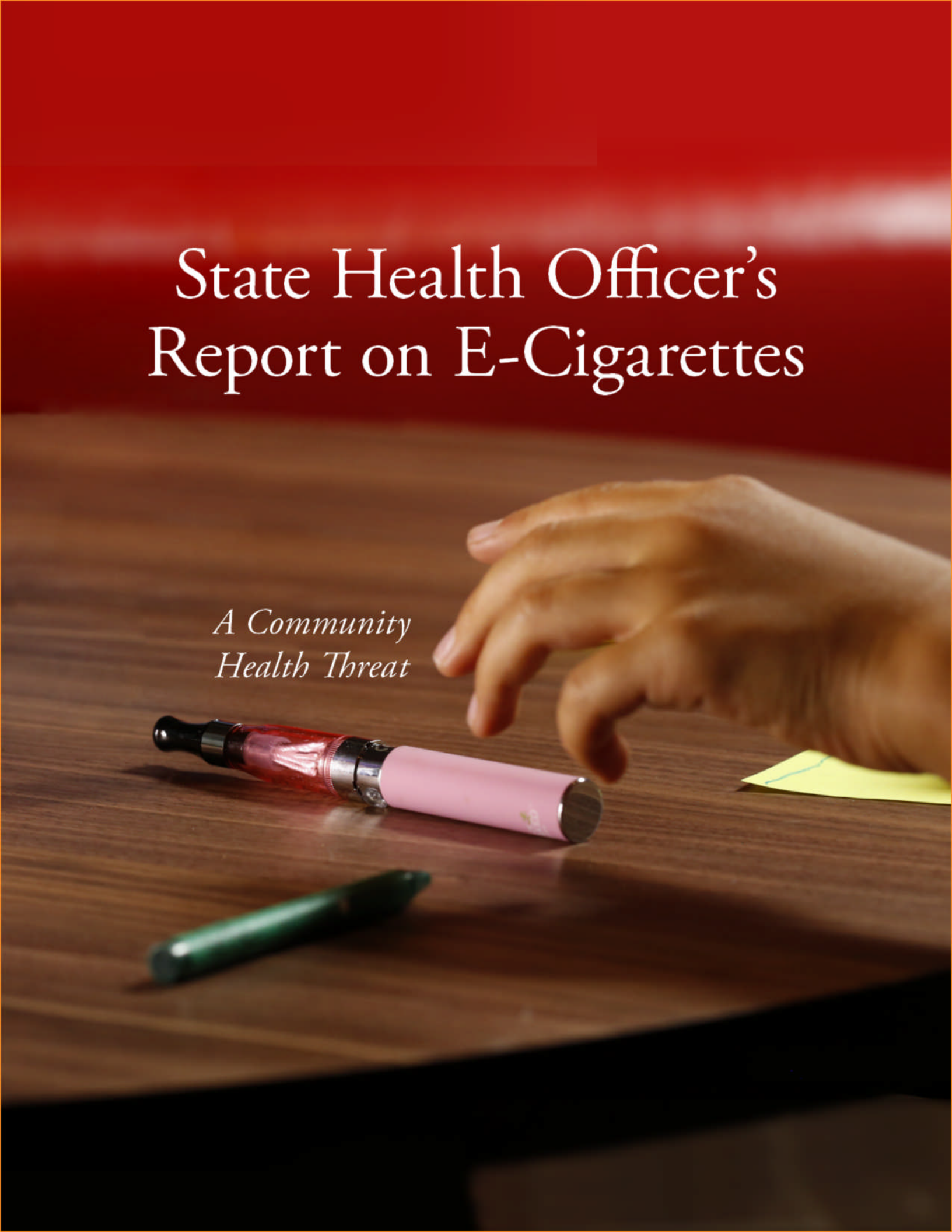
State Health Officer's Report on E-Cigarettes

A Community Health Threat



State Health Officer's Report on E-Cigarettes

A Community Health Threat

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California Tobacco Control Program

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Introduction from the State Health O cer

Ron Chapman, MD, MPH
CDPH Director and State Health O cer

As the California Department of Public Health (CDPH) Director and State Health O cer, I am pleased to present CDPH's second issue of the State Health O cer's Report which focuses on electronic cigarettes (e-cigarettes). While there is still much to be learned about the individual and public health impact of e-cigarette use, this report provides factual information about e-cigarettes, the marketing of these products, and the public health concerns related to their use. It outlines a number of steps to protect children from nicotine poisoning, adolescents from nicotine addiction, and non-users from exposure to the toxic aerosol emitted from e-cigarettes.

