

Analysis of the Relationship Between the Legalization of Marijuana and a Potential Increase in Teenage E-cigarette Use

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Abstract

Adolescent vaping has increased from 3% in 2011 to 27% in 2014, leading to concerns for respiratory health. In this paper, we look at the increased availability of nicotine products stemming from the legalization of marijuana as a possible cause for increased teen e-cigarette usage. The Youth Behavioral Risk Survey and Healthy Kids Colorado Survey were analyzed to investigate this hypothesis. Through a Google Scholar and PubMed literature search, the following key terms were utilized: “adolescent”, “nicotine”, and “vaping”. The evidence suggests that following the legalization of marijuana in Colorado, teenage e-cigarette use increased two times from 2013 to 2021 and sits at a higher rate than the national average (36.2%). There is strong support for the theory that the legalization of marijuana increased e-cigarette use amongst adolescents through increased availability of such products.

1. Introduction

Since 2014, the most popular nicotine product in teens has been vapor products/e-cigarettes(1). A large majority of e-cigarette use is continued due to the addictive properties of nicotine. Nicotine addictions are problematic as e-cigarette use has been shown in clinical studies to cause increased rates of respiratory disease and adversely alter pulmonary function in teens(2). Another problem caused by e-cigarette use in teens is increased stress levels(3). Stress can cause poor health conditions and life-threatening illnesses(4). Furthermore, stress can lead to using other narcotics in teens, causing further physical harm(3).

To minimize the negative consequences of adolescent e-cigarette use, we must look at the potential causes. Common theories suggest aggressive marketing and ineffective education regarding the consequences of frequent e-cigarette use(1,2). However, the research on these causes is not concrete enough to discredit looking for new solutions, such as the increase of teen e-cigarette usage through the lack of perceived harm. Therefore, this study will explore the concept that e-cigarette use is increasing through the availability and subsequent perceived lack of danger stemming from recreationally legal marijuana in Colorado, as it is one of the states with the highest adolescent e-cigarette usage(5,6).

Starting in 2012, Washington and Colorado legalized recreational marijuana statewide. Afterwards, many other states have followed in their footsteps and brought up similar legislation(7). The evidence and analysis will explore the relationship between the legalization of marijuana and the corresponding increase of e-cigarette based nicotine addiction. Therefore, we hypothesize that the legalization of marijuana is a major contributor to the increase of e-cigarette based nicotine addictions.

2. Methods

This paper reviewed a combination of previously published research and reports on national/statewide databases.

2.1 Search queries and Search Engine

Pubmed and Google Scholar were searched with the keywords: “addiction”, “adolescent”, “Colorado”, “e-cigarette”, “marijuana”, “nicotine”, “teen”, “vaping”, “weed” in different combinations to find literature that reported on trends of e-cigarette use in adolescents.

2.2 Databases/Surveys

The Youth Risk Behavior Surveillance Survey (YRBSS) or Youth Risk Behavior Survey (YRBS) conducted by the Center of Disease Control (CDC) asked a series of questions to students in grades 9-12 regarding key health habits that contribute to the highest teen mortality rates. For the purpose of this analysis, we reviewed questions regarding e-cigarette usage. These questions include: “Have ever used e-cigarette products” and “Used e-cigarette products in the last 30 days.” This source was primarily used to compare Colorado to other states and overall national data. This survey is administered every odd year and we use the most recent date available as of 2023(9).

A second database called Healthy Kids Colorado Survey (HKCS) focuses on a questionnaire asked toward Colorado students. This survey is done during the fall on odd years. Similar to the nationwide survey, we are focusing on answers regarding questions on e-cigarette use. This source was used to observe trends regarding e-cigarette use overtime in Colorado students. We look at data from 2013-2021 as these are years where specific e-cigarette focused questions were asked.

The provided online portal for both sources were used to filter specific questions about e-cigarette use in teens and students.

2.3.1 Exclusion Criteria

We excluded data regarding other types of nicotine products (traditional cigarettes, nicotine gum, nicotine patch, dip, chew), side effects of adult e-cigarette use, and teenage substance abuse other than e-cigarettes. We excluded data outside of the U.S and before 2010.

