENDS.
- For those who are already using combustible tobacco and are unable or unwilling to stop, we support movement to the exclusive use of less harmful alternatives with the goal of eventually stopping all tobacco and nicotine use.

TRUTH INITIATIVE SUPPORTS THE FOLLOWING RECOMMENDATIONS WITH REGARD TO ENDS:

- Prudent and expeditious regulation of ENDS to maximize benefits and minimize harms to protect individuals and public health, especially youth.
- Regulation of ENDS so that health and cessation claims may be appropriately reviewed by the FDA as a neutral regulatory body, thus allowing the public to make informed decisions regarding the relative harms and benefits of ENDS as compared to combustible tobacco use.
- Restriction and enforcement of ENDS product sales and marketing so that it does not:
 - Target or appeal to youth
 - Mislead the public

WHERE WE STAND: ENDS, CONTINUED

- Encourage dual use of tobacco products
- Undermine smoke-free air laws
- Restricting sales of all tobacco and nicotine products, including ENDS, to those 21 years of age and older.
- Eliminate flavors (including menthol) in all tobacco products, including ENDS, except when a manufacturer can demonstrate to the FDA that a relatively low-harm flavored product does not appeal to and is not marketed to youth (verified with careful post-market surveillance of actual usage patterns).
- Inclusion of ENDS in smoke-free indoor air laws.
- Reasonable manufacturing and consumer safety standards, including child-resistant packaging of e-liquids and cartridges, accurate labeling of ingredients and nicotine levels and appropriate safe handling and warning labels.

PATTERNS OF USE

YOUTH

- Between 2011 and 2014, national cross-sectional studies demonstrate rapid increases in ever and past 30-day use of ENDS by high school and middle school students in the U.S. The largest increase in past 30-day use of ENDS has been among high school students.^{9,10} Ever and past 30-day use of ENDS in these populations, as measured by the National Youth Tobacco Survey (NYTS), are summarized below in Table 1.

Table 1: Prevalence of ever use and past 30-day use of ENDS in youth and young adults (2011-2014)

	Youth		Middle School Students		High School Students	
	Ever Use	Past 30-Day Use	Ever Use	Past 30-Day Use	Ever Use	Past 30-Day Use
2011	3.3% ¹¹	1.1% ¹¹	1.4% ¹¹	0.6% ¹¹	4.7% ¹¹	1.5% ¹¹
2012	6.8% ¹¹	2.1% ¹¹	2.7% ¹¹	1.1% ¹¹	10.0% ¹¹	2.8% ¹¹
2013	8.0% ^a	3.1%	3.0% ¹²	1.1% ¹²	11.9% ¹²	4.5% ¹²
2014	19.8% ^a	9.3%	10.1% ^a	3.9% ⁹	27.3% ^a	13.4% ⁹

^a Data not reported in recent U.S. Centers for Disease Control and Prevention (CDC) reports or in the published literature are publicly available on the CDC website: http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/

