



Research Article

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The Effect of U.S. College Campuses' Smoke and Tobacco Policies on Student Vaping and Smoking Behavior: A Systematic Review Protocol

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Abstract

Background: Smoking cigarettes remains the leading cause of preventable death worldwide, with more than 16 million American adults affected by smoking-related illnesses and around a half-million Americans suffering from a smoking-related death each year. Despite a decline in cigarette use over the past several decades, the introduction of the electronic nicotine delivery system (ENDS) in 2011 to the market accelerated nicotine use by two to four times the pre-ENDS rates, particularly among college students. With the emergence of electronic smoking products, there is a gap in the evidence regarding how effective policies are at restricting smoking and vaping behavior on college campuses. To address this, a systematic review will be conducted to determine how Smoke and Tobacco-free Policies on US college campuses and universities affect student smoking behavior, including ENDS products, including a greater emphasis on the extent Smoke and Tobacco-free policies impacted student ENDS use.

Methods

A systematic review will be conducted using PubMed, EMBASE, Web of Science, and ERIC databases. Inclusion criteria will include studies published between 2014 and 2020, that includes a variation of smoke/tobacco policy and quantifies outcomes using college students' tobacco/nicotine smoking behavior on US college campuses. All of the articles will be dual screened through Covidence at the title/abstract stage and the full-text review stage. Data extraction from the included articles will also take place through a dual extraction framework. The entire team will then work together to analyze the collected data and complete the systematic review.

Discussion

Electronic tobacco/nicotine products are fairly new and there is limited research published regarding the effect of college campus policy on smoking behavior of college students and faculty. The information collected from this systematic review will help inform the scientific community as well as others in the public health space about the current state of smoke/ tobacco smoking policy on college/university campuses and its effect on student smoking behavior.

Systematic review registration

This study protocol has been registered to the PROSPERO database under the registration number CRD42021255826.

Keywords

Smoke/ Tobacco Policies, Smoking Behavior, College, University

Background

Smoking cigarettes remains the leading cause of preventable death worldwide, with more than 16 million American adults

affected by smoking-related illnesses and around a half-million Americans suffering from a smoking-related death each year



[1]. Nearly all (99%) people who smoke start before they reach 26 years of age, drawing attention to the considerable influence the tobacco industry has on influencing youth and young adults [2]. Over the last two decades, youth and young adult cigarette smoking prevalence has steadily declined, from the most recent high (13.1%) in 1999 to a historic low of 4.1% in 2020 [3]. Despite this decline in cigarette use, the 2011 introduction of the electronic nicotine delivery system (ENDS) to the market accelerated nicotine use by two to four times the pre-ENDS rates [4]. Among college age young adults, vaping of nicotine in the last 30-days more than tripled between 2017 (6.1%) and 2019 (22%), with only a slight decrease in 2020 (19%) [3]. While the adoption of college Smoke and Tobacco-free policies, framed as public health tobacco control initiatives, have led to decreased college aged young adult smoking behaviors, there is need for additional research on vaping behavior among this population [11].

In the general demographic of college aged young adults, it is crucial to also consider race and ethnicity because of the ways tobacco companies have historically targeted minority communities. A recent study stated that transgender adolescents of color were more likely to use vape products compared to their cisgender white adolescent counterparts [5]. Minority groups, who are often the victims of discrimination by peers, were at an increased risk for becoming frequent vapers [6]. Since minority groups seem to be disproportionately affected by the tobacco industry in general, looking at the smoking behavior of minority groups is especially important when considering the implications of policy.

California colleges and universities use campus policy and prevention programs as the most common means of reducing nicotine use among college aged young adults. The range of policies varies significantly by institution, from partial restrictions, such as designated smoking areas, to campus-wide prohibitions. In 2012, the University of California, the state's 10-campus flagship system of public higher education, passed a 100% Smoke and Tobacco-free Policy, setting the bar for colleges across the nation to move towards comprehensive policies that prohibit all forms of tobacco use. As of July 2021, about 2,560 colleges have passed a 100% smoke-free and tobacco-free policy [7]. Of these policies, 2,194 (85.7%) specifically included ENDS language.