3. Results

3.1 Literature results

A paper published by Hadland et al. interprets a general surgeon report from 2016 stating that from 2011 to 2015 e-cigarette use increased from 3% to 27%. Furthermore, data from the same paper states a 78% increase of e-cigarette use among high schoolers from 2017-2018(8).

Lin et al. shows the trends of e-cigarette use amongst teens in California between the years 2014 and 2018. In these years Lin found a 55.2% increase in e-cigarette use amongst teens.(9)

Another article by Wang et al. notes an increase in e-cigarette products sales from US retail scanner data. The units sold increased to 1,547 per 100,000 in 2016 from 667 per 100,000 in 2012 nationwide. Alongside this increase of sales there was a reported average decrease of 48% regarding the prices of e-cigarette products(10).

3.2 Database results

The YRBS finds the percent increase of e-cigarette use in teens compared to the national average in Colorado, Alaska, Washington DC, Nevada, and California to be 4.1%, 9.6%, 3.8%, 0.2%, 6.1%, respectively. While the percent decrease compared to the national average in Massachusetts and Maine to be -5.2% and -4.5% (11)(Figure 1).

Figure 1

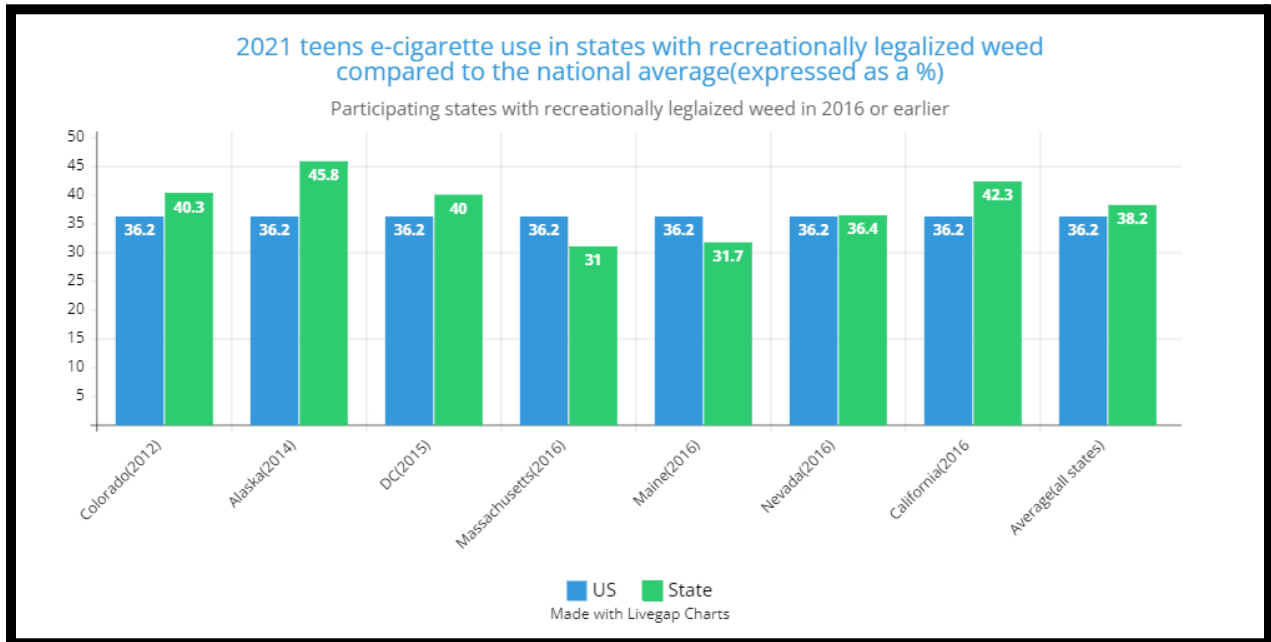


Figure 1: The graph shows results of the YRBS. The years next to the names of states refer to the year the state recreationally legalized weed. The two columns on the furthest right refer to the average of all the states shown on the graph(11).

