US Tobacco 21 is Paving the Way for a Tobacco Endgame

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ABSTRACT

The battle against tobacco usage is being fought on all fronts. On December 19, 2019, a measure to raise the minimum age to buy tobacco products to 21 from 18 was passed by the United States Congress and signed by President Donald Trump. This instated banning the sale of all tobacco products and electronic cigarettes to anyone in the US under the age of 21. This follows the raising of the age to buy tobacco in California to 21 in 2016. According to the California Tobacco Control Program: in 2016, roughly 10% of high-school students were smoking cigarettes, but by 2018, only 2%. The percentage of retailers selling tobacco to underaged youth dropped dramatically. These data show that the CA Tobacco 21 law was effective in decreasing the obtainability and usage of tobacco by youth. We expect that US Tobacco 21 will be similarly effective in reducing tobacco use by youth leading to less tobacco addiction in the US.

KEYWORDS: Tobacco 21, nicotine, vaping, policy

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Introduction

According to the CDC, in 2019, nearly 14 of every 100 US adults aged 18 years or older (14%) currently smoked cigarettes, while more than 16 million Americans live with a smoking-related disease.[1] About 2 of every 100 middle-school students reported smoking cigarettes in the past 30 days, while about 6 of every 100 high-school students (5.8%) reported smoking cigarettes in 2019.[2] The prevalence of smoking was 31.1% among persons below the federal poverty level,[3] so smoking can be considered a health disparity. Fortunately, smoking has declined from 20.9% in 2005 to 13.7% in 2018, and the proportion of ever smokers who have quit has increased.[4] We expect these trends to continue after the United States Congress passed legislation amending the Federal Food, Drug, and Cosmetic Act to raise the federal minimum age of sale of tobacco products from 18 to 21 years old. This law, which we label US Tobacco 21, was passed by Congress and signed by President Trump on December 19, 2019, makes it illegal for a retailer to sell any tobacco product—including cigarettes, cigars, and e-cigarettes—to anyone under 21. This important change in public health policy is part of the Tobacco Endgame, a term used to describe the ending of the tobacco epidemic,[5] that should have received major publicity but was overshadowed by the presidential impeachment proceedings[6] and later by the COVID-19 pandemic.

Nicotine Addiction and Youth Smoking

The United States Department of Health and Human Services shows that about 95% of adult smokers claim that they began smoking before they turned 21 years of age. About three-quarters of adult smokers stated that they first started smoking before the age of 18. 46% of adult smokers become regular smokers, but over 80% of smokers who smoke before they turn 18 will turn into daily regular smokers before they turn 21. Thus, people who smoke before 21 are at high risk to become addicted-daily-smokers.[7]

Strikingly, another survey showed that the median age of smoking initiation was 12.6 years old. Youth, aged 16 and under, primarily used five tobacco products: electronic cigarettes, cigarettes, cigars, smokeless tobacco, and hookah.[8] Youth, which the WHO defines as those under the age of 24,[9] who started using any of these products at or before the age of 13 were much more likely to become current daily users of the above products and developed nicotine dependence.[8]

This evidence of creating youth addiction was further solidified when a researcher from the tobacco company RJ Reynolds stated that "if a man has never smoked by age 18, the odds are three-to-one he never will. By age 24, the odds are twenty-to-one."[10] Furthermore, a Phillip Morris Company report of January 21, 1986 said "Raising the legal minimum age for cigarette purchaser to 21 could gut our key young adult

market (17-20) where we sell about 25 billion cigarettes and enjoy a 70% market share."[11] Tobacco and e-cigarette companies are notorious for actively targeting the youth since they are the next generation of "money-makers."[12,13]

The youth are especially susceptible to nicotine physiologically.[14] Nicotine binds to the nicotinic acetylcholine receptors in the brain and other tissues. In doing so, dopamine release is increased in certain regions of the brain, leading to dependency on dopamine release that leads to nicotine addiction. Research conducted by the Odell group has shown that adolescents display enhanced nicotine reward and reduced withdrawal because they experience short-term positive and reduced aversive effects of nicotine.[15] Furthermore, it has been shown that adolescents do not have physiologically mature brains.[16] The prefrontal cortex is responsible for executive functions, which include decision making, peer pressure susceptibility, and sensation-seeking impulses and does not develop fully until after the age of 25, thus crippling adolescents from making sound decisions about their health.[17] Because of this, tobacco companies continue working to target youth who are easily manipulated.[18]