As the State Health O cer, of particular concern to me is the impact of e-cigarettes on the health and safety of children, teens, and young adults. e availability of e-cigarettes in a variety of candy and fruit avors such as cotton candy, gummy bear, chocolate mint, and grape makes these products highly appealing to young children and teens. e use of marketing terms such as "e-juice" may further mislead consumers into believing that these products are harmless and safe for consumption.

Among children ages 0 to 5 years old, e-cigarette poisonings increased sharply from 7 in 2012 to 154 in 2014. By the end of 2014, e-cigarette poisonings to young children tripled in one year, making up more than 60 percent of all e-cigarette poisoning calls.

E-cigarette use is rapidly rising among teens and young adults. Nationally, the use of e cigarettes by high school students tripled in just two years and e-cigarette use by teens now surpasses the use of traditional cigarettes. With this age group the long-term impact that nicotine has on adolescent brain development is of particular concern. In California, use among young adults ages 18 to 29 tripled in one year. While the long term health impact resulting from use of this product by this population is presently unknown – it is known that e-cigarettes emit at least 10 chemicals that are found on California's Proposition 65 list of chemicals known to cause cancer, birth defects, or other reproductive harm. Comprehensive steps taken now can prevent a new generation of young people from becoming addicted to nicotine, avoid future health disparities and avert an unraveling of California's approximately $2 billion, 25-year investment in public health e orts to prevent and reduce tobacco use in California.

is report highlights several steps to address the health and safety issues related to e-cigarette use. First and foremost, education is needed to counter the marketing of e-cigarettes which is often misleading and highly appealing to teens. Second, there is a need to treat e-cigarettes in a comprehensive manner

that is consistent with how we approach traditional cigarettes. Existing laws that currently protect minors and the general public from traditional tobacco products should be extended to cover e-cigarettes. ird, immediate action is needed to protect children and workers from the toxicity associated with unintentional exposure and handling of e-liquid and the toxic aerosol emitted from e-cigarettes.

I trust that this report provides you with new information and that you will join me in this e ort to protect our communities.

Sincerely,

Ron Chapman, MD, MPH
CDPH Director and State Health O cer

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Executive Summary

While there is still much to be learned about the ingredients and the long-term health impacts of e-cigarettes, this report provides Californians with information on e-cigarette use, public health concerns related to e-cigarettes, and steps that can be taken to address the growing use of these products. The following are key highlights from the report:

E-Cigarette Use

- In 2014, teen use of e-cigarettes surpassed the use of traditional cigarettes for the first time, with more than twice as many 8th and 10th graders reporting using e-cigarettes than traditional cigarettes. Among 12th graders, 17 percent reported currently using e-cigarettes vs. 14 percent using traditional cigarettes.
- In California, adults using e-cigarettes in the past 30 days doubled from 1.8 percent in 2012 to 3.5 percent in 2013. For younger adults (18 to 29 years old), e-cigarette use tripled in only one year from 2.3 percent to 7.6 percent.
- Young adults are three times more likely to use e-cigarettes than those 30 and older.
- Nearly 20 percent of young adult e-cigarette users in California have never smoked traditional cigarettes.

Health Effects of E-Cigarettes

- E-cigarettes contain nicotine, a highly addictive neurotoxin.
- Exposure to nicotine during adolescence can harm brain development and predispose youth to future tobacco use.
- E-cigarettes do not emit water vapor, but a concoction of chemicals toxic to human cells in the form of an aerosol. The chemicals in the aerosol travel through the circulatory system to the brain and all organs.
- Mainstream and secondhand e-cigarette aerosol has been found to contain at least ten chemicals that are on California's Proposition 65 list of chemicals known to cause cancer, birth defects, or other reproductive harm.

Heightened Concern for Youth

- The variety of fruit and candy flavored e-cigarettes entice small children who may accidently ingest them. Even a fraction of e-liquid may be lethal to a small child.
- E-cigarette cartridges often leak and are not equipped with child-resistant caps, creating a potential source of poisoning through ingestion and skin or eye contact.
- Calls to poison control centers in California and the rest of the U.S. have risen significantly for both adults and children accidently exposed to e-liquids.
- In California, the number of calls to the poison control center involving e-cigarette exposures in children five and under tripled in one year.

