

## E-cigarette Myths: Responses & Context

**Bottom Line: E-cigarettes have not undergone government review of their safety or public health impact.** Youth e-cigarette use is soaring to unprecedented and epidemic rates. Youth and young adults are *far* more likely than older adults to use e-cigarettes, including adults using e-cigarettes to quit smoking. The U.S. Surgeon General has issued a call to action, urging state and local governments to respond to this epidemic with evidence-based tobacco controls.

### 1. Prevalence of Youth E-cigarette Use

**The Myth: Rates of youth e-cigarette use are overblown, and regardless, public health concern about use is unjustified.**

**The Truth:** Youth e-cigarette use has surged to unprecedented levels, and is now identified as an epidemic. This is a problem, because the use of e-cigarettes is unsafe.

#### Additional Information

The 2017-2018 spike in youth vaping represented an unprecedented annual jump in youth use of any substance recorded in the 44-year history of a prominent national survey of teen behavior, and prompted the U.S. Surgeon General to label youth e-cigarette use an “epidemic.”<sup>1</sup> Data from 2019 suggest a continued acceleration.<sup>2</sup> E-cigarette use among New York high school students surged 160 percent between 2014 and 2018, and an astounding 27.4 percent of high school students reported currently using e-cigarettes in 2018.<sup>3</sup> E-cigarettes are by far the most commonly used tobacco product among adolescents, both nationally and in New York.<sup>4</sup>

Concern over the prevalence of youth e-cigarette use is justified: E-cigarette use during adolescence poses serious health and safety risks and nicotine is highly addictive. Yet e-cigarette marketing targets children. These risks are detailed throughout this resource, and support the wide acceptance among experts that pervasive youth e-cigarette use is a problem.

#### Where did this myth come from?

The standard measure for identifying youth who are at risk for nicotine addiction and chronic disease is any use of a tobacco product in the past 30 days. This prevailing measure allows for comparison with other survey years and tobacco products. It captures even infrequent use, while maximizing the likelihood of respondents’ accurate recall. Many tied to the vapor product industry try to undermine the alarming data on youth e-cigarette use by arguing that *daily* use is the proper measure of current use or addiction. This is misguided, as addiction can occur with infrequent, experimental use, especially among adolescents, and it is important to keep a finger on the pulse of youth experimentation with e-cigarettes. Further, that argument ignores the fact that youth are separately asked about frequent e-cigarette use (defined as use on 20 or more days of the month). Findings indicate that frequent use is rising in line with current use. Finally, the vapor product industry and its affiliates have framed concern about the hazards of e-cigarette use as stirring a “moral panic,” when in fact it is resoundingly justified (below).

## 2. Harm Reduction

**The Myth: E-cigarettes are 95 percent safer than cigarettes.**

**The Truth:** E-cigarettes are hazardous to health, and their risk level cannot be reliably compared to that of other products.

### Additional information

This vaping industry talking point has been debunked.<sup>5</sup> E-cigarettes pose health risks to users and bystanders who are exposed to aerosol emissions. The lack of government oversight of e-cigarettes magnifies these risks.

Most e-cigarettes contain harmful substances, such as formaldehyde and other carcinogens, heavy metals, and particulate matter.<sup>6</sup> E-cigarettes are overwhelmingly flavored, and flavor additives can be the primary toxicants,<sup>7</sup> damaging cells and lung function.<sup>8</sup> Most e-cigarettes contain nicotine, a *highly* addictive drug (read below for more on harms posed by nicotine exposure). Beyond chronic health risks associated with inhaling toxins, particulate matter, and nicotine, e-cigarettes can cause acute illness and injury, including seizures from nicotine toxicity and lung illness linked to vaping.<sup>9</sup> Finally, the epidemic of youth e-cigarette use is erasing decades of public health progress in creating a tobacco-free norm, meaning that more youth are exposed to vaping as a socially accepted behavior and are therefore more susceptible to tobacco use.