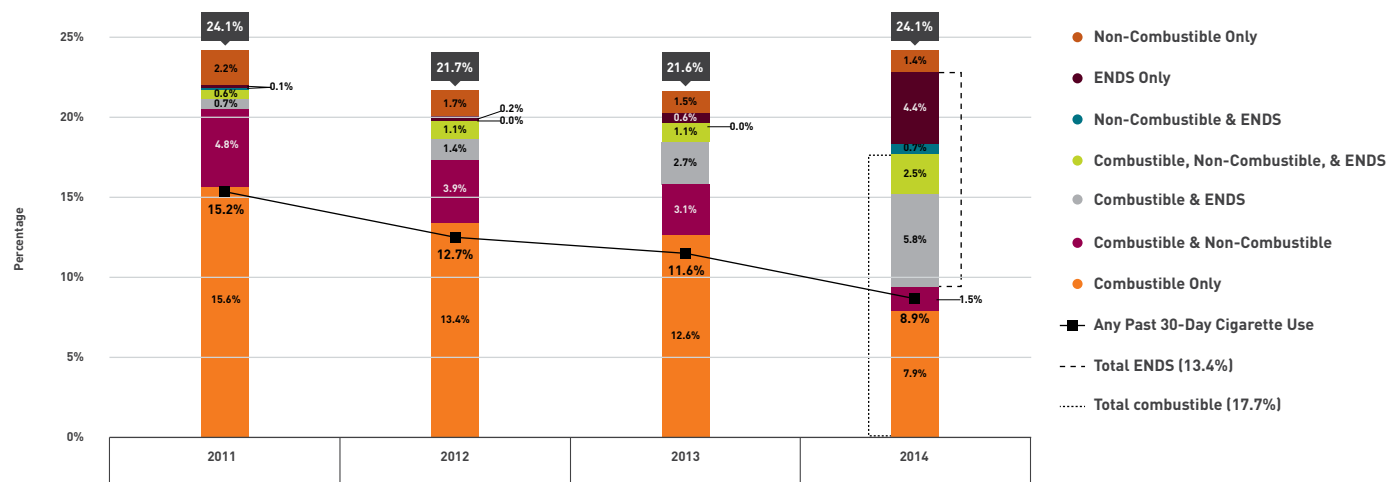
- There are limitations to measures of “ever use in one’s lifetime” and “use at least once in the past 30 days.” By their nature, the measures do not differentiate frequency of use and include both individuals who are experimenting with ENDS (i.e., ever used in lifetime or used 1-2 times in the past 30 days) and may not progress to more frequent use (e.g., on 20-30 days in the last 30 days).¹³⁻¹⁵
- In 2014, the NYTS also included measures of frequency of use during the past 30-day period, so that distinctions can be made between what is most likely experimental or trial use (e.g., 1-2 occasions) and more frequent use (e.g., all 30 days in the past month). For example, of the 13.4% of the population of high school students reporting any past 30-day ENDS use, 74% (or 9.9% of the population) had tried ENDS on 1-9 days, while only 9.7% (or 1.3% of the population) used ENDS all 30 days. Regular use (use on ≥20 days) was reported by 15.5% (or 2.1% of the population).^{9,16} Frequency of past 30-day use of ENDS among U.S. high school students is presented in Table 2.

Table 2: Frequency of past 30-day use of ENDS among the 13.4% of all U.S. high school students by number of days used and by percent of the population, NYTS, 2014.¹⁶

Days used/month	% high school ENDS users	% high school population	Cumulative%
1-2 days	45.4	6.1	6.1
3-5 days	16.2	2.2	8.3
6-9 days	12.0	1.6	9.9
10-19 days	10.9	1.4	11.3
20-29 days	5.8	0.8	12.1
All 30 days	9.7	1.3	13.4
Total	100%	13.4%	--

- Figure A shows the prevalence of tobacco and ENDS use by high school students from 2011 to 2014. It is important to keep in mind that the NYTS data are cross-sectional and capture behavior at one point in time. They cannot be used to imply causality or temporality, or to draw conclusions about what co-occurs with, leads to or follows ENDS use.¹⁷ Additionally, in 2014, the survey question on ENDS changed, thus prevalence is not directly equivalent to 2011-2013.⁹

Figure A: Past 30-Day Prevalence of Tobacco and ENDS Use in U.S. High School Students



NOTE: Includes published and unpublished NYTS data; all data are publicly available at http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/. The survey question on ENDS changed in 2014 and thus prevalence is not directly equivalent to 2011-2013.