Harm Reduction Claims and Myths

- There is no scientific evidence that e-cigarettes help smokers successfully quit traditional cigarettes.
- E-cigarette users are no more likely to quit than regular smokers, with one study finding 89 percent of e-cigarette users still using them one year later. Another study found that e-cigarette users are a third less likely to quit cigarettes.

Unrestricted Marketing

- In three years, the amount of money spent on advertising e-cigarettes increased more than 1,200 percent.
- E-cigarette advertisements (ads) are on television (TV) and radio where tobacco ads were banned more than 40 years ago. Most of the methods being used today by e-cigarette companies were used long ago by tobacco companies to market traditional cigarettes to kids.
- Many ads state that e-cigarettes are a way to get around smoking bans, which undermines smoke free social norms. Various tactics and claims are also used to imply that these products are safe.
- The fact that e-cigarettes contain nicotine, which is highly addictive, is not typically included in e-cigarette advertising.

In Conclusion

California has been a leader in tobacco use prevention and cessation for over 25 years, with one of the lowest youth smoking rates in the nation. The promotion and increasing use of e-cigarettes threaten California's progress. These data suggest that a new generation of young people will become addicted to nicotine, accidental poisonings of children will continue, and involuntary exposure to secondhand aerosol emissions will impact the public's health if e-cigarette marketing, sales and use continue without restriction. Additionally, without action, it is likely that California's more than two decades of progress to prevent and reduce traditional tobacco use will erode as e-cigarettes re-normalize smoking behavior.

The Problem: E-cigarettes

E-cigarettes are battery-operated devices, often designed to resemble cigarettes, which deliver a nicotine containing aerosol, not just water vapor. E-cigarettes have many names, especially among youth and young adults, such as e-cigs, e-hookahs, hookah pens, vapes, vape pens, vape pipes, or mods.

E-cigarettes were first introduced in the U.S. in 2007 and have skyrocketed in popularity, availability, and variety. From disposable and rechargeable e-cigarettes to "tank systems" that can hold a large volume of a liquid solution (e-liquid), customers can modify e-cigarettes in many ways.[1]

A Significant Public Health Concern

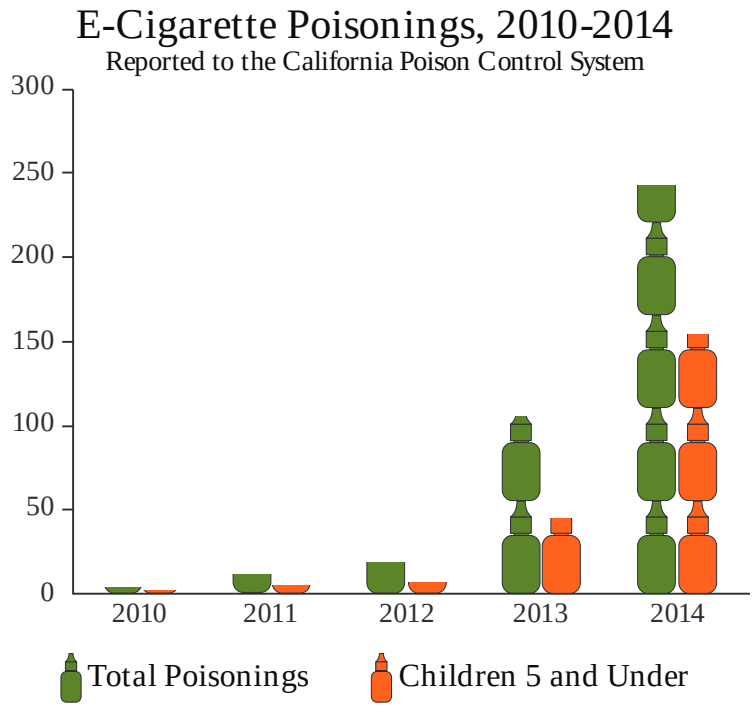
Unlike traditional cigarettes where the tobacco leaf is burned and the resulting smoke inhaled, e-cigarettes heat e-liquid that generally contains nicotine, flavorings, additives, and propylene glycol. The heated e-liquid forms an aerosol, not just water vapor, that is inhaled by the user. The aerosol has been found to contain toxic chemicals like formaldehyde, lead, nickel, and acetaldehyde all of which are found on California's Proposition 65 list of chemicals known to cause cancer, birth defects, and other reproductive harm.[2-4] These chemicals travel through the circulatory system to the brain and all organs. The aerosol also contains high concentrations of ultrafine particles that are inhaled and become trapped in the lungs.[5]

E-liquids are available in thousands of candy and fruit flavors, including bubble gum, cherry and chocolate, which are especially appealing to youth and small children who may accidently ingest them. Even a small amount of e-liquid may be lethal to a small child.[6] In addition, e-cigarette cartridges often leak and are not equipped with child-resistant caps, creating a potential source of poisoning through ingestion and skin or eye contact.