For these reasons, it is not accurate to conclude that e-cigarettes are safer than cigarettes. Moreover, comparing e-cigarettes to combustible cigarettes (one of the most deadly consumer products ever created) is a low bar and not a public health objective. When considering a product's risk, the comparison should be to clean air and the answers far more certain. Former NY DOH Commissioner Nirav Shah understood this when he wrote to the New York Times in 2013: "The lack of science on critical questions should be cause for close regulation of e-cigarettes until these questions are better answered, rather than careless optimism with the lives of our youth."<sup>10</sup>

### Where did this myth come from?

This myth of "95 percent safer" is an industry talking point. It's based on a 2014 paper<sup>11</sup> reporting on the theories of a small group of individuals, some with ties to the vapor product industry, who met to estimate theoretical safety levels of specific tobacco products, including e-cigarettes. The authors of the paper explicitly warn of a "lack of hard evidence for the harms of most products on most of the criteria." They further limit their findings by stating, "there was no formal criterion for the recruitment of the experts." In other words, the reported opinions represented those of a few individuals with no prerequisite expertise and were based on an almost total *absence* of evidence of harm. It is on this flimsy foundation that the US vapor product industry bases conclusions of relative safety.



### 3. Harms of Nicotine

**The Myth:** Nicotine is safe to use—it's the tar and smoke that are deadly.

**The Truth:** Nicotine is NOT benign. It is a highly addictive drug posing serious health concerns, especially for developing brains.

#### Additional Information

While tar and other chemicals in tobacco product smoke are indeed toxic, nicotine poses a myriad of health harms, and nicotine overdose or poisoning can be serious or fatal. Nicotine from e-cigarettes may be especially hazardous, as these products are unregulated and available in flavors and otherwise marketed to appeal to children, who can inadvertently ingest nicotine liquids.<sup>12</sup> Further, the most commonly used types of e-cigarettes among teens deliver very high levels of nicotine,<sup>13</sup> especially concerning for this age group.

Nicotine exposure during adolescence and young adulthood alters brain chemistry and causes potentially serious cognitive and other health consequences such as mood disorders and impulse control.<sup>14</sup> Nicotine primes the developing brain for addiction and future substance abuse by significantly increasing a user's sensitivity to drugs.<sup>15</sup> This concern extends to the potential impact of e-cigarettes as a "gateway" to tobacco smoking.<sup>16</sup>

Adult nicotine use also poses health risks. Nicotine adversely affects every organ system, including cardiovascular, respiratory, gastrointestinal, and reproductive systems.<sup>17</sup> Nicotine can dangerously interfere with prescribed medications.

At the same time, addiction to nicotine increases exposure to other substances or toxins if absorbed alongside the nicotine. Whether exposed through aerosol from e-cigarettes, smoke from combustible tobacco products, or another type of tobacco product, accumulated exposure to nicotine and toxins increases risk of associated illness and injury.

#### Where did this myth come from?

The tobacco industry has long downplayed the harmful effects and extremely addictive nature of nicotine.<sup>18</sup> For example, companies have long compared nicotine to caffeine, as a strategy for enhancing the social acceptability of tobacco use.<sup>19</sup> However, the reality is that tobacco companies manipulated nicotine levels in cigarettes to precisely ensure that users will become addicted—to the point that commercial cigarettes carry a higher risk of causing addiction than heroin, cocaine, alcohol, or cannabis.<sup>20</sup> E-cigarette companies—including those that manufacture products with high levels of nicotine—are now adopting this strategy to trivialize the health risks of vapor products.<sup>21</sup>



## 4. E-cigarettes to Aid Cessation

**The Myth:** Adult smokers are using e-cigarettes to quit smoking.

**The Truth:** E-cigarettes are not an FDA-approved smoking cessation aid, and few adults use e-cigarettes to successfully quit smoking.

### Additional Information

Approved nicotine replacement drug therapies undergo rigorous evaluation to prove that they are effective in helping people quit smoking, safe to consume as labeled, and pose a low likelihood of addiction. FDA has approved nicotine patches, lozenges, and chewing gum products via this regulatory pathway. An e-cigarette manufacturer may submit its product to FDA for review and approval as a cessation aid. Meanwhile, the compelling personal stories of quitting smoking with e-cigarettes merit further research, but do not merit lax controls.