- Exclusive use of ENDS at least once in the past 30 days increased to 4.4% among high school students in 2014.
- From 2011-2014, cigarette use at least once in the past 30 days among high school students declined in every year (15.2%, 12.7%, 11.6%, 8.9%, respectively). The steepest rate of decline to a record low occurred from 2013-2014.
- Past 30-day use of any type of combustible tobacco products (cigarettes, cigars, hookah, pipes and bidis) has declined more slowly (21.7%, 19.8%, 19.5%, 17.7%, respectively) in high school students. In 2014, past 30-day cigarette use was lower (8.9%) than ENDS use (13.4%); however, total combustible tobacco use (17.7%) was higher than total ENDS use (13.4%).
- The highest co-use of ENDS – meaning use of ENDS and at least one other tobacco product – is among cigarette smokers. About 76% of past 30-day ENDS users also smoked cigarettes, and about 24% had not smoked cigarettes.^{11,18-20} Assuming those rates apply to the 2014 NYTS data, it would appear there is little daily use of ENDS among high school students who are not otherwise using tobacco products. For example, if 24% of the 1.3% of high school students who were daily ENDS users according to NYTS were never or past smokers, this would be a total of 0.3% of the high school population.
- Several studies show that the majority of adolescents trying ENDS are also experimenting with other tobacco products, alcohol and marijuana.²¹⁻²⁹ These risk-taking behaviors travel together, which is consistent with the common liability model, which posits that no single product acts as a “gateway” to another, but rather early use of these substances stems from a shared vulnerability due to a number of common underlying bio-psycho-social factors.^{30,31}

YOUNG ADULTS

- The National Health Interview Survey (NHIS), conducted by the U.S. Census Bureau on behalf of the U.S. Centers for Disease Control and Prevention, first began to collect data about ENDS use

among adults in 2014. These data show that “ever” use of ENDS among young adults aged 18-24 years old in the U.S. in 2014 was 21.6%, while “every day” or “some days” use in the same age group totaled 5.1%.^{32,33}

- While young adults were significantly more likely to report ever use of ENDS than older adults, they were not more likely than other adults to be using ENDS “some days” or “every day.”³²
- The percentage of young adult never cigarette smokers who had “ever” tried ENDS was 9.7% compared to 3.2% among all adults.³³ It is unclear whether the prevalence of “some day” or “every day” ENDS use in never cigarette smokers differs in young adults compared to older adults.

ADULTS

- NHIS data show that ever use of ENDS among adults in the U.S. in 2014 was 12.6%, and that 3.7% of adults report ENDS use on “some days” or “every day.”^{32,33}
- These data show that recent former smokers (quit less than 1 year ago) were more likely to report using ENDS “every day” or “some days” (22.0%) than either adults who had never smoked (0.4%) or former smokers who had quit for one year or more (2.3%), or former smokers who quit cigarettes four or more years ago (0.8%).^{32,33} The patterns of use suggest that cigarette smokers may be using ENDS to quit or to prevent relapsing back to cigarettes during the year most proximal to their cessation of cigarettes.³⁴⁻⁴⁶

HEALTH & SAFETY

ENDS are substantially less harmful than the inhaled smoke from combustible tobacco (i.e., cigarettes). Long-term monitoring of health effects, addictiveness and toxicity is necessary to determine their absolute harm compared with no use of any products and their relative harm compared with other nicotine delivery products (e.g., nicotine replacement therapies) and other tobacco products (both non-combustible and combustible products).

RELATIVE HARM

- Public Health England, after reviewing currently available evidence on the subject, concluded that it was reasonable to estimate that ENDS are around 95% less harmful than smoking cigarettes.⁵⁰
- While some are concerned the precise percentage is hard to quantify, studies of the major biomarkers of cancer or other chemicals in ENDS indicate substantially (9-450 times) lower levels compared to the smoke from cigarettes, cigars, hookah and other combustible tobacco products.^{51,52}

TOXICITY AND ADVERSE EFFECTS

- Many ENDS contain nicotine. Nicotine can alter nerve cell functioning in developing organisms, especially during fetal, early childhood and adolescent stages of development and thus should not be used by youth or pregnant women.^{47,48} Nicotine may also be harmful for people with specific medical conditions, including cardiovascular disease and diabetes. However, even for individuals with those conditions, clean nicotine, for example in the form of FDA-approved nicotine replacement therapy, is much less harmful than smoking.⁴⁹
- Nicotine content in ENDS liquid and aerosol varies across manufacturers, devices, cartridges and even puff-to-puff.⁵³⁻⁶² Liquids and mainstream and exhaled aerosol contain the chemical propylene glycol,^{51,52,61,63-67} flavorings⁶⁴⁻⁶⁶ and some potentially harmful constituents. However, exposure to toxicants in ENDS aerosol is substantially lower (9-450 times lower) than in cigarette smoke.^{51,52,58,63-66,68-79}

