Tobacco 21 Policy in Maryland: State of the Evidence

Released: February 1, 2019

Johns Hopkins Bloomberg School of Public Health | Institute for Global Tobacco Control

www.globaltobaccocontrol.org

Suggested Citation: Hardesty JJ, Awopegba A, Cohen JE. Tobacco 21 Policy in Maryland: State of the Evidence. February 2019. Available at: https://globaltobaccocontrol.org/resources/tobacco-21-report-summary.

In recent years, it has become increasingly common for states and local communities to raise the age of majority for purchasing tobacco to 21 years. Over 370 cities and counties in 22 states have tobacco 21 (T21) policies,[1] the first of which was Needham MA in 2005.[2] Although state-level preemption may constitute a potential barrier to enacting T21 policies in a number of states, there has been no successful legal challenge to T21 policies.[3] Moreover, the existence of tobacco sales-related preemption laws do not always preclude T21 policies.[4]

Nearly all tobacco use begins during youth and young adulthood,[5,6] therefore T21 policies have the potential to significantly decrease the prevalence of use in the immediate and long-term.[7] It has been argued that many high school students who use tobacco products can obtain it from peers above 18 years, therefore raising the minimum age to 21 could further reduce legal purchase of tobacco products.[7]

The evidence surrounding tobacco 21 policy has grown in recent years in terms of public support, public health and financial impact, and compliance. The purpose of this short report is to provide an overview of the most recent evidence concerning T21 policy as it relates to these topics.

PUBLIC SUPPORT:

Public support for T21 policies is high according to multiple public opinion polls completed between 2015-17.[3,8-12] A common theme is that support is high across all age groups, however, there is a dip in support among 15-20 year olds.[9,10] A nationally representative 2016 poll found the majority of 18-20 year olds were in favor the policy but 18-20 year old smokers were not. Among older smokers who initiated smoking between 18-20 years old, there was high support.[10]

Support is high among most subgroups, particularly nonsmokers, African-Americans, and women.[10,12] LGBT children had lower support relative to other subgroups, nevertheless, their overall support was over 60%.[12] In addition, those in Republican and Democrat leaning states had equally high support. Trust in government may be an important indicator of support (i.e., as trust increases, support increases).[3]

Comparing T21 to T20 and T19 policies, support for T21 was either as high or higher than support for T20 and T19 policies. Among youth (13-17 year olds), support was no different irrespective of the policy.[3]

In New York City, prior to passing their T21 policy in 2013,[1] overall support was 60%.[8] New York City was the first major city to pass a T21 policy.[1]

PUBLIC HEALTH IMPACT:

Impact of Tobacco 21 policy on public health

In 2005, Needham, MA was the first city to pass a T21 policy; it is an important case study in understanding the effectiveness of T21 policies. A six year long evaluation following implementation was conducted and focused on tobacco use in the previous 30 days and self-reported purchases among high school students under 18 years. To ensure the researchers were not measuring broader substance use trends in the region, they also evaluated alcohol use in the previous 30 days. The researchers also evaluated these data for the 16 surrounding communities that did not have a T21 policy to help verify that trends in Needham, MA were in fact due to the T21 policy.[2]

Despite the high mobility of Needham, MA high school students and their proximity to communities without similar policy, the T21 policy in Needham appears to have been successful. During the first four years after implementation, compared to the surrounding 16 communities, tobacco use in the previous 30 days and self-report sales were lower. While all 16 communities witnessed decreases as one might expect given broader national trends, use and sales decreased in Needham, MA more than the surrounding 16 communities combined (e.g., percentage of youth under age 18 who purchased cigarettes in stores decreased from 18.4% to 11.6% in Needham, MA compared to the surrounding communities that decreased from 19.4% to 19.0%). The remaining two years of the study found further decreases in Needham and the surrounding communities but there were no relative differences observed. It is also worth noting that there were no differences between Needham and the surrounding communities in terms of alcohol use, providing further evidence that the trends in tobacco use were independent of broader substance use trends.[2]