There has been a significant rise in the number of calls to poison control centers in California and nationally for both adults and children who were accidently exposed to e-liquids, many of whom are children aged five and under.[7] Nationally, the number of calls rose from one per month in September 2010 to 215 per month in February 2014.[8] In California, from 2012 to 2013, the number of calls to the poison control center involving e-cigarette exposures in children ages five and under increased sharply from 7 to 154. By the end of 2014, e-cigarette poisonings to young children tripled in one year, making up more than 60% of all e-cigarette poisoning calls (see Figure 1). Adults have also mistakenly used e-liquid in harmful ways, such as eye drops, and have been harmed by exploding cartridges and burning batteries.

School and law enforcement officials have reported that e-cigarette devices are also used to inhale illegal substances, such as marijuana and hash oil.[6] Because many of these devices are similar in appearance to a ball point pen, school and law enforcement personnel are not aware that inappropriate use of nicotine and illegal substances is occurring.

Figure 1



California Poison Control Sytem, San Diego, CA, Jan. 2015

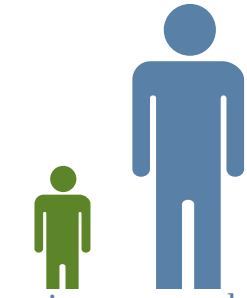
Despite the lack of manufacturing standards, quality control, and external oversight by a federal regulatory agency of e-cigarettes, they are heavily marketed, widely available, and a signi□cant public health concern.

E-Cigarette Use by Youth

Aggressive marketing has led to an increase in e-cigarette use and experimentation by youth. Many are concerned that e-cigarettes are a gateway to using traditional cigarettes.[9] Research suggests that kids who may have otherwise never smoked cigarettes are now becoming addicted to nicotine through the use of e-cigarettes and other e-products.[9] An analysis of the 2011-2012 National Youth Tobacco Survey (NYTS) found that adolescents who used e-cigarettes were more likely to progress from experimenting with traditional cigarettes to becoming established smokers and were less likely to quit.[9]

In 2014, for the □rst time ever, teen use of e-cigarettes surpassed the use of traditional cigarettes. □ e Monitoring the Future study, which tracks substance abuse trends among 40,000 youth nationally, found that among 8th and 10th graders, current e-cigarette use was double that of traditional cigarettes (8.7 percent vs. 4 percent for 8th graders and 16.2 percent vs. 7.2 percent for 10th graders). Among 12th graders, 17.1 percent reported current e-cigarette use vs. 13.6 percent traditional cigarette use.[10] □ is 2014 □nding that e-cigarette use exceeds traditional cigarette use among teens comes on the heels of the 2013 NYTS which found that e-cigarette use tripled among high school students, increasing from 1.5 percent in 2011 to 4.5 percent in 2013.[11] An analysis of the 2011- 2013 NYTS also reported that more than a quarter million youth who had never smoked a traditional cigarette used e-cigarettes in 2013, a three-fold increase since 2011, and that youth who had used e-cigarettes were nearly twice as likely to try traditional cigarettes as those who never used e-cigarettes.[12]

In California, preliminary data of more than 430,000 middle and high school students from the California Healthy Kids Survey found that in 2013, 6.3 percent of 7th graders, 12.4 percent of 9th graders, and 14.3 percent of

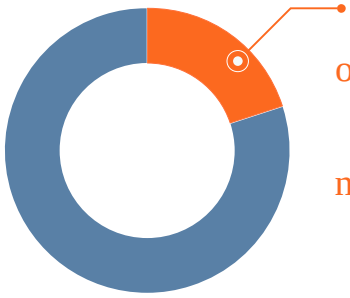


e-cigarette use has **tripled** among high school students

11th graders had used e-cigarettes in the past 30 days. In all instances, California teens were found to use e-cigarettes at much higher rates than traditional cigarettes. □ e survey data also show that 11.4 percent of 7th graders, 23.6 percent of 9th graders, and 29.3 percent of 11th graders have ever tried e-cigarettes.[13] While the California Healthy Kids Survey is not representative of all California youth, the large sample size and consistency with the recent national data and data from other U.S. states, speci□cally Minnesota and Hawaii, suggest that California youth are experimenting with e-cigarettes at a rapidly increasing rate.[14, 15]