College campus policies addressing tobacco and ENDS usage aim to influence attitudes and behaviors associated with both smoking and vaping. The change in attitude towards smoking policies after policy implementation is well-studied [8]. After a smoke-free and tobacco-free policy is implemented, general support for the policy increases [9]. Despite these observed changes in attitudes

towards smoking policies, the effect of such policies on behavior is not extensively explored [10]. The current literature suggests that smoke-free or tobacco-free policies may lead to a decrease in the prevalence of smoking on college campuses [11]; however, the prevalence of vaping in response to such policies requires additional research.

As approval of smoke-free policies expands, attitude shifts affect the changes in smoking behavior. More widespread disapproval for smoking on college campuses, as evidenced by increased support for smoke-free college campus policies, holds the potential to denormalize smoking and possibly vaping, depending on policy language. Research showed that stigmatization is detrimental to mental and physical health outcomes because it may result in smokers less likely to quit [12]. Studying the effect of denormalization through college campus policy on student smoking and vaping behavior may contribute to a better understanding of college campus smoking prevention and cessation.

The current literature focusing on the efficacy of policy on tobacco use behavior of college students is not well characterized, especially with the growth of electronic smoking products. A 2017 systematic review on the effect of campus tobacco-free policies on the student's smoking behavior found mixed results regarding the use of tobacco and ENDS [11]. Some studies in the systematic review suggested that adding policies caused a significant decrease in student smoking behavior; however, these articles did not include the effect of electronic smoking products [13-15]. There are currently no systematic reviews published that consider the effect of college smoking policy on students' use of ENDS products. Furthermore, minority groups, such as the African American and Hispanic populations, are often disproportionately affected by smoking, begging the importance of considering the effect of geography of the college campus, as well as the ethnicity of its sample size, on student smoking and vaping behavior [16].

With the emergence of electronic smoking products, there is a gap in the evidence regarding how effective policies are at restricting smoking and vaping behavior on college campuses. To address this, a systematic review was conducted to determine how Smoke and Tobacco-free Policies on US college campuses and universities affect student smoking behavior, including ENDS products. We put greater emphasis on the extent Smoke and Tobacco-free Policies impacted student ENDS use. We hypothesize that a 100% Smoke and Tobacco-free Policy, with ENDS language included, is the most effective type of policy to decrease smoking behavior on college campuses. As schools/universities start going back in person after the peak of the COVID-19 pandemic, this issue is especially pertinent to the health well-being of the students.

Methods/ Design

The study protocol is based upon the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) Statement, which is registered to the PROSPERO database (Registration number CRD42021255826).

Eligibility Criteria. To ensure consistent screening across four reviewers and to define the scope of this review, we used the outline of population, intervention, comparators, outcomes, timing, and setting (PICOTS):

Population

This study includes data from students/ faculty at US institutions of higher learning. This includes 4-year colleges and universities, junior or community colleges, vocational schools, and career colleges, but not distance learning online schools or military academies.

Intervention

Smoke and Tobacco Policies on college campuses are the primary focus of the studies selected. The type of policy, such as a non-comprehensive policy (no policy at all to entryway policies), a designated smoking area policy, or a comprehensive (100% smoke/ tobacco-free) policy are considered. We excluded studies that do not directly address what type of tobacco use policies were implemented at their campus.

Comparator

The data collected from the selected studies were used to compare the type of tobacco use policies implemented at the respective institution.

Outcome

The main outcome is vaping and/or tobacco use behavior on college campuses. This includes, the percentage of students/ staff/ faculty using nicotine, the products they use (conventional cigarette products, electronic cigarette products, etc...), the frequency at which they use nicotine products, and whether they use these products in designated smoking areas or anywhere on college campuses. Additional outcomes that are included in the studies selected are trends between vaping and smoking based on the types of policy implemented.

Timing

Studies published between 2014-2020 are included because the University of California campuses implemented a strengthened smoke/ tobacco-free policy in 2014 (policy adopted in 2012) and this sparked a change within college campus policy culture throughout the United States [13,17]. Furthermore, the popularity of ENDS substantially increased in the mid-2010s which shifted college vaping culture during this time period [18].

Setting

Any college or university campus in the US was considered. Studies with settings outside of the US were not included. By specifically selecting college and university campuses in the US, the data from this systematic review will help inform further policy change and research to decrease tobacco use in college populations in the US. The geographic location of the campus relative to the United States (West, Northeast, etc...) was collected to determine any trends in college and university campus policy based on geographic location.

Information Sources. Four databases were searched: PubMed, EMBASE, Web of Science, and ERIC. These databases include published, peer-reviewed research in the health sciences, policy, and education domains, making them ideal for this investigation.