E-cigarettes Epidemic and Its Implications Among Youth

E-cigarettes first came to the markets in the mid-2000s. Initially, they were advertised as "safer" alternatives to traditional, combustible cigarettes and an effective tool for quitting cigarette smoking.[19] E-cigarettes are associated with creating a new generation of smokers by causing youth nicotine dependence[20]; they can cause serum nicotine/cotinine levels to be substantially above that of combustible cigarettes,[21] thus facilitating frequent use with their highly addictive content, appealing flavors, and appealing accessibility of use. The CDC reported a 78% increase (from 11.7% to 20.8%) in high-school students' usage of e-cigarettes by 2018.[22] The Monitoring the Future survey showed that vaping prevalence more than doubled in 12th, 10th, and eighth-grade students from 2017 to 2019; showing that 1 in 4 12th grade students had vaped in the last 30 days.[23] The alarming rate of increase in e-cigarettes use by youth points to the need for policies to limit their purchase.

Impact of a "Tobacco 21" Law in California

Following the e-cigarette epidemic, states began to adopt policies to combat nicotine dependence. In 2014, NYC combated youth initiation and helped reduced the heavy burden of tobacco use on the city and saw rates of adolescent tobacco use decline steadily (from 11.6% to 9.5%).[24] Hawaii raised the legal age for tobacco in 2016, and in data taken from grocery stores from June 2010 compared to February 2017, the average monthly cigarette sales dropped 4.4% and cigar/cigarillos sales dropped 12.1%.[25] Oregon's law became effective in January 2018, and preliminary data from the first nine months since its passing showed a significant decrease in tobacco use initiation among youth aged 13 to 17 (34% to 25%) and young adults 18 to 20 (23% to 18%).[26]

California's fight against tobacco usage by underaged individuals began with Proposition 99 in November 1988 which funded the California Tobacco Control Program, which worked to keep tobacco out of the hands of youth, help tobacco users quit, and aimed to ensure that all Californians can live, work, play, and learn in tobacco-free environments. In 1998, 12.8% of middle-school students and 34.8% of high-school students reported smoking cigarettes. By 2002, in California, 16.0% of youth were smoking cigarettes, and in 2016, 10% of high-school students were still smoking. However, with the influx of e-cigarettes in the 2010s and their accessibility, California saw an uptick in e-cigarette usage with almost 28% of high-school students using them in 2018.[27] To combat both cigarette and e-cigarette use by youths, California legislators fought a difficult battle to limit youth tobacco purchase that was challenged by money from tobacco companies amid intense e-cigarette, tobacco industry, and California Association of Retail Tobacconists opposition. But, lawmakers were able to overcome these obstacles during a special session on health care that allowed the measures to circumvent the normal legislative process. On June 9, 2016, a set of laws raised the minimum legal sale age (MLSA) of tobacco products to 21 years of age, expanded California's smoke-free workplace laws, broadened California's tobacco-free school laws to cover all school property at all times, and increased the licensing fees for distributing and selling tobacco products, while also expanding the law to include e-cigarettes. These laws came to be known as CA Tobacco 21.[28]

By 2019, we saw the effects of CA Tobacco 21 although this may also be due to other factors, roughly 2% of high-school students in California were smoking cigarettes, compared to the previous 10% in 2016.

Zhang et al[29] found high awareness and support for CA Tobacco 21 law among young adults and tobacco retailers, the two key audiences most affected by the law. Overall, 63.6% of young adults' ages 18–24 were aware of the law, and awareness was high across all ethnic groups. Interestingly, over 60% of young adult tobacco users agreed that raising the age of tobacco sales to 21 years of age would decrease youth tobacco use. This attitude was significantly stronger among Hispanics and non-Hispanic Blacks than non-Hispanic Whites. However, young adult e-cigarette users were significantly less likely to agree. This may show that e-cigarette users are unaware of the detrimental effects of using these products. This suggests that more campaigns to spread awareness about the law, specifically pertaining to e-cigarettes, are needed to communicate the risks of these products and help people quit.

Seven months after the law was passed, awareness of the law was at 98.6% among tobacco retail owners, managers, and clerks, with more than 60% of them supporting the law. Furthermore, 85.6% of those surveyed agreed that it was easy to

comply with the law, and 90.7% stated that it was easy to train staff to comply with the law.