Most adult e-cigarette users also use other tobacco products (“dual use”), and dual users tend to *remain* dual users or *relapse* to exclusive cigarette smoking.<sup>22</sup> For example, in New York State, as recently as 2016, half of adult e-cigarette users continued to also smoke cigarettes, and half of the remaining e-cigarette users had never been cigarette users to begin with.<sup>23</sup> Similar findings from 2017 indicate that among all New York adults, current use of e-cigarettes was highest among current smokers (12.8 percent) compared to former smokers or those who had never smoked cigarettes.<sup>24</sup> These findings are consistent with other studies showing limited evidence that e-cigarettes are effective aides to quit smoking.<sup>25</sup> The adult smoking rate in New York State has remained stagnant since 2014, further illustrating that adults are not using e-cigarettes to quit smoking.<sup>26</sup>

Finally, preliminary evidence reveals that dual use may be even more harmful to respiratory and cardiovascular health than using any single product alone,<sup>27</sup> further weakening the case that dual use is a public health benefit representing a transition to exclusive e-cigarette use. And of course, any public health benefit of e-cigarettes to adult smokers must be weighed against the cost in terms of youth prevention. One study found that for every one cigarette smoker who quits using an e-cigarette, 81 non-smoking adolescents will initiate e-cigarette use.<sup>28</sup>

### Where did this myth come from?

Though their incentives may differ, many sectors—government, private industry, and public health alike—share an interest in technologies that help smokers to quit. While many shared the hope that e-cigarettes would be highly impactful in advancing smoking cessation, that promise has not borne out.

One study heavily contributed to the myth that e-cigarettes are an effective cessation aid. This study was conducted in the United Kingdom and included cigarette-only users with high motivation to quit—atypical of e-cigarette users in the United States.<sup>29</sup> While promising and worthy of future research, this study alone is not sufficient basis for broadly concluding that e-cigarettes are more effective smoking cessation aids than nicotine replacement therapies approved by FDA.

## 5 & 6. Who's Using *Flavored* E-cigarettes and Why

**The Myth:** Adult smokers need **FLAVORS** in their e-cigarettes to switch from smoking.

**The Truth:** Relatively few adults successfully quit smoking with e-cigarettes. For those that have, there is not enough evidence to show that flavors play a special role in their success.

**The Myth:** Flavors are not the reason that youth are interested in e-cigarettes.

**The Truth:** Adolescents consistently cite flavors as a reason for trying e-cigarettes, and most of them first experiment with a flavored product.

### Additional Information

Most New York adults are not using e-cigarettes to quit smoking. Among the minority of adults who anecdotally report quitting using e-cigarettes, evidence does not validate claims of flavors playing an outsized role in that success. The threat of relapse among former smokers who lack access to flavored e-cigarettes is another red herring, given that most adult e-cigarette users in New York State are not former smokers.<sup>30</sup> In truth, the role of flavors in aiding adult smokers to quit by using e-cigarettes is unclear<sup>31</sup> and the FDA has not formally evaluated any e-cigarette as a cessation aid. Adult e-cigarette users appear to prefer tobacco and menthol flavors, and appealing flavors is a less salient reason for their e-cigarette use in comparison to reducing harm and aiding smoking cessation.<sup>32</sup>

Meanwhile, there is clear, robust evidence that flavors attract youth to tobacco products, including e-cigarettes.<sup>33</sup> Youth e-cigarette users consistently cite flavors as a top reason for their interest in e-cigarettes, and are far more likely than adults to use flavors.<sup>34</sup> Adolescents perceive less risk from flavored e-cigarettes—especially fruity and spice flavors—and these misperceptions are linked to willingness to try these products.<sup>35</sup> Indeed, the current youth vaping epidemic is largely driven by the proliferation of kid-friendly flavors, to the point that federal, state, and local governments are moving to clear or severely limit the market of flavored e-cigarettes.<sup>36</sup>

E-cigarettes are available in tens of thousands of flavors—flavors largely approved for ingestion, but not for inhalation.<sup>37</sup> While federal government discusses, many states and localities are acting to restrict the sale of flavored tobacco products, including e-cigarettes. For more information, see our technical report, [Regulating Sales of Flavored Tobacco Products](#).