- Published studies report the most common adverse events after use of ENDS as mouth and throat irritation, nausea, headache and dry cough.^{1,80-86} The FDA received 35 adverse event reports of passive aerosol exposure between January 2012 and December 2014. Twenty-five include respiratory symptoms, eight include eye irritation, eight include headache, six include nausea, six include sore throat/irritation, five include dizziness and five include racing/irregular heart rate.⁸⁷
- Data is very limited on the impact of secondhand exposure to ENDS aerosol on health. Low levels of nicotine in secondhand ENDS aerosol have been detected in some studies.⁸⁸⁻⁹⁰

ADDICTIVENESS

- Nicotine is an addictive substance, but its level of addictiveness can vary substantially depending on its mode of delivery; nicotine delivered via combustion of tobacco (e.g., in a cigarette) is its most addictive form.⁹¹ On the other hand, FDA-approved nicotine replacement therapies (NRTs) are minimally addictive^{49,92,93} and have been approved for long-term use.^{94,95}
- Overall, most ENDS at their current state of development are associated with lower levels of nicotine exposure and slower rates of uptake relative to cigarettes.^{5,96-98} Plasma nicotine levels have been shown to approach those achieved by cigarettes in more experienced ENDS users, depending on the product type, the nicotine concentration in the liquid and users' "puff topography," or the way they use ENDS.^{98,99} Thus, some ENDS have the potential to be addictive in some users. ENDS also bear some similarities to dependence-inducing tobacco products (e.g., cigarettes, smokeless tobacco) in terms of cigarette smoking withdrawal and craving suppression^{82,96,98-106} and positive subjective effects.^{5,82,98,99,102,107,108}

MISUSE AND UNINTENDED EXPOSURE

- Nicotine can be harmful if not properly stored and handled. With an estimated median lethal oral dose between one and 13 mg per kilogram of body weight, one teaspoon (5 ml) of a 1.8% nicotine solution could be lethal to a 200-lb (90-kg) person.¹⁰⁹
- The American Association of Poison Control Centers reported 271 ENDS exposures in 2011; 460 in 2012; 1,543 in 2013 and 3,783 ENDS exposures in 2014.¹¹⁰
- According to the 2013 annual report from the National Poison Data System (NPDS), ENDS exposure calls comprised 15% and cigarettes comprised 57% of all tobacco-related single exposure calls in 2013.¹¹¹ ENDS exposure calls comprised 35% of all tobacco-related single exposure calls at their peak in April 2014. Following April 2014, there was a decline in exposures, perhaps due to implementation of state/local regulations.¹¹¹

CIGARETTE SMOKING CESSATION

Current research suggests that ENDS can promote cessation of cigarettes, increase quit attempts, reduce symptoms of nicotine withdrawal, prevent relapse and potentially serve as a pathway to cessation of cigarettes. Further high-quality, randomized controlled trials and more rigorous observational studies are important to confirm findings from the research published to date.

- A comprehensive review by Public Health England concluded, "Smokers who have tried other methods of quitting without success could be encouraged to try e-cigarettes (EC) to stop smoking, and stop smoking services should support smokers using EC to quit by offering them behavioral support. There is also evidence that EC can encourage quitting or cigarette consumption reduction."⁵⁰
- The U.S. Preventive Services Task Force, citing variability in the unregulated ENDS product

market, concluded there was still insufficient evidence to recommend ENDS use for smoking cessation.¹¹²