Review Team. The review team is composed of three tobacco control advocates: first, second, and third authors. All three members of the review team are Board Members of the COUGH (Campuses Organized and United for Good Health) Coalition, a statewide movement advocating for comprehensive smoke/tobacco-free policies, education, and treatment services on all colleges and universities in California. COUGH is supported by the California Youth Advocacy Network (CYAN), a statewide organization working to promote smoke/tobacco-free college campuses by providing training and technical assistance to individuals, organizations, and coalitions advocating for commercial tobacco-free communities. The review team is overseen by the fourth author, an expert tobacco control consultant to CYAN and college health professionals working in higher learning institutions.

Search Strategy. We used three categories of terms: vaping/ smoking, college, and policy. Search terms within each category will be separated by the Boolean operator "OR," and categories of search terms will be separated by the Boolean operator "AND." Each search will include results from 2014 to 2020.

Title and abstract keywords were included in EMBASE and PubMed for search terms relating to 'college'. A topic Field Tag will be used in Web of Science. Each query will be adapted to suit its respective database. Refer to Appendix A for search queries for each respective database.

Selection of Studies. To determine study eligibility based on the inclusion criteria shown in Table 1, the list of studies resulting from the search strategy query will be imported into an online review management tool, Covidence. The first phase of screening will involve scanning titles and abstracts, in which two reviewers were assigned to each article. Potentially eligible articles will undergo a second screening, where two reviewers will conduct a full-text review. A third reviewer resolved conflicts in either of these phases until a consensus was met. (Table 1)

Table 1: Inclusion Criteria.

Criteria	Justification
Published between 2014-2020	The surge in ENDS products usage prompted a wave of policies to be passed in the mid-2010's onwards. Using this narrowly defined time period is essential in capturing policy decisions that took place during this surge.
Based at a United States higher-education institution	The study must take place at higher education institutions based in the United States and additionally must focus on individuals who identify as part of the institutional community. Studies with populations that do not identify as part of the institutional community will not be considered (i.e., campus visitors).
Focuses on behaviors	Behavior related to tobacco/ nicotine smoking, vaping, or both must be described. This ensures that solely attitudes are not communicated, and that physical actions that violated or abided by the campus policy took place.
Defines the policy in effect	Because policies are subject to change over time or information may be unattainable from campus websites, a description of the policy studied must be stated within the article.
Published in English Language	Resources for translating studies published in languages other than English were not acquired during this review.

Data Extraction. For each of the selected articles, we will extract data and information based on the abstraction guide created, which is shown in Appendix B. This includes the demographic information of the sample size studied, the type of policy at the college campus and how well it is implemented, the nicotine use behavior of the students, the types of products that they are using, and where they are using nicotine. We will also extract information regarding the geographical location of the college campuses as well as any trends in vaping and smoking behavior.

Two members of the review team extracted each study, while blinded to each other's extraction (SNN, BM, EJ, and SLT). Any disagreements will be discussed by the reviewers who worked on the extraction and a consensus will be reached. A "gold standard" reviewer gave the final conflict resolution (SLT) if an agreement was not reached. The corresponding author for the selected study was conducted to provide the information needed, in the case that there is any missing data. This process will occur on the Covidence software, where all stored data will be exported as CSV or Excel files that are only accessible to the review team.

Analysis and Reporting. Due to the high degree of heterogeneity expected from the results of the different articles selected for data extraction, we plan to perform a narrative synthesis of the studies. The main outcome, campus nicotine use behavior, will be reported through many different scales, and thus warrants a narrative synthesis. The narrative synthesis will include synthesizing the findings from all of the included studies in a heterogeneous manner as the outcomes are not consistent across the articles. The studies were also grouped according to additional outcomes such as whether or not the policy emphasized electronic cigarette use and the geographic region of the campuses. This will allow us to determine how the policies implemented on college and university campuses have adapted to the new surge in electronic cigarette use and what type of policy is the most effective in reducing the use of these products. We will also be able to study the types of policies

that are predominant in different areas of the US (West, Northeast, etc...), which have been signaled as a gap in knowledge of the current literature by past systematic reviews [9].

Quality Control and Quality Assurance. At least two reviewers in each stage of the selection of studies checked each study. Additionally, at least two reviewers will employ the Cochrane Risk of Bias tool in the event that more than fifteen articles pass the full text review phase. The Cochrane Risk of Bias tool will be used due to the prevalence of randomized trials in the chosen articles.