### Where did this myth come from?

E-cigarette companies vehemently oppose restricting flavored e-cigarettes because they rely on flavors to build interest in their products and win new customers (youth). For the vapor product industry, keeping flavors on the market increases their bottom line and is more important than protecting youth from a lifetime of addiction.

E-cigarette retailers and companies also claim that studies prove that flavors are not what draw youth to e-cigarettes. While curiosity is reported as the leading reason for youth trying e-

cigarettes, the survey questions do not tease out what aspect(s) of the products intrigue youth and invite this curiosity.<sup>38</sup> Flavors, which are widely available in a myriad of notoriously intriguing names, could very well play a role in triggering adolescent curiosity to try e-cigarettes. In fact, tobacco companies have a well-documented history of using flavors to target youth experimenters, compiling rich evidence along the way on how flavors in products and marketing drive youth interest and use.

## 7. Necessity of Policy Change

**The Myth: Existing laws, such as Tobacco 21, along with private policies and education are sufficient to address youth e-cigarette use.**

**The Truth:** Youth e-cigarette use is an urgent public health crisis, and state and local governments need to address this issue head on with evidence-based policies.

### Additional Information

State and local governments are charged with protecting public health, and may regulate sales of e-cigarettes alongside cigarettes and other commercial tobacco products to fill the gaps in federal regulations. In fact, states and localities have historically taken the lead on tobacco control.<sup>39</sup>

Comprehensive sales restrictions are an evidence-based strategy to reduce all tobacco use, including e-cigarette use. Local communities may decide where and how harmful products are sold, and reduce the availability and accessibility of these products to promote public health. Existing laws, private policies, and education are insufficient—more action is needed to restrict the sale of e-cigarettes.

Importantly, tobacco controls are cost-effective.<sup>40</sup> In general, the long-term benefits of preventing tobacco-related disease and deaths far outweighs any potential short-term disruption to retailers' businesses. The New York State Department of Health models this important principle with its 2019 proposal to restrict sales of e-cigarettes to protect public health, while acknowledging potential economic hardship to individual businesses.<sup>41</sup>

### Where did this myth come from?

Tobacco companies have long sought to deter meaningful policy interventions by supporting weaker measures that deflect responsibility for tobacco use away from companies and on to retailers, consumers, law enforcement, parents, and teachers. Meanwhile, companies' marketing practices drive initial use, while nicotine holds their customers hostage, depriving them of the choice to stop using tobacco products.

Evidence supports policies aimed at curbing the impact of Industry's bad practices—the heart of the problem. Yet today, e-cigarette companies and their affiliates are recycling these same arguments and pledging to support efforts that do not implicate their own conduct. For instance, companies tout initiatives focused on shifting blame to retailers (e.g., higher sales age, more age verification), consumers (e.g., penalties for underage possession, use, or purchase), law

enforcement, and even parents and teachers providing education. There is no evidence that these approaches facilitate and enable behavior change on their own. In short, these distractions are part of a coordinated effort to prevent comprehensive, sensible regulation of the e-cigarette market to improve health and safety for all.