In a study put forth by the California Department of Public Health, 10.3% of retailers were selling tobacco to youth in 2016, but in 2018, only 5.4% were selling to youth. Furthermore, it was found that tobacco use among all California youth, including cigars, cigarillos, hookah, smokeless tobacco, and other related products, was at dramatically lower levels than they were in 2016, with the only outlier being e-cigarettes.[27] Tobacco purchase data also showed a significant decline in tobacco sales to younger teens. In fact, 15–16-year-old youth have experienced a 45% reduction in sales of tobacco products. The law included added ID check requirements and penalties to retailers. Furthermore, the law banned retailers from having self-service displays, which allow customers to access items without help from the retailer. This also reduced sales to 15–17 year-olds who may have friends over 18 who could buy them tobacco products, but are unlikely to have friends over 21. These evidences suggest that this law has significantly contributed to reducing illegal tobacco sales to youth under 21 and has achieved widespread retailer compliance.[27]

Friedman et al, using 2016–2017 data, found that state and local Tobacco 21 laws reduced smoking among 18–20-year-olds who have ever tried cigarettes.[30] Their data are significant because US Tobacco 21 should result in lower amounts of smoking in under-21-year-olds, and the number of new smokers will continue to drop. Furthermore, data continue to show that Tobacco 21 laws are also preventing large cigar/cigarillo purchases.[25] More research needs to be gathered to show the decline in other tobacco/nicotine products.

Some studies have modeled the public health impact of raising the minimum age of tobacco sales to 21.[31,32] Prior to its passage of US Tobacco 21, raising the MLSA was gaining momentum in reducing tobacco use, decreasing negative health outcomes including premature births and chronic diseases, and increasing overall public health, achieving strong compliance in many states[33] with 19 of the country's 50 states and Washington, DC already setting 21 as the minimum age.[34] However, the states that passed the minimal age laws were, for the most part, states with low rates of smoking. Until the passage of US Tobacco 21, states in the "tobacco-belt" still had high rates of smoking and an MLSA of 18 that was often not enforced.

US Tobacco 21

This federal age change is part of a comprehensive fight that some states have already begun against tobacco use. The FDA will now oversee the enforcement of the law, including penalizations for retailers who sell to underage customers. It has implemented a ban on selling all tobacco products to military personnel under the age of 21 who were previously exempted. The law also requires states to demonstrate that their retailers are in compliance. In addition to the benefits of restricting sales of tobacco products in underaged Americans, it will create awareness among both retailers and consumers (Table 1). It will help de-normalize tobacco use in society and lead to more tobacco-control campaigns and tobacco-cessation programs. Tobacco 21 may be more readily implemented in the US, where there is already an age 21 limit for alcohol, than in other countries where the alcohol age limit is lower. Passage of US Tobacco 21 will provide multiple benefits.

California smoking rates have decreased 4 times faster than the rest of the US after passing its Tobacco 21 law. They also have the second lowest adult smoking rate in the nation. High-school smoking rates have also dropped significantly. We estimate there will be a 9.4% decline in adult smoking rates in California by 2026.[35,36] Currently, about 500,000 people die of smoking-related deaths/year, if the nation were to follow California's trend, this may decrease the rate to 450,000 deaths/year saving 50,000 lives per year.[37] This is under-estimating the number of lives saved as there will be less second-hand smoke exposure and potentially fewer e-cigarette users going on to cigarette smoking.

Table 1. Benefits and challenges of the Tobacco 21 law.

BENEFITS	CHALLENGES
Reduction in youth tobacco use and underaged smoking especially in tobacco-belt states[53]	There are still high numbers of tobacco usage among youth, specifically with e-cigarettes
Delaying the age when youth first start smoking	
Reduction in the use of cigars, cigarillos, and flavored products	E-cigarette usage is still increasing
Decreased underage attempts to buy tobacco products and in increase in the age gap between adolescents initiating tobacco use and those who can legally provide them with products, "shoulder tapping"[54]	Shoulder tapping (underaged buyers asking other patrons to buy their products for them) in many retail businesses still exists, as shown in the Zhang et al study.[29] There are still illicit dealers and businesses selling to youth illegally
Reduction in adult tobacco use and decreased number of new smokers	With youth vapers, many of them turn into adult smokers[8]
Increasing awareness of old/new risks of tobacco and e-cigarette usage; the law provides grant funding to states for compliance with the law, pushing states to spread awareness	We must keep up with the ever-evolving market for illicit drug use. THC vapes are gaining traction
Improved/stricter enforcement of the new US Tobacco 21 law at all levels of government including the military	Actively enforcing the law among both brick and mortar retailers and online retailers.
Reduced tobacco-related morbidity and mortality	Reduced adult smoking rates may take years as youth who stop smoking become adults