Discussion

The use of electronic tobacco/nicotine products is a new phenomenon that has especially impacted the smoking behavior of young adults (USDHHS (U.S. Department of Health and Human Services, 2014)). Due to this, it has been understudied in the literature and needs more research in order to better understand how to decrease smoking behavior in the population. One of the tactics to decrease smoking behavior that may be effective is enacting policy, and the results of this systematic review will help consolidate all of the literature published on this topic, specifically on US college campuses, and allow for evidence-based interventions in the future.

This systematic review builds on the [2] systematic review by focusing on electronic tobacco/nicotine products as well as conventional products on college campuses. In the past four years since the Bennett et al., 2017 has been published, many more articles that include electronic tobacco/nicotine products have been published, and thus the scope for this systematic review should be able to include these relatively new products. The information collected from this systematic review will help inform the scientific community as well as others in the public health space about the current state of smoke/ tobacco smoking policy on college/university campuses and its effect on student smoking behavior.

List of Abbreviations

1. COUGH: Campuses Organized and United for Good Health
2. CYAN: California Youth Advocacy Network
3. ENDS: electronic nicotine delivery system
4. PRISMA-P: Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SNN, BM, EJ and SLT all worked towards creating the research idea and worked together with consistent meetings to formulate this protocol paper. All the authors contributed to scoping the literature, thinking through nuances, and finally writing the manuscript. All authors read and approved the final manuscript.

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Appendix A: Full Search Strategy

((Vaping OR Electronic Nicotine Delivery System OR cartridge OR cartridges OR disposable pod device OR disposable pod devices OR e cig OR e cig smoking OR e cig use OR e cigarette OR e cigarette smoke OR e cigarette smoking OR e cigarette use OR e cigarettes OR e cigs OR e liquid OR e liquid smoke OR e liquid smoking OR e liquid use OR e liquids OR e-cig OR e-cig smoke OR e-cig smoking OR e-cigarette OR e-cigarette smoke OR e-cigarette smoking OR e-cigarettes OR e-cigs OR e-liquid OR e-liquid smoke OR e-liquid smoking OR e-liquid use OR e-liquids OR ecig OR ecig smoke OR ecig smoking OR ecig use OR ecigarette OR ecigarette smoke OR ecigarette smoking OR ecigarette use OR ecigarettes OR ecigs OR electronic cigar smoking OR electronic cigar use OR electronic cigarette OR electronic cigarette smoke OR electronic cigarette smoking OR electronic cigarettes OR electronic cigars OR electronic nicotine delivery system OR electronic nicotine delivery system OR electronic nicotine delivery systems OR electronic nicotine delivery systems OR electronic smoke OR electronic smoking device OR electronic smoking devices OR eliquid OR eliquid smoke OR eliquid smoking OR eliquid use OR eliquids OR ENDS OR ENDS OR ESD OR juul OR JUUL OR juuling OR juuls OR vaping OR wax pen OR wax pens OR Cigar Smoking OR Cigarette Smoking OR Tobacco Products OR Tobacco Smoking OR Big tobacco OR cigar OR cigar smoking OR cigarette OR cigarette smoking OR cigarettes OR cigars OR nicotine OR smoking device OR smoking devices OR Tobacco OR Tobacco Products OR Tobacco Smoking) AND (campus[Title/Abstract] OR campuses[Title/Abstract] OR college[Title/Abstract] OR college campus[Title/Abstract] OR college campuses[Title/Abstract] OR colleges[Title/Abstract] OR community college[Title/Abstract] OR community colleges[Title/Abstract] OR four year institution[Title/Abstract] OR four year institutions[Title/Abstract] OR four-year institution[Title/Abstract] OR four-year institutions[Title/Abstract] OR higher education[Title/Abstract] OR higher learning[Title/Abstract] OR institution of higher education[Title/Abstract] OR institutions of higher education[Title/Abstract] OR post-secondary education[Title/Abstract] OR post-secondary education[Title/Abstract] OR postsecondary education[Title/Abstract] OR technical college[Title/Abstract] OR technical colleges[Title/Abstract] OR technical school[Title/Abstract] OR technical schools[Title/Abstract] OR trade college[Title/Abstract] OR trade colleges[Title/Abstract] OR trade school[Title/Abstract] OR trade schools[Title/Abstract] OR two year institution[Title/Abstract] OR two year institutions[Title/Abstract] OR two-year institution[Title/Abstract] OR two-year institutions[Title/Abstract] OR universities[Title/Abstract] OR university[Title/Abstract] OR university campus[Title/Abstract] OR university campuses[Title/Abstract] OR vocational school[Title/Abstract] OR vocational schools[Title/Abstract])) AND (Policy OR Smoke-Free Policy OR campus policy OR campus policies OR designated smoking area OR designated smoking areas OR partial smoking ban OR partial smoking bans OR Policies OR Policy OR partial smoking ban OR partial smoking bans OR Policies OR Policy OR Rule OR Rules OR smoke free OR 'smoke/tobacco free policies' OR 'smoke/tobacco free policy' OR 'smoke/tobacco-free policies' OR 'smoke/tobacco-free policy' OR Smoking ban OR smoking bans OR smoking prohibition OR smoking prohibitions OR tobacco free OR tobacco free policies OR Tobacco free policy OR tobacco-free OR tobacco-free policies OR tobacco-free policy OR vape free OR vape-free)