Companies also prey on fears of economic harm to oppose government regulation. They have historically “cried wolf” at every opportunity, claiming that smoke-free laws would shutter airlines, restaurants, and bars. These myths have not become a reality. Today, companies and retailers often argue that local sales laws will just push consumers to shop for tobacco products in a neighboring town or online. However, research shows that making tobacco products less available, accessible and conspicuous translates to a reduction in tobacco use, especially among priority populations such as youth.<sup>42</sup>

To learn more about policy options for local governments, visit the “Other Tobacco Products” section of our website, including our report, [“Local Regulation of E-Cigarettes.”](#)

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<sup>1</sup> U.S. SURGEON GENERAL, *Surgeon General’s Advisory on E-cigarette Use Among Youth 1* (2018), <https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf> (last visited May 29, 2019); U.S. FOOD AND DRUG ADMINISTRATION, *FDA takes new steps to address epidemic of youth e-cigarette use, including a historic action against more than 1,300 retailers and 5 major manufacturers for their roles perpetuating youth access 1* (2018), <https://www.fda.gov/news-events/press-announcements/fda-takes-new-steps-address-epidemic-youth-e-cigarette-use-including-historic-action-against-more> (last visited Feb 4, 2020); NATIONAL INST. ON DRUG ABUSE, “Monitoring the Future Survey Results Show Alarming Rise in Teen Vaping,” (December 17, 2018) available at <https://www.drugabuse.gov/about-nida/noras-blog/2018/12/monitoring-future-survey-results-show-alarming-rise-in-teen-vaping> (last visited Feb 4, 2020).

<sup>2</sup> Teresa W. Wang et al., *Tobacco Product Use and Associated Factors Among Middle and High School Students - United States, 2019*, 68 MORB MORT WKLY REP 1–22 (2019) (noting “direct attribution of the 2019 observed increase to actual increases in product use is not possible because changes made to the 2019 survey could lead to higher estimates of use.”)

<sup>3</sup> N.Y. DEP’T. OF HEALTH, *ELECTRONIC CIGARETTE USE BY YOUTH INCREASED 160% BETWEEN 2014 AND 2018* (2019), available at [https://www.health.ny.gov/prevention/tobacco\\_control/reports/statshots/volume12/n1\\_electronic\\_sig\\_use\\_increase.pdf](https://www.health.ny.gov/prevention/tobacco_control/reports/statshots/volume12/n1_electronic_sig_use_increase.pdf) (last visited Aug 22, 2019) (reporting 27.4% of NY high school students were current ENDS users in 2018, while only 4.8% were current cigarette users and 9.2% were current users of other tobacco products).

<sup>4</sup> *Ibid.*; Andrea S. Gentzke, *Vital Signs: Tobacco Product Use Among Middle and High School Students — United States, 2011–2018*, 68 MORB MORT WKLY REP (2019).

<sup>5</sup> Thomas Eissenberg et al., *Invalidity of an Oft-Cited Estimate of the Relative Harms of Electronic Cigarettes*, 110 AM J PUBLIC HEALTH 161–162 (2020).

<sup>6</sup> THE NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, *PUBLIC HEALTH CONSEQUENCES OF E-CIGARETTES* (2018), <https://www.nap.edu/catalog/24952/public-health-consequences-of-e-cigarettes> (last visited Jun 6, 2019) [hereinafter, “NASEM REPORT”] (finding evidence that e-cigarettes emit particulate matter [Conclusion 3-1], numerous potentially toxic substances [Conclusion 5-1], contain metals [Conclusion 5-4], and formaldehyde and acrolein [Conclusion 10-4], and accordingly, long-term e-cigarette use could increase the risk of cancer and adverse reproductive outcomes [Conclusion 10-4]); Esteve Fernández et al., *Particulate Matter from Electronic Cigarettes and Conventional Cigarettes: a Systematic Review and Observational Study*, 2 CURR ENVIRON HEALTH REP 423–429 (2015).

<sup>7</sup> Vicky Yu et al., *Electronic Cigarettes Induce DNA Strand Breaks and Cell Death Independently of Nicotine in Cell Lines*, 52 ORAL ONCOL. 58–65 (2016).