The Healthy Kids Colorado Survey shows an increase in teenage e-cigarette use following the legalization of weed in 2012 (Figure 2). In 2013, the percentage of students that answered “yes” if they have ever used an e-cigarette product was 15.1%. This proportion increased to 46.2%, 44.2%, 45.9%, 30.3% in the years 2015, 2017, 2019, 2021 respectively(12).

Figure 2:

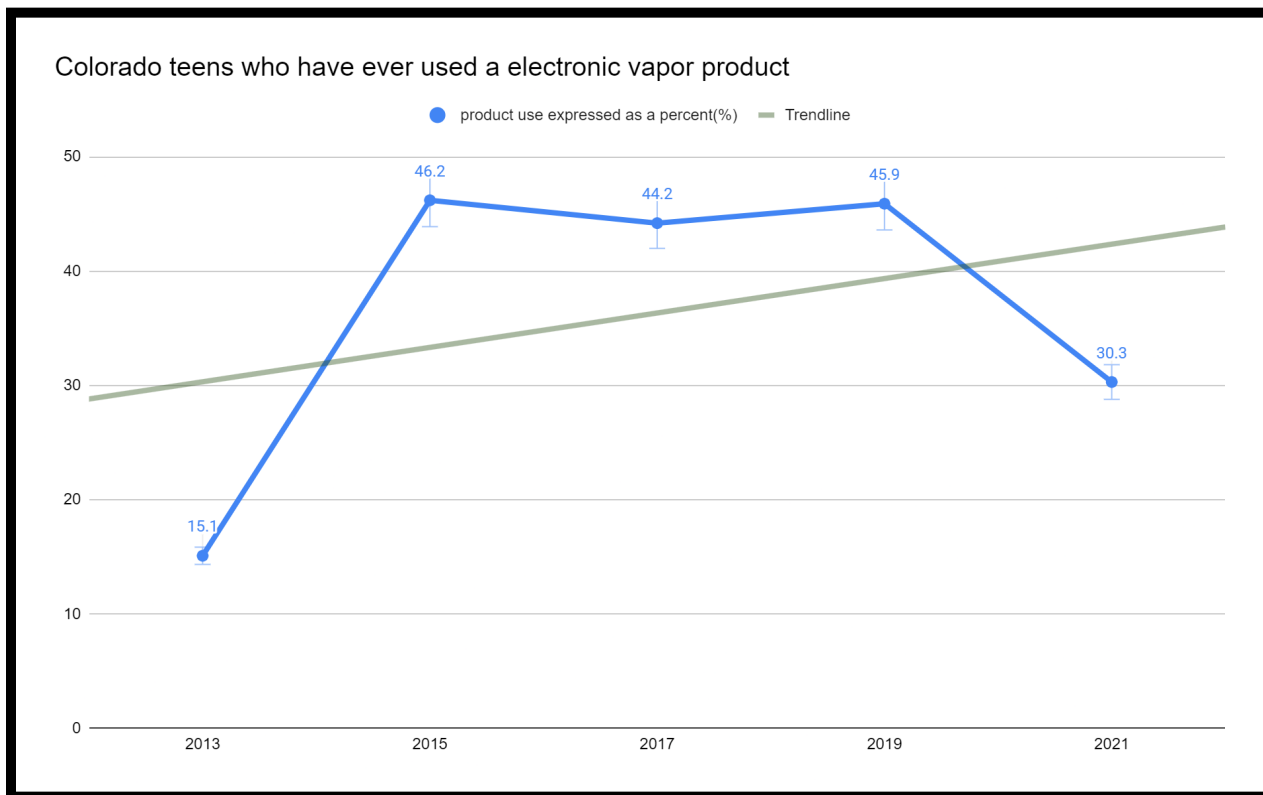


Figure 2. The percentage of Colorado teens that have ever vaped from 2013-2021. The trendline demonstrates the overall change of percentage values each year the survey was conducted(12).