In 2015, a report from the Institute of Medicine found that increasing the minimum age of sale for tobacco products to 21 years of age would have a significant impact on the amount of youth smoking nationally. It projected a 12% decrease in tobacco product use prevalence in adults. Furthermore, it reported that close to 4700 young people under the age of 21 try their first cigarette every day, 1400 of them will become regular smokers, and roughly 50% will die from smoking-related diseases.[38] However, it found that a new law would reduce smoking by 25% among 15–17 year-olds and 15% among those 18–20 years old. This could prevent roughly 223,000 fewer premature deaths nationwide, 50,000 fewer deaths from lung cancer, and 4.2 million fewer years of life lost among people born between 2000 and 2019.[39] As California has shown, US Tobacco 21 will help break this cycle of death and disease by discouraging/preventing generations of youth from smoking.[40] US Tobacco 21 may be one of the most important public health laws passed, as it has the potential to save a large number of lives and along with other policies, reduce cigarette use in the USA.

Future Steps to Reduce Cigarette and E-Cigarette Use Among Underaged Youths

Though we have seen success with CA Tobacco 21 and in other parts of the nation and expect to see even more success with US Tobacco 21, policymakers should take steps to combat the new vaping epidemic using the newly passed US Tobacco 21 law in a comprehensive approach:

1. Publicize the positive effects of raising the tobacco purchase age to 21.
   (1) California's Department of Public Health shows cigarette smoking in youth is at an all-time low.
   (2) The vaping epidemic can follow suit and be taken under control with enforcement of the law.
2. Push for enforcement of the new law.
   (1) In California, over 5% of retailers still sell e-cigarette products to youth.[27]
   (2) Shut down businesses that sell tobacco products including e-cigarettes to underage patrons.
3. Push for taxation of e-cigarettes.[41]
   (1) It is well documented that taxation of combustible cigarettes drastically leads to decreased sales.[42]
   (2) The taxation on e-cigarettes will lead to decreased sells, but should not be higher than on cigarettes, otherwise e-cigarette users may switch to cigarettes.
4. Push for much tighter regulation of online sales.
   (1) If you go to some e-cigarette websites, it simply "asks" a purchaser if they are 21 without verification.
   (2) There is existing technology (such as used by Juul) that would require documentation of age prior to online purchase of electronic cigarettes that should be implemented.
   (3) Studies have shown that tighter regulation of online sales could prohibit underaged sale.[43]
5. Push for the ban of all flavored vaping products.
   (1) Brands now emphasize consumer choice in models and flavors.
   (2) Research has shown that flavored products appeal to the underaged and make up the majority of electronic products used by youth.[18]
   (3) President Trump initially supported a federal ban on all flavored products but scaled back after pressure from the industry and risk of political fallout.[44]
6. Spread awareness of how dangerous all tobacco products including e-cigarettes are.
   (1) There have been 60 nationwide vaping-related deaths (EVALI).[45]
   (2) Many of the patients presenting with EVALI are reporting use of THC or purchasing products from illicit dealers.[46,47]
   (3) Vapor from electronic cigarettes contains carcinogenic compounds.[48] Flavoring compounds have been shown to cause cell cytotoxicity.[49]
   (4) Nicotine products have been shown to have many detrimental effects on health, including metabolic syndrome and gut microbiota.[50,51]

Ultimately following these six steps, along with other measures and programs set forth by the WHO Framework Convention on Tobacco Control (WHO FCTC),[52] will help push e-cigarettes usage on a downward trend similar to cigarette smoking. If we want this new law to effectively reduce e-cigarette usage as much as it has reduced cigarette smoking usage among both adults and youth, we must publicizeboth the data and the law itself. Nonetheless, US Tobacco 21 is a substantial victory for America's public health at a time when the vaping epidemic is sweeping across the nation that is likely to save hundreds of thousands of lives and push us one step closer toward reaching a tobacco endgame.

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