- Two randomized controlled trials (RCTs) show that ENDS are effective in helping some adult smokers to quit or to reduce their cigarette smoking.^{81,113} Rates of cessation in the ENDS groups were at least as good as those in the Clinical Practice Guideline of NRT using their standard six month follow-up criteria.¹¹⁴ A Cochrane review meta-analysis confirms the net effect.¹¹⁵
- Several observational studies measuring the effect of ENDS use on smoking cessation^{36,46,116-123} reported negative correlations between those who tried ENDS and smoking cessation. Due to (a) serious limitations of study design, measurement and methodology, including inadequate measures of exposure (e.g., ever use in one's lifetime) to be a fair test for a cessation indication, (b) selection bias and (c) confounders (e.g., smokers who have repeatedly failed to quit are more likely to try ENDS), we consider the conclusions invalid.¹²⁴⁻¹²⁶ This is not without precedent, as some observational studies of NRT and smoking cessation showed similar negative correlations,^{127,128} while more than 80 randomized control trials of NRT show strong positive cessation effects.¹²⁹
- Recent observational studies with more robust measures of how ENDS were used (e.g., duration of use, type of device and use specifically for cessation) suggest ENDS can facilitate quit attempts and cessation.¹³⁰⁻¹³³ Intensive use of ENDS for a month or more is associated with six times greater chance of cessation and a 20.4% quit rate.¹³⁰ Users of tank or Mod ENDS devices were more likely to quit than "cigalike" users.¹³³
- Because ENDS are more widely available and appealing to smokers than conventional nicotine replacement therapies (NRTs), they have the potential for making a large public health impact on population prevalence of smoking cessation.^{134,135} For example, in the United Kingdom, compared with conventional NRTs, more smokers are using ENDS to quit (20.7% vs. 35.1% respectively).¹³⁶ In the U.S., NHIS data also suggest ENDS may be displacing cigarette smoking. Recent former smokers (quit <1 year ago) were more likely to have used ENDS in the past 30 days (22.0%) than former smokers who had quit >1 year ago (2.3%).³³ In another study, recent quitters (<1 year) were four times more likely to be daily ENDS users than current smokers (13% vs. 3.5%). Only 0.8% of former smokers with more than four years since smoking cessation used ENDS, suggesting that ENDS are not attractive to long-term quitters.³²
- Some studies suggest that ENDS use may facilitate cigarette smoking cessation or reduce harms in dual users of both ENDS and cigarettes who also reduce cigarette use.^{81,137-140} It is difficult to determine to what extent dual use results in sufficiently sustained cigarette reduction for a net population health benefit.¹³⁷ The greatest health benefit would accrue if smokers switched immediately to exclusive ENDS use, or dual-used ENDS and cigarettes for a short time before stopping all cigarette use.^{134,135}

PERCEPTIONS OF ENDS

Most people, but especially smokers, are aware of ENDS, perceive them to be less harmful than traditional cigarettes and cite smoking cessation as a reason for use. However, there are some concerns that people are beginning to incorrectly believe that ENDS are just as harmful as combustible cigarettes. We need to carefully monitor perceptions in the U.S. on this issue and take appropriate steps to ensure consumers understand the relative harms of various nicotine delivery products.

- Awareness of ENDS and vaping is high in all populations, especially among smokers.^{20,39,40,42,44,141-145}
- ENDS are generally perceived to be less harmful^{23,146,147} and less addictive than regular cigarettes.^{37,148,149}
- Data from England suggest, “[a]lthough the majority of adults and youth still correctly perceive EC [electronic cigarettes] to be less harmful than tobacco cigarettes, there has been an overall shift towards the inaccurate perception of EC being at least as harmful as cigarettes over the last year, for both groups.”^{50,150-152} In the U.S., among current smokers aware of ENDS, there was a decline (85% in 2010 to 65% in 2012) in the proportion who believed that ENDS are less harmful than combustible cigarettes.^{42,143,153}
- One 2013 survey indicated that as many as 40% of U.S. adults perceived ENDS to be just as harmful or much more harmful than combustible cigarettes.¹⁵³ Those adults are mistaken.
- The most common reasons e-cigarette users cite for using the products are:
 1. as a smoking reduction/cessation aid,^{1,3,44,46,83,116,149,154-169} and in particular to avoid tobacco craving/withdrawal symptoms,²
 2. to avoid smoke-free policies and/or to avoid disturbing people with secondhand smoke^{1,3,44,46,83,147,154-158,160,162,163,166-172} and
 3. the perception that they are less harmful/less toxic than traditional cigarettes.^{2,3,44,46,144,147,149,154-158,160,161,163,165,169-171}
- E-cigarette users also report trying or using ENDS because they are less expensive than regular cigarettes,^{2,4,44,154-157,162,163,168-170} to prevent relapse back to cigarettes,^{2,155,169} out of curiosity,^{154,156,158,170} because they are accessible and convenient,^{170,172,173} for social reasons,^{158,170,172,174} because they taste^{156,163} and smell better^{155,170} and because they feel the experience is like smoking a regular cigarette but without the lingering odor.¹⁶⁸
- One study conducted in two middle schools, four high schools and two public universities in Connecticut found that in focus groups of young people who had ever tried an e-cigarette, the top reasons for experimentation were curiosity (54.4%), appealing flavors (43.8%) and peer influences (31.6%).¹⁷⁰ In the survey, fewer than 10% of participants in any age group reported experimentation because “it is cool.” Being “uncool” was one of the top reasons endorsed among middle school, high school and college students for stopping e-cigarette use.¹⁷⁰