E-Cigarette Use by Adults

Nationally, 8.1 percent of adults have tried e-cigarettes while 1.4 percent were current users in 2012.[16] New California data shows that adults using e-cigarettes in the past 30 days also doubled from 1.8 percent in 2012 to 3.5 percent in 2013. For young adults (18 to 29 year old), e-cigarette use tripled in only one year from 2.3 percent to 7.6 percent. Young adults are three times more likely to use e-cigarettes than those 30 and older. Nearly 20 percent of young adult e-cigarette users have never smoked traditional cigarettes.[17]



20% of young adult e-cigarette users have never smoked traditional cigarettes

Health E□ects of Nicotine

In 1990, the O□ce of Environmental Health Hazard Assessment of the California Environmental Protection Agency added nicotine to the Proposition 65 list of chemicals known to cause cancer, birth defects, or reproductive harm.[4]

Nicotine is a highly addictive neurotoxin, proven as addictive as heroin and cocaine.[18] Nicotine a□ects the cardiovascular and central nervous systems, causing blood vessels to constrict, raising the pulse and blood pressure.[19] Nicotine adversely a□ects maternal and fetal health during pregnancy, contributing to low birth weight, preterm delivery, and stillbirth.[20] Nicotine is also known to cross the placenta and is detectable in the breast milk of smoking mothers as well as mothers exposed to secondhand smoke.[21, 22]

Preliminary studies have shown that using a nicotine-containing e-cigarette for just □ve minutes causes similar lung irritation, in□ammation, and e□ect on blood vessels as smoking a traditional cigarette, which may increase the risk of a heart attack.[1, 23]

Adolescents are especially sensitive to the e□ects of nicotine and are likely to underestimate its addictiveness. Research shows that adolescent smokers report some symptoms of dependence even at low levels of cigarette consumption.[25]

Adolescents are still going through critical periods of brain growth and development and are especially vulnerable to the toxic e□ects of nicotine. Exposure to nicotine during adolescence can harm brain development and a□ect future tobacco use and smoking-related harms.[20, 24, 25] Even a brief period of continuous or intermittent nicotine exposure in adolescence elicits lasting neurobehavioral damage.[26]

Exposure to Secondhand Aerosol

While e-cigarettes pollute the air less than traditional cigarettes, contrary to popular belief, e-cigarettes do not emit a harmless water vapor, but a concoction of chemicals toxic to human cells in the form of an aerosol. Vapors are purely gases, whereas aerosols also contain particulate matter.[5]

Although several studies have found lower levels of carcinogens in e-cigarette aerosol compared to smoke emitted by traditional cigarettes, the mainstream and secondhand e-cigarette aerosol has been found to contain at least ten chemicals that are on California's list of chemicals known to cause cancer, birth defects, or other reproductive harm, including acetaldehyde, benzene, cadmium, formaldehyde, isoprene, lead, nickel, nicotine, N nitrosonornicotine, and toluene.[1-3, 27] □ ere is also evidence that e-cigarette aerosol contains propylene glycol and higher levels of other toxicants including heavy metals (tin, nickel) and silicate nanoparticles than are present in traditional cigarettes.[3]

Overall, research con□rms that e-cigarettes are not emission-free and their pollutants could be of health concern for both users and those exposed to the secondhand aerosol. Although it may not be as dangerous as secondhand smoke from cigarettes, people passively exposed to e-cigarette aerosol absorb nicotine at levels comparable to passive smokers.[28] □ ey are also exposed to volatile organic compounds (VOCs) and □ne/ultra□ne particles.[27] □ ese ultra□ne particles can travel deep into the lungs and lead to tissue in□ammation.[23]

Harm Reduction Claims and Myths about Cessation

Despite numerous claims, the e□ectiveness of e-cigarettes as cessation aids has not been proven. Unlike the U.S. Food and Drug Administration (FDA)-approved nicotine replacement therapies, e-cigarettes are not FDA-approved cessation aids. □ ere is no scienti□c evidence that e-cigarettes help smokers successfully quit traditional cigarettes or that they reduce their consumption.[9, 29]