A 2015 report requested by the Food and Drug Administration, *Public Health Implications of Raising the Minimum Age of Legal Access to Tobacco Products*, written by a committee of experts at the Institute of Medicine of the National Academies used models to predict the public health impact of T19, T21, and T25 policies. They found a national law raising the minimum legal age of access to 19, 21, and 25 would reduce tobacco prevalence by 3%, 12%, and 16%, respectively, by the year 2100.[13] While reductions in tobacco-caused mortality, cancer, and heart disease would not be seen for at least 20-30+ years, there could be near term health benefits, including a reduction in harmful maternal, fetal, and infant outcomes (e.g., preterm births, low birth weight, and sudden infant death) and hospitalizations (e.g., from reduced inflammation). It should be noted that the models employed by the committee addressed cigarette use only but they felt the results would translate to other tobacco products as well. The models also did not account for variations in tobacco use among subgroups (e.g., race and sociodemographic status), initiation rates, tobacco control activities, and future products (e.g., e-cigarettes).[13]

Despite these positive findings, recent data from New York City suggest uneven policy implementation, enforcement, or compliance may have negatively impacted the public health impact of their T21 policy. While adolescent tobacco use declined slightly after implementation, the decrease was greater in other locations (i.e., control cities) that did not have T21 policy.[14]

E-cigarette use and transitions to cigarette use among youth and young adults

According to the Centers for Disease Control and Prevention, current e-cigarette (any time in the previous 30 days) use has accelerated by 78% and 48% during 2017-18 among US high school and middle school students, respectively. Approximately one in five high school students (3.05 million) and one in twenty middle school students (570,000) currently use e-cigarettes.[15] Nationwide, current use among adults appears highest in the 18-24 age group at 9.2%.[16]

In 2017, researchers compiled evidence from studies that tracked youth and young adults ages 14-30 over time. They found those who never previously used cigarettes and tried e-cigarettes at least one time had a 30.4% probability of trying cigarettes in the future. Conversely, those who never previously used either product had a 7.9% probability of trying cigarettes.[17] A 2018

National Academies of Sciences, Engineering, and Medicine Consensus Study Report* concluded there is "substantial evidence that e-cigarette use increases the risk of ever using combustible tobacco cigarettes. For e-cigarette users who have also ever used combustible tobacco cigarettes, there is moderate evidence that e-cigarette use increases the frequency and intensity of subsequent combustible tobacco cigarette smoking."[18] A subsequent study concluded trying e-cigarettes may increase smoking among some youth, however, the overall effect at the population level is negligible relative to the declines in smoking seen after vaping increased in popularity.[19] Nevertheless e-cigarettes do impact the health of users.

Known harms of e-cigarettes

The 2016 Surgeon General Report stated rising e-cigarette use has the potential to negatively impact the health of youth and young adults by means of nicotine, other constituents in the aerosol (e.g., aerosolized solvents, flavorants, and adulterants), and toxicants produced during aerosolization (e.g., formaldehyde, acetaldehyde, and acrolein).[20] Given the relative novelty of e-cigarettes, it may not yet be possible to discern which, if any, long-term health consequences may result[18] (e.g., cancer can take decades to develop). The current evidence is therefore limited to short-term health consequences,[18] knowledge about the chemicals identified in e-liquid or those created after heating the e-liquid, and animal studies.[20]

Nicotine exposure can result in nicotine addiction and harm to brain development and plasticity in utero through adolescence and early adulthood. For example, relative to adults, youth and young adults exposed to nicotine may be more susceptible to addiction, potentially reduced impulse control, deficits in attention and cognition, and mood disorders. Fetal exposure can result in sudden infant death syndrome, obesity, and deficits in auditory processing, attention, and cognition.[20]

Scientific knowledge of the health impact of constituents in the aerosol other than nicotine is still developing. Solvents in e-liquid, such as propylene glycol (PG) and vegetable glycerin (VG), are known to produce mild eye and respiratory irritation when people are exposed to PG midst for 1

*Many have argued e-cigarettes allow cigarette users to quit smoking. Per this report, "There is insufficient evidence from randomized controlled trials about the effectiveness of e-cigarettes as cessation aids compared to no treatment or to FDA approved smoking cessation treatments. While the overall evidence from observational trials is mixed, there is moderate evidence from observational studies that more frequent use of e-cigarettes is associated with increased likelihood of cessation."