FLAVORS

Flavored tobacco products appeal to youth, and flavors are cited as a reason for e-cigarette use by both youth and adults.

- Essentially all ENDS have a characterizing flavor, such as tobacco, menthol, fruit or candy flavor. As of January 2014, there were nearly 8,000 flavors.¹⁷⁵
- Menthol cigarettes have been shown to appeal to young people¹⁷⁶⁻¹⁷⁸ and facilitate the transition from experimentation to regular smoking.¹⁷⁹ It is likely that flavors in other tobacco products, including ENDS, also facilitate tobacco trial and longer-term use. Evidence indicates that flavors are viewed as an attractive characteristic of ENDS,¹⁷¹ and youth and adults cite flavors as a reason

for e-cigarette use.^{154,162,170}

- In 2013-2014, 85.3% of U.S. youth aged 12-17 years old who had used ENDS in the past 30 days reported using a flavored e-cigarette.¹⁸⁰ The prevalence of flavored e-cigarette use among adults is not currently available at the national level.
- One international study of adult users of ENDS (the large majority of whom were current or former smokers) indicates that the availability of flavored e-cigarette products is an important factor in choosing to use ENDS in their efforts to reduce or quit cigarette smoking.¹⁸¹
- In laboratory studies of human and animal cells, particular e-cigarette flavors may be more toxic than others, but all are less toxic than cigarette smoke extract.¹⁸²⁻¹⁸⁴ The most common flavor found to be toxic to human and animal cells is cinnamon.^{183,185-187} There are also studies examining the presence of chemicals associated with “butter” flavor, such as diacetyl (a common and approved food additive) in ENDS liquid.¹⁸⁸ Diacetyl has been associated with obliterative bronchiolitis, a serious lung condition among individuals with very high levels of workplace exposure. It is unknown what effect the presence of this flavoring in ENDS may have.

MARKETING

There has been tremendous growth in the marketing of ENDS since 2010. Unlike combustible cigarettes, there is no regulation of e-cigarette marketing at a national level and ENDS may be advertised on television. Youth and young adults are widely exposed to e-cigarette marketing and have high awareness of ENDS.

- ENDS are the most widely advertised noncombustible tobacco product.¹⁸⁹ Individuals aware of ENDS report that the most common platforms to hear about ENDS are through in-person communications, by seeing them for sale and through online and television advertisements, in which some celebrities have endorsed the products.^{44,190-193} ENDS are promoted heavily online through e-cigarette company sponsored advertisements,¹⁹⁵ and on YouTube¹⁹⁵⁻¹⁹⁸ and Twitter.¹⁹⁹
- Promotional spending across all media channels has rapidly increased since 2010.^{200,201} The total expenditure for e-cigarette advertisements across all media channels is increasing annually, and from 2011 to 2013 was primarily driven by blu eCigs.^{200,201} There were large increases in the marketing of MarkTen from 2013 to 2014. Both blu eCigs and MarkTen are owned by large tobacco companies primarily in the business of selling cigarettes.
- ENDS are commonly marketed as alternatives to conventional cigarettes,²⁰²⁻²⁰⁶ and e-cigarette advertisements often make unproven claims.¹¹⁷ The most common claims advertise ENDS as a healthier alternative to conventional cigarettes,²⁰⁴ a way to circumvent smoking bans^{202,203,205} and/or as a smoking cessation aid.^{117,204}
- A 2014 Congressional investigation of the marketing practices of nine popular brands found that many were sponsoring events geared toward youth, often handing out free samples, and running advertisements on television and radio.²⁰⁷
- Youth and young adults are exposed to e-cigarette advertisements with increasing frequency. Youth exposure to television ads increased by 256% from 2011 to 2013, and young adult exposure increased by 321%.²⁰⁸ One study conducted from April 2012 to April 2013 found that certain e-cigarette brands advertised on websites with substantial youth audiences (up to 35% of youth as their audience).²⁰⁹ Another study in 2014 showed that approximately 62% of U.S. teens aged