- <sup>8</sup> Chad A. Lerner et al., *Vapors produced by electronic cigarettes and e-juices with flavorings induce toxicity, oxidative stress, and inflammatory response in lung epithelial cells and in mouse lung*, 10 PLOS ONE e0116732 (2015).
- <sup>9</sup> E.g. Micah G. Katz & Katie W. Russell, *Injury from E-Cigarette Explosion*, 380 N. ENGL. J. MED. 2460–2460 (2019); U.S. FOOD AND DRUG ADMINISTRATION, *Some E-cigarette Users Are Having Seizures, Most Reports Involving Youth and Young Adults* (2019), <http://www.fda.gov/tobacco-products/ctp-newsroom/some-e-cigarette-users-are-having-seizures-most-reports-involving-youth-and-young-adults> (last visited Dec 17, 2019); CTRS FOR DISEASE CONTROL AND PREVENTION, *Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products* (2019). [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html) (last visited Dec 17, 2019).
- <sup>10</sup> Opinion | Regulate E-Cigarettes, THE NEW YORK TIMES, December 20, 2013, <https://www.nytimes.com/2013/12/21/opinion/regulate-e-cigarettes.html> (last visited Dec 17, 2019).
- <sup>11</sup> David J. Nutt et al., *Estimating the harms of nicotine-containing products using the MCDA approach*, 20 EUR. ADDICT. RES. 218–225 (2014).
- <sup>12</sup> CTRS FOR DISEASE CONTROL AND PREVENTION, “Electronic Cigarettes: What’s the Bottom Line?” 3 (November 15, 2018), available at [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/pdfs/Electronic-Cigarettes-Infographic-p.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/Electronic-Cigarettes-Infographic-p.pdf) (last visited Aug 23, 2019).
- <sup>13</sup> E.g., Maciej Lukasz Goniewicz et al., *High exposure to nicotine among adolescents who use Juul and other vape pod systems (‘pods’)*, 28 TOB CONTROL 676–677 (2019); Robert K. Jackler & Divya Ramamurthi, *Nicotine arms race: JUUL and the high-nicotine product market*, 28 TOB CONTROL 623–628 (2019).
- <sup>14</sup> U.S. SURGEON GENERAL, *E-cigarettes: Know the Risks*, “Brain Risks” (2019), available at <https://e-cigarettes.surgeongeneral.gov/knowtherisks.html> (last visited Dec 17, 2019).
- <sup>15</sup> Menglu Yuan et al., *Nicotine and the adolescent brain*, 593 J. PHYSIOL. 3397–3412 (2015); Eric R. Kandel & Denise B. Kandel, *A Molecular Basis for Nicotine as a Gateway Drug*, 371 N ENGL J MED 932–943 (2014).
- <sup>16</sup> NASEM REPORT, *supra* note 6 at SA1-2 (“There is substantial evidence that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.”).