minute, but little is known about their long term effects. Animal studies suggest they are relatively safe when inhaled by animals for 18 months, however, e-cigarette use leads to high exposure of submicron-sized particles that may present a potential toxicological risk to users.[20] In e-liquid flavorings, many of the chemicals used are "generally recognized as safe" for ingesting in foods, however, they have not undergone adequate safety testing when heated to an aerosolized form that can be inhaled. Furthermore, chemicals in flavorings are often not reported on e-cigarettes or their packaging. One study, as noted in the Surgeon's General Report, identified the presence of aldehydes, which are known respiratory irritants. Others have found chemicals approved for ingestion that have toxicity when inhaled; the toxicity is particularly pronounced for cinnamon-related and butter flavorants.[20] Other studies have identified carcinogenic adulterants in e-liquids, albeit at lower levels than in cigarettes. These carcinogens are most likely a result of the processes used to extract nicotine from tobacco leaves, addition of tobacco flavorings, packaging material, and production procedures. An FDA study also identified the presence of two pharmaceutical ingredients suggesting some users may have exposure to the pharmacologically active substances, amino-tadalafil and rimonabant. Amino-tadalafil is closely related in structure to tadalafil, the active ingredient in Cialis, a prescription drug used to treat erectile dysfunction. Rimonabant was previously approved in Europe to treat obesity but its marketing authorization was withdrawn approximately nine years ago. Unresolved issues involving increased frequency of psychiatric adverse events, including suicide and a relatively undefined collection of neurological symptoms and seizures, have prevented FDA approval of Rimonabant.[20]

When the aerosol is heated by the heating coils in e-cigarettes, the chemicals in e-liquid can change into other toxicants, namely formaldehyde, acetaldehyde, and acrolein. The amount of these toxicants in the aerosol is related to the voltage of the devices. Some of the higher powered devices reported higher formaldehyde levels than cigarettes; however, at a lower power the levels are lower than cigarettes. These toxicants are each known to increase the risk of cancer.[20]

FINANCIAL IMPACT:

In 2014, researchers conducted a study assessing the proportion of total cigarette consumption that is attributable to 18-20 year old smokers to better understand the retail impact of a nationwide T21 policy. Assuming that the number of cigarettes smoked by 18-20 year old respondents is a close approximation of the cigarettes sold to those in the age group, the researchers found retailers could

expect a maximum reduction in cigarette sales of 2% immediately following implementation. Given the policy is intended to decrease initiation, one could expect future reductions in sales as well, however, given the already lower cigarette sales among 18-20 year old respondents, it is likely that future reductions in sales would be gradual thereby allowing retailers to adjust to changing market conditions.[21]

The potential impact of T21 on cigarette tax revenues in Maryland has been modeled by estimating the market size of young smokers. Younger smokers of legal age tend to smoke fewer packs per day—in Maryland, this was 3.5 cigarettes per day for 18-19 year-olds and 6.1 for 20-21 year-olds, compared to an average of 12.3 per day for all adult smokers according to the Current Population Survey, Tobacco Use Supplement 2014-15. Smoking intensity is both lower and less frequent among teens under 18 years old. Adjusting for the intensity of smoking, less than 5% of all cigarette sales and the corresponding cigarette tax revenues in Maryland can be attributed to the under-21 population. Under different scenarios that assume varying levels of success in implementing a T21 law, an upper bound of the tax revenue declines was determined to be 2% of 2017 revenues, with most scenarios suggesting smaller revenue losses.[22]

COMPLIANCE:

Prior to implementing the T21 policy in New York City, a study conducted in 92 retail dense micro-neighborhoods found that approximately 25% of retailers did not request identification from young women just above the cut-off age who sought to buy cigarettes. Moreover, young people seeking cigarettes at 70% of the retail micro-neighborhoods sampled were able to purchase them somewhere in that area without providing identification. The authors note that, from a policy implementation perspective, making the minimum legal purchase age of cigarettes and alcohol age 21 may simplify a vendor's task as vendors could implement a single protocol for checking identification for both, easing some of the administrative burden of these policies. As a result, compliance may improve simply as a result of aligning minimum purchase age policies across these domains.[23]

Following implementation, compliance with the minimum purchase age law in New York City appears to have decreased from 71% to 61%. That being said, the compliance study was conducted only 9 months following policy implementation.[24]

SUMMARY AND POLICY IMPLICATIONS:

Existing evidence shows that T21 policies have consistently high support and can prevent youth and young adults from initiating tobacco use. The impact of T21 policies on e-cigarettes is not clear as no studies were identified in our search. That said, e-cigarette use among youth and young adults is rising, can lead to initiation of cigarette use, and exposes users to harmful solvents, flavorants, adulterants, and toxicants that they otherwise may not have been exposure to. Based on this information, it is reasonable to believe there could be a public health benefit to including e-cigarettes in T21 policy. Our review of the literature also revealed T21 policies have a small but negative impact on local retailers and state budgets and data from New York City highlight the importance of compliance. Policies that include enforcement mechanisms will likely improve compliance.

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