A number of recent studies have shown that e-cigarette users are no more likely to quit than regular smokers, with one study □nding that 89 percent of e-cigarette users are still using them one year later.[30] Another study found that e-cigarette users are a third less likely to quit cigarettes, suggesting that e-cigarettes inhibit people from successfully kicking their nicotine addiction.[31, 32]

89%

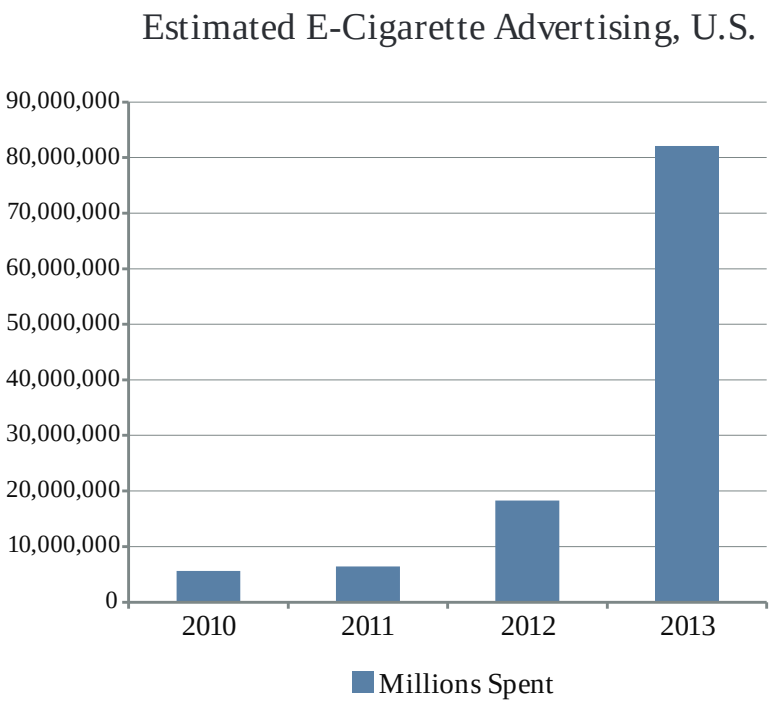
of e-cigarette users are still using them one year later

In addition, dual use of cigarettes and e-cigarettes is continuing to rise, which may diminish any potential bene□ts of cutting back on traditional cigarettes.[33] Continuing to smoke traditional cigarettes, while also using e-cigarettes, does not reduce cardiovascular health risks.[1, 34, 35]

Unrestricted Marketing

In just three years, the amount of money spent on advertising e-cigarettes increased more than 1,200 percent or 12-fold (Figure 2).[36, 37] E-cigarette ads are found in all forms of media, including TV and radio where cigarette ads were banned more than 40 years ago.

Figure 2



Sources:
2010 and 2013 estimates from: Kantar Media Intelligence e-cigarette competitive spend data as reported in Legacy, 'Vaporized: E-Cigarettes, Advertising, and Youth',□(2014).
□
2011 and 2012 estimates from: A. E. Kim, K. Y. Arnold, and O. Makarenko, 'E-Cigarette Advertising Expenditures in the U.S., 2011-2012', Am J Prev Med, 46 (2014), 409-12.

Many TV networks with a substantial proportion of youth viewers, are airing e-cigarette TV advertising. E-cigarette ads have appeared on highly viewed broadcasts, including the 2013 and 2014 Super Bowls, which had more than 110 million viewers.[38, 37]

In addition to TV, e-cigarette ads are on the radio, magazines, newspapers, online, and in retail stores. In Style, Us Weekly, Star, Entertainment Weekly and Rolling Stone are some of the tabloids and magazines with e-cigarette ads reaching millions of youth and young adults.[38, 39] Manufacturers are also promoting their products on social media sites (Facebook, Instagram, YouTube and Twitter), which are heavily used by youth and young adults, and sponsoring sports, music, and cultural events in California where free samples may also be provided.[37]

Most of the e-cigarette marketing tactics were previously used by tobacco companies to market traditional cigarettes to kids, such as featuring celebrities.[39] Advertising appeals include rebelliousness, sexual appeal, glamour, trendy and fun—all of which strongly resonate with youth who have a desire to be cool and □t in. Cartoon characters, which are also prohibited in traditional cigarette advertising for their youth appeal, are used by some brands and there are numerous youth oriented designs for e-cigarette products, including “Hello Kitty.”