4. Discussion

4.1 Analysis

There has been extensive research into the damages of teen e-cigarette-based nicotine addiction. However, the research for identifying specific causes of e-cigarette-based nicotine addiction has been limited to mostly targeted marketing and underwhelming education about the risks of e-cigarettes. We believe we are the first study to attempt to link marijuana use to a perceived lack of risk perception as a potential cause to explain the increase in adolescent e-cigarette use.

It is clear that within the last decade, e-cigarette use in teens has increased substantially nationwide from 3 to 27% in 4 years.(8). E-cigarette retail sales increased nationwide from 667 to 1547 per 100,000 between 2012-2016(10). Specifically, states with recreationally legalized marijuana have higher teen e-cigarette use than states without recreationally legalized marijuana(6). Data from the YRBS supports this conclusion as states that have had marijuana legalized for over 7 years have a higher e-cigarette use than the national average (2% increase for recreationally legalized marijuana). When focusing on Colorado specifically, we can see an increase of 4.1% higher than the national average(11). Looking at longitudinal trends in Colorado, we can see an approximately 100% increase in teen e-cigarettes following the legalization of marijuana between late 2012 to 2021(12). This issue is not state specific; California, another weed-legal state, has also demonstrated increased e-cigarette use between 2014-2018(55.5%) and also sits higher than the national average(6%) in 2021(9).

Following legalization in Colorado, there has been a massive increase in overall marijuana use(13). According to the Colorado Department of Revenue, since initial legalization, 78% of marijuana sales have been retail-based (14). These retail sales include physical and online store options. Therefore, we can infer that with the increase in demand, there is an increase in supply in the form of more stores that sell marijuana products. Based on a study from Berg et al., the managers/owners of vape shops agree that many e-cigarette consumer base shares with the marijuana use consumer base. Therefore, many managers/owners are willing to sell both at the same store(15). From these previous assertions, we can infer that from the legalization and further increase of marijuana use, there has been a sharp increase in demand, leading to more retail stores that often sell both marijuana and e-cigarette products. According to a study done by Broman, the increased availability of substances during adolescence shows an increase in substance use for the adolescents exposed(16). In conclusion, existing research and data suggest that a potential cause of e-cigarette use in teens stems from the legalization of marijuana and its subsequent increase in demand, which causes the availability of similar products, such as e-cigarettes, to increase. This increase in supply leads to more availability that causes adolescents' use of e-cigarettes to increase.

4.2 Limitations

A limitation of this study is that we could not effectively compare e-cigarette trends between states. This is because most statewide surveys differed in their collection methods, questions, sample sizes, and time when data was collected. Therefore, it could not be determined how Colorado's increased rate of teen e-cigarette compared to other marijuana-legal states or marijuana-illegal states.

Another limitation of the study is that the link between the increased availability of substances and the further use of the substance in teens does not focus on the exact scenario of our paper(16). Instead, it primarily focuses on increasing the availability of substances in a household instead of increasing availability in the overall environment. However, we still used this source since an article by the National Institution of Drug Abuse corroborates a similar relationship between adults and heroin use, showing a higher rate of heroin use following the increase in availability(17).

4.3 Future Studies

New research studies should focus on addressing the limitation of the inconsistent sampling methods between states. To do this, creating a standardized survey that can run in consistent timeframes in each state and nationally is recommended. With potential information from this method, more accurate correlations can be made between the legalization of marijuana and an increase in teenage e-cigarettes at state and national levels.

The psychological relations between the increase in the availability of nicotine products and the potential subsequent increase of use in teens should also be further explored. To our knowledge, there has not been an in-depth study focusing on this relationship with a focus on nicotine products.

4.4 Conclusion

We have found strong evidence to suggest a potential cause of nicotine addictions in teens stemming from the legalization of marijuana. With further research, this concept can be further strengthened. Therefore, legislatures should consider the increase in nicotine addiction among teens as a potential side effect of legalizing marijuana. Systems should be put in place to minimize this consequence when considering the legalization of marijuana.

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