Appendix B: Data Extraction Form

Methods

Study Design:

Mode of Administration:

Point in Time:

- Baseline only
- Follow up data only
- Baseline and follow up data

Sampling method:

- Convenience sample
- Random sample
- Other

Population

Inclusion Criteria: *If the study meets the inclusion criterias, copy paste this into the text box*

- Publication Year: 2014-2020
- Location: American Universities/ Colleges
- Focus on Student Behaviors
- Campus Smoke/Tobacco Policy enacted

Exclusion Criteria: *If the study meets the exclusion criterias, copy paste this into the text box*

- No access
- Systematic and meta-analysis
- Lack of adequate data to extract
- No Policy
- Not USA
- Retail/ Marketing
- Animal Models
- Not Behavior (eg. only attitudes)
- Not College Campus

Group Differences: *Group differences is just if there is a major difference between the groups that are being compared (Table 2).*

Interventions

Overall Directions: Some boxes will not be applicable to certain studies, and thus can be filled in with "N/A." (Table 3).

Outcomes

Overall Directions: Each study will likely have different outcomes and different ways they are reporting the outcomes; thus, individual tables will have to be built for each article (some articles might have multiple usable outcomes and will have multiple tables that we will

extract).

- Outcome name:
- Outcome type:
- Reported as: Confidence intervals (mean, CI, N), Standard deviation (mean, SD, N), Standard Error (mean, SE, N)
- Outcome group: *usually not applicable*
- Scale: *enter the name of scale*
- Data value: *Is the change calculated from baseline or endpoint (usually change is calculated from baseline)*
- Notes: *anything else that helps us better understand the results*
- *Save as an individual outcome. Enter the timepoints of follow up (i.e., Baseline and 9 months)*
- *Add a new outcome for different types of patients reported outcomes if applicable in the study*
- *****Add location of where students went to smoke (like perimeter, cafe, etc.) ****

Table 2: Baseline Characteristics

Characteristics	Baseline
Sample Size Students (N)	
Sample Size Faculty/Staff (N)	
Gender N man (%)	
Gender N woman (%)	
Gender N other (%)	
Age Mean (SD)	Student & Faculty [Total]
Race/Ethnicity	Student & Faculty [Total] American Indian/Alaska Native: N (%) Asian: N (%) Black or African American: N (%) Native Hawaiian/Other Pacific Islander: N (%) LatinX/Hispanic: N (%) White: N (%)
Setting (Name of Campus)	
Setting (Region)	● Northeast ● Southern ● Central ● Western
Years policy has been implemented (in reference to data collection)	
Follow up timepoints and duration	
Limitations of the study reported by the authors	
Other Relevant Information that has not been addressed yet	

Table 3: Interventions	
Characteristics	
Policy Type (including what products they ban, if applicable)	<p>Copy pastes the policy type that applies:</p> <ul style="list-style-type: none"> ● Partial Smoke free policy ● Partial Tobacco free policy ● Partial Smoke & tobacco free policy ● 100% Smoke free policy ● 100% Tobacco free policy ● Smoke & tobacco free policy ● 100% Smoke & tobacco free policy [comprehensive tobacco policy]?
Policy Diction	<p>Copy pastes the policy diction that applies:</p> <ul style="list-style-type: none"> ● ENDS language used in policy ● ENDS language not used in policy
Other Relevant Information that has not been addressed yet	

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