- <sup>17</sup> Aseem Mishra et al., *Harmful effects of nicotine*, 36 INDIAN J. MED. PAEDIATR. ONCOL. OFF. J. INDIAN SOC. MED. PAEDIATR. ONCOL. 24–31 (2015).
- <sup>18</sup> See CAMPAIGN FOR TOBACCO-FREE KIDS, “Designed for Addiction: How the Tobacco Industry Has Made Cigarettes More Addictive, More Attractive to Kids and Even More Deadly,” 11 (June 2014) [https://www.tobaccofreekids.org/press-releases/2014\\_06\\_23\\_report](https://www.tobaccofreekids.org/press-releases/2014_06_23_report).
- <sup>19</sup> Rachel Becker, *Why Big Tobacco and Big Vape love comparing nicotine to caffeine*, THE VERGE (2019), <https://www.theverge.com/2019/4/26/18513312/vape-tobacco-big-companies-nicotine-caffeine-comparison-drugs-chemicals> (last visited Feb 4, 2020).
- <sup>20</sup> CAMPAIGN FOR TOBACCO-FREE KIDS, *supra* note 18 at 11.
- <sup>21</sup> Becker, *supra* note 19.
- <sup>22</sup> See Megan E. Piper et al., *Changes in Use Patterns OVER ONE YEAR Among Smokers and Dual Users of Combustible and electronic cigarettes*, NICOTINE TOB. RES. (2019) (finding that the vast majority baseline dual users were after one year either exclusive cigarette smokers or remained dual users).
- <sup>23</sup> S. Sean Hu, *State-Specific Patterns of Cigarette Smoking, Smokeless Tobacco Use, and E-Cigarette Use Among Adults — United States, 2016*, 16 PREV. CHRONIC DIS. (2019).
- <sup>24</sup> N.Y. DEP’T OF HEALTH, BRFSS Brief Number 2020-01, 3 (2020), available at [https://www.health.ny.gov/statistics/brfss/reports/docs/2020-01\\_brfss\\_electronic\\_cigarette.pdf](https://www.health.ny.gov/statistics/brfss/reports/docs/2020-01_brfss_electronic_cigarette.pdf) (last visited Jan 15, 2020).
- <sup>25</sup> NASEM REPORT, *supra* note 6 (Conclusion 17-1).
- <sup>26</sup> N.Y. DEP’T OF HEALTH, BRFSS Brief Number 1910, 2 (2019), available at [https://www.health.ny.gov/statistics/brfss/reports/docs/1910\\_brfss\\_smoking.pdf](https://www.health.ny.gov/statistics/brfss/reports/docs/1910_brfss_smoking.pdf) (last visited Feb 4, 2020).
- <sup>27</sup> Maciej L. Goniewicz et al., *Comparison of Nicotine and Toxicant Exposure in Users of Electronic Cigarettes and Combustible Cigarettes*, 1 JAMA NETW. OPEN e185937–e185937 (2018); Talal Alzahrani et al., *Association Between Electronic Cigarette Use and Myocardial Infarction*, 55 AM. J. PREV. MED. 455–461 (2018); Dharma N. Bhatta & Stanton A. Glantz, *Association of E-Cigarette Use With Respiratory Disease Among Adults: A Longitudinal Analysis*, 58 AM. J. OF PREV. MED. 182–190 (2020).