Many ads state that e-cigarettes are a way to get around smoking bans, which undermines social norms and entices young people to disregard laws established for traditional cigarettes.

Another tactic used to imply the safety of these products is that the e-liquid containing nicotine is typically labeled as "e-juice" and promoted in candy and fruit flavors, such as cotton candy, gummy bear, chocolate mint, watermelon, and grape. The fact that e-cigarettes contain nicotine is downplayed in e-cigarette advertising. Younger adults and youth who are experimenting with these products may not realize that e-juice contains the highly addictive chemical nicotine, and that the products are classified as a tobacco product.

e-liquid

The leading e-cigarette brands have taken the position that their products should not be sold or marketed to youth, but advertising industry data revealed that 73 percent of 12-17 year olds were exposed to e-cigarette advertising from Blu, the most heavily advertised e-cigarette brand.[38]

73%
of 12-17 year olds were exposed to e-cigarette advertising

All of the major tobacco companies now own e-cigarette brands and the amount of e-cigarette advertising is expected to skyrocket. The two biggest tobacco companies, R.J. Reynolds (Camel brand) and Altria (Marlboro brand), launched their own e-cigarette brands nationally in late June and early July 2014. They join Lorillard, the third biggest tobacco company, already in the market with Blu e-cigarettes for the last few years. Other types of e-cigarette-like products can also be expected from the major tobacco companies, such as the recent news by Philip Morris International to test and launch an e-cigarette device that heats tobacco leaf instead of a liquid.[40]

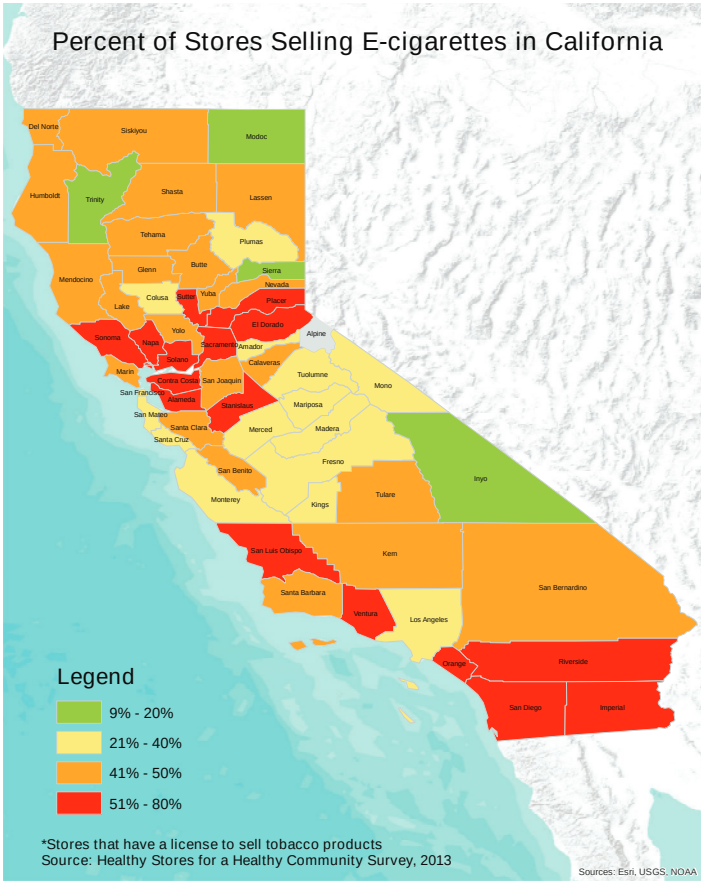
Where E-Cigarettes are Sold in California

E-cigarettes are readily available throughout California, and the number of stores selling e-cigarettes quadrupled in a two-year period, from 2011 to 2013. A survey of over 7,000 retail stores conducted in 2013 showed that 46 percent of retail stores that sold tobacco also sold e-cigarettes in California.[41] In 2011, only 12 percent of stores sold e-cigarettes.[42]

The map of where e-cigarettes are sold in California shows that counties around the Bay Area, Sacramento and San Diego have a higher percentage of stores selling e-cigarettes than the statewide average of 46 percent and many are equal to the state average (Figure 3).