12-17 year olds and 64% of young adults aged 18-24 year olds were exposed to e-cigarette advertisements on television, and 47% of teens and 82% of young adults were exposed to e-cigarette print advertisements in magazines.²¹⁰

- Recent studies note potential impacts of e-cigarette advertising on e-cigarette intentions and use in youth and young adults. One randomized controlled trial found that among adolescents who had never used ENDS, those who were exposed to four e-cigarette television ads reported a greater intention to use ENDS in the future compared to those who did not view the e-cigarette ads, and current cigarette smoking was highly associated with likelihood of future e-cigarette use.²¹¹ Another randomized controlled trial in young adults showed that brief exposure to four print e-cigarette ads increased curiosity about ENDS in the young adults exposed to the ads, and ad exposure was also associated with subsequent trial of ENDS in a small proportion of the young adults who had never used an e-cigarette or cigarette at the start of the study.²¹²

CURRENT POLICY ENVIRONMENT AS OF DECEMBER 1, 2015

Nearly all states ban sales of ENDS to youth. There are no national policies restricting indoor use of ENDS, but several states have set limits in schools, workplaces, restaurants and bars. ENDS currently do not have to display warning labels, and few states levy a tax on ENDS or their components.

YOUTH ACCESS

- Currently, there are no policies limiting youth access to ENDS at the national level, but the proposed April 2014 FDA deeming rule, if finalized, would prohibit sales to individuals younger than eighteen.
- Sale of ENDS to minors is banned in all but four states – Massachusetts, Michigan, Pennsylvania and Texas – and the District of Columbia. Legislation has been passed in Montana and Oregon to ban sales to minors in the next year.²¹³⁻²¹⁵ However, vigorous enforcement of these sales restrictions will be necessary for them to be effective in reducing youth uptake.

SMOKE-FREE INDOOR AIR

- There are no policies restricting indoor use of ENDS at the national level.
- Three states (New Jersey, North Dakota and Utah) have a ban on ENDS in workplaces, restaurants and bars.²¹⁶
- Ten states (Arkansas, California, Colorado, Illinois, Minnesota, New Hampshire, Vermont, Virginia, Washington and West Virginia) ban ENDS in schools or on grounds used for instructional purposes.^{213,215}
- Four states (Hawaii, Delaware, Oregon and North Dakota) prohibit use of ENDS in state workplaces, one state (Maryland) prohibits use on public commuter rail, and five states (Kansas, North Carolina, South Dakota, Oklahoma and Utah) prohibit use in departments of corrections.^{213,215}

PRODUCT PACKAGING

- There are currently no mandated warning labels on e-cigarette packaging.

- Ten states (Illinois, Indiana, Minnesota, New Mexico, New York, North Dakota, Tennessee, Vermont, Virginia and Wyoming) require child-resistant packaging. Utah will implement rules for product packaging in 2016.²¹⁵

TAXES

- Two states have imposed a tax on ENDS. In Minnesota, one-time use ENDS and cartridges/e-juice containing nicotine are subject to the Tobacco Tax (95% of wholesale), but reusable/refillable devices and components and cartridges/e-juice containing no nicotine are not taxable. North Carolina taxes liquid nicotine at five cents per milliliter.^{214,215}

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