- <sup>28</sup> Samir S. Soneji et al., *Quantifying population-level health benefits and harms of e-cigarette use in the United States*, 13 PLOS ONE e0193328 (2018).
- <sup>29</sup> Peter Hajek et al., *A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy*, 380 N ENGL J MED 629–637 (2019).
- <sup>30</sup> S. Sean Hu, *State-Specific Patterns of Cigarette Smoking, Smokeless Tobacco Use, and E-Cigarette Use Among Adults — United States, 2016*, 16 PREV. CHRONIC DIS. (2019).
- <sup>31</sup> U.S. FOOD AND DRUG ADMINISTRATION, REGULATION OF FLAVORS IN TOBACCO PRODUCTS (Advance notice of proposed rulemaking), 12298 (March 21, 2018), <https://www.federalregister.gov/d/2018-05655/p-42> (last visited Aug 23, 2019); see John Buckell, Joachim Marti & Jody L. Sindelar, *Should flavours be banned in cigarettes and e-cigarettes? Evidence on adult smokers and recent quitters from a discrete choice experiment*, 28 TOB. CONTROL 168–175 (2019) (“adult smokers prefer, from most to least: tobacco, fruit/sweet, and menthol e-cigarette flavours”); see also DONALD S KENKEL ET AL., *Mostly Harmless Regulation? Electronic Cigarettes, Public Policy and Consumer Welfare* (2017), <http://www.nber.org/papers/w23710> (last visited Mar 15, 2019) (“while flavors increase utility on average, they decrease utility for 35 percent of the sample”); see also Carla J Berg, *Preferred Flavors and Reasons for E-cigarette Use and Discontinued Use Among Never, Current, and Former Smokers*, 61 INT. J. PUB. HEALTH 225–236 (2016) (finding smokers most likely to report using tobacco-flavored e-liquids).
- <sup>32</sup> Samir S. Soneji, Kristin E. Knutzen & Andrea C. Villanti, *Use of Flavored E-Cigarettes Among Adolescents, Young Adults, and Older Adults: Findings From the Population Assessment for Tobacco and Health Study*, 134 PUB HEALTH REP 282–292 (2019); Minal Patel et al., *JUUL use and reasons for initiation among adult tobacco users*, 28 TOB. CONTROL 681–684 (2019).
- <sup>33</sup> U.S. DEP’T HEALTH & HUMAN SERVS., E-CIGARETTE USE AMONG YOUTH AND YOUNG ADULTS: A REPORT OF THE SURGEON GENERAL 11 (2016), [https://e-cigarettes.surgeongeneral.gov/documents/2016\\_SGR\\_Full\\_Report\\_508.pdf](https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_Full_Report_508.pdf); U.S. DEP’T OF HEALTH AND HUMAN SERVICES, THE HEALTH CONSEQUENCES OF SMOKING--50 YEARS OF PROGRESS: A REPORT OF THE SURGEON GENERAL 782 (2014) (finding “smokeless tobacco products were designed with...flavor characteristics targeted...for initiation by youth” and that menthol in cigarettes contributes to smoking initiation); U.S. DEP’T OF HEALTH AND HUMAN SERVICES, PREVENTING TOBACCO USE AMONG YOUTH AND YOUNG ADULTS: A REPORT OF THE SURGEON GENERAL 541 (2012) [hereinafter 2012 SURGEON GENERAL REPORT] (finding tobacco companies historically manipulated product design, including through addition of flavors at specific levels, to attract new customers and promote a graduation strategy to unflavored cigarettes, “a practice which the industry has continued”).
- <sup>34</sup> Sarah D. Kowitt et al., *Perceptions and Experiences with Flavored Non-Menthol Tobacco Products: A Systematic Review of Qualitative Studies*, 14 INT. J. ENVIRON. RES. PUBLIC HEALTH, 14 (2017), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409539/> (last visited Aug 1, 2019); Deesha Patel et al., *Reasons for current E-cigarette use among U.S. adults*, 93 PREV. MED. 14–20 (2016).
- <sup>35</sup> Amy Henes, et al., *Evaluation Findings: 2019 E-cigarette Studies*, RESEARCH TRIANGLE INTERNATIONAL [presentation] (November 19, 2019), on file with author.
- <sup>36</sup> U.S. FOOD AND DRUG ADMINISTRATION, “FDA advances investigation into whether more than 40 e-cigarette products are being illegally marketed and outside agency’s compliance policy,” (October 12, 2018) available at <https://www.fda.gov/news-events/press-announcements/fda-advances-investigation-whether-more-40-e-cigarette-products-are-being-illegally-marketed-and> (last visited Feb 4, 2020).
- <sup>37</sup> Clara G. Sears et al., *Generally Recognized as Safe: Uncertainty Surrounding E-Cigarette Flavoring Safety*, 14 INT. J. ENVIRON. RES. PUBLIC HEALTH 1274 (2017).
- <sup>38</sup> Wang et al., *supra* note 2.
- <sup>39</sup> Micah L. Berman, *The Faltering Promise of FDA Tobacco Regulation*, 12 SAINT LOUIS UNIV. J. OF HEALTH LAW & POLICY, 155-164 (2019).
- <sup>40</sup> Teresa Leão, Anton E Kunst & Julian Perelman, *Cost-effectiveness of tobacco control policies and programmes targeting adolescents: a systematic review*, 28 EUR. J. PUBLIC HEALTH 39–43 (2018).
- <sup>41</sup> N.Y. DEP’T OF HEALTH, “Proposed Rulemaking: Prohibition on the Sale of Electronic Liquids with Characterizing Flavors” (I.D. No. HLT-53-19-00001-P), 27-28 (New York State Register), Dec. 31, 2019.
- <sup>42</sup> 2012 SURGEON GENERAL REPORT, *supra* note 33 at 508; see also PUBLIC HEALTH & TOB POL CTR, “Tobacco Retail Licensing: Promoting Health Through Local Sales Regulations,” (June 2018) available at <https://tobaccopolicycenter.org/documents/TobaccoRetailLicensing.pdf> (last visited Feb 4, 2020).