Tobacco companies have historically enlisted convenience stores, the type of store most frequented by youth, as their most important partners in marketing tobacco products and opposing policies that reduce tobacco use.[43] More than 60 percent of convenience stores sold e-cigarettes in 2013, with almost one third selling e-cigarettes near candy, ice cream, or slushie/soda machines. Drug stores and pharmacies (other than CVS Pharmacy which will no longer sell tobacco as of October 2014), which people visit to improve their health, are also selling e-cigarettes at a rate higher than the state average (56 percent vs. 44 percent), with 88 percent of those stores placing e-cigarettes visibly in the main check-out area.[41]

Figure 3



Local E□orts

While the FDA has proposed a rule that would provide limited regulation of e-cigarettes, the FDA does not have the authority to regulate "where" e-cigarettes may be used. □ us, the responsibility lies with states and local governments to implement restrictions that protect youth, workers, and the public from exposure to e-cigarette aerosol emissions.

Given that much of e-cigarette marketing focuses on the users' ability to circumvent smoke-free laws and "smoke anywhere," local communities play a critical role in protecting nonsmokers and youth from the secondhand exposure to the e-cigarette aerosol.

Many California cities and counties are taking steps to treat e-cigarettes the same as cigarettes and other tobacco products. To date, more than one hundred cities and counties in California have passed policies regulating the use of e-cigarettes in their jurisdictions, some requiring retailers to obtain a license to sell e-cigarettes, while others prohibit the use of e-cigarettes in indoor and/or outdoor areas, including in multi-unit housing complexes.[44]

Summary of FDA Proposed Regulation

In 2011 the U.S. Court of Appeals determined that e-cigarettes may not be regulated by the FDA as a drug or medical device, but may be regulated as a tobacco product under the Family Smoking Prevention and Tobacco Control Act of 2009.[45] As described below, on April 24, 2014, the FDA released its proposed deeming rule to regulate the sale and distribution of e-cigarettes.[46] The proposed rule is limited in scope and may take several years to be finalized and even longer to be implemented. As written now, the proposed rule would:

E-cigarette samples provided at an event.

- Prohibit the sales of e-cigarettes to anyone under the age of 18 nationally
- Restrict vending machines to adult-only facilities
- Prohibit free samples
- Require a nicotine health warning statement on packaging and in advertisements
- Require all manufacturers to register their e-cigarette product with the FDA
- Require ingredients to be disclosed
- Allow the FDA to review any new or changed products before being sold
- Require manufacturers to show scientific evidence to support a claim that an e-cigarette product is less harmful and demonstrate the overall public health benefit

E-cigarette sponsorship of events and samples.

Public Education Campaign on E-Cigarettes

As the State of California Health O cer, and in the face of public health and safety concerns, aggressive e-cigarette marketing, and increasing number of e-cigarette users, I am announcing the intentions of CDPH to launch an educational campaign to inform the public about the dangers of e-cigarettes. e campaign will include:

- Partnering with the public health, medical, and child care communities: CDPH will disseminate information to the public health, medical, and child care communities to increase awareness about the known toxicity of e-cigarettes and the high risk of poisonings, especially to children. We will continue to promote and support the use of proven e ective cessation therapies.
- e launch of a media and public education campaign: California was the rst state in the nation to comprehensively address smoking in 1990, including a bold public education campaign. We must do the same today to address the proliferation of e-cigarette marketing and products.
- Joining with the California Department of Education (CDE) and school o cials: e Department will work with CDE and school o cials to assist in providing accurate information to parents, school administrators, and students on the dangers of e-cigarettes.

Conclusion

The facts outlined in this report indicate a high need to educate the public regarding safety concerns associated with e-cigarettes. These devices pose a poisoning hazard, particularly for children, but also for adults who may confuse e-liquid bottles with other products. The nicotine in e-cigarettes has lasting health implications to the brain development of teens and young adults, and there are indications that chemicals in e-liquids may pose a respiratory hazard to users and to those exposed to the aerosol emitted from these devices. Furthermore, there are worker safety and biohazard concerns regarding the conditions under which e-liquids are mixed and how materials are disposed. Increasingly, there are reports from schools and law enforcement agencies about the use of these e-cigarettes for other illicit substances.

The adverse health effects of e-cigarettes and their by-products make it clear that these products should be strictly regulated. Restrictions on marketing to youth and access by youth, protections to prevent poisonings—particularly among children—and education of the public on the dangers of e-cigarettes are important measures to take to address this growing public health threat.

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