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Development and evaluation of smoke-free or tobacco-free policies in university settings: A systematic scoping review

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Abstract

We conducted a systematic scoping review to map the available evidence on smoke-free or tobacco-free (SF/TF) university policies globally. We specifically looked at a) how policies were developed and communicated and b) what indicators were used to evaluate their impact. We searched for peer-reviewed literature, published up to January 2020, across ten multi-disciplinary databases. We followed a duplicate, independent data selection, and charting process. We inductively categorized the studies according to the research design and objective of "process" and "impact evaluation." We identified 75 unique studies across 23 countries conducted between 1993 and 2019. Most studies were conducted in the US (46/75, 61.3%), were based on quantitative research design, and focused on impact evaluations; a third (n=28) reported both process and impact evaluations (37.3%). Community engagement and multi-channel communication strategies are mostly used to disseminate SF/TF policies.

The impact was determined by a wide range of indicators for knowledge, attitudes, and behaviors related to policies. There is a mature, relevant body of literature describing the development and evaluation of SF/TF policies in universities. Future reviews could quantify the impact of the bans and may consider process indicators as moderating factors to explain the potential heterogeneity of results.

Introduction

Tobacco smoke, including second-hand smoke and smokeless tobacco, causes cancer, respiratory and cardiovascular disease, chronic diseases, stroke, and diseases of the mouth [1,2]. Research literature indicates that students often initiate heavy smoking behaviors while in college [3–5]. Implementing university tobacco control efforts, such as 100% smoke-free or tobacco-free (SF/TF) policies, can reduce smoking behavior and exposure to second-hand smoke among college students and personnel [6–9]. A 100% smoke-free policy implies that smoking is not allowed anywhere at any time on campus, whereas a 100% tobacco-free policy extends the smoke-free policy to non-combustible products, such as smokeless tobacco [10]. For example, a recent systematic review, which explicitly focused on the determinants of waterpipe smoking among students [11], provided considerations for implementing policies to regulate this behavior. The authors suggested that, in the absence of state-wide regulations on specific tobacco products such as hookah, policy actions should focus on developing effective risk communication strategies and on limiting access to these products in university settings, where students spend most of their time while studying [11].

SF/TF policies are among the recommended strategies to reduce smoking in university settings, which should entail the creation of a tobacco-free normative environment, education, and support through tobacco cessation programs [12]. In the last decade, many academic institutions have become smoke-free, especially in the United States (US). Based on data from the American Nonsmokers' Rights Foundation (ANRF), a 2017 report showed that the number of colleges and universities that had at least a smoke-free policy almost doubled from 2012 [13]. According to the most recent ANRF's report, as of October 2019, there were at least 2,469 100%-smoke free campuses in the United

States. Of these, 2,044 were 100% tobacco-free, 2,074 prohibited electronic cigarette use, 1,089 prohibited waterpipe use, 477 prohibited smoking/vaping marijuana, and 528 applied all tobacco protections to personal vehicles on campus [14].

To what extent are these bans effective? Previous systematic reviews on SF/TF policies in university settings generally suggest that policies are effective in reducing the prevalence of smoking and second-hand smoking [12,15–18]. According to Frazer et al.'s meta-analysis [16], the bans were associated with a positive reduction in smoking prevalence (RR=0.72, 95% CI 0.64 to 0.80; n = 6369, I^2 = 59%). However, these estimates are based on data from two observational studies conducted in US-based university settings. In fact, a major limitation of the currently available review evidence is that it is based on a few studies, mostly coming from the US. In fact, Murphy-Hoefer et al.'s 2005 review [18] included 14 reports, published from 1980 until 2013, only 2 from Europe (one from Germany and one Switzerland); Rodgers et al.'s 2012 review [12] identified 8 studies published in 2001-2009, all from the US; Lupton et al.'s 2015 review [17] identified 19 reports, published up to 2013, of which one was from the UK; Frazer et al.'s Cochrane review [16], identified 2 studies in universities, published between 2011 and 2012, both from the US; Bennett et al.'s review focused explicitly on 11 studies from US colleges, published up to 2016 [15].

From the current review evidence, we know very little about the process of development, implementation, dissemination, and evaluation of these policies, fundamental knowledge that is necessary to inform policy-making efforts [19]. According to the implementation framework proposed by Moullin and colleagues [20], the process of implementation of an innovation, such as a SF/TF policy, depends on

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various stages or steps, which should take into account three core elements: factors (also called barriers and enablers or determinants of practice), strategies (approaches to address the factors and implement the innovation), and evaluations (e.g., feasibility, efficacy, and effectiveness). Currently, no review has reported on how the policies are developed (process) and disseminated (communication strategies used), and what indicators are used to estimate the effectiveness.

We conducted a systematic scoping review [21–24] with the aim to map and characterize the evidence available globally and describe how these policies were developed, communicated, and evaluated. In particular, we were interested in understanding whether community engagement and communication strategies were used to promote the uptake of policies among academic communities, as well as what process and impact indicators are related to the evaluation of SF/TF policies.

Methods

We followed Arksey and O'Malley's framework [25], which entails (1) identifying a research question, (2) identifying relevant studies, (3) selecting the relevant studies based on the research questions,(4) charting the data, and (5) collating and summarizing the results.

Research questions

The general research question of this review is: How has the process of developing a SF/TF university policy been described in the literature? Specifically, we wanted to understand: 1) How were these SF/TF policies developed and communicated? i.e., What

communication channels and methods were used to promote these policies? 2) What type of indicators are used to determine the impact of the bans?

Identification of studies

Search strategy

Searches included the combination of two concepts: "smoke-free policy" and "universities", as a setting for these policies. The first concept was defined through medical subject heading (MeSH) "Smoke-Free Policy" and keywords "smoking", "smoke", or "tobacco" near to "free", "legislation", "law", or "policy" (with appropriate truncation variations). The second concept included the MeSH term "Universities", in combination with keywords such as "university", "college", "educational institution", or "campus" (with truncation variations). In databases without controlled vocabulary, only keywords were used and searches were restricted to database-defined subject headings. Examples of searches for four databases are provided in Supplemental Material 1.

Sources of information

With the help of an expert librarian, we selected 10 multi-disciplinary databases to have a broad coverage of the topic, combining economics, medical, health, behavioral, and social sciences: Medline (access provided by Ovid), Academic Search Complete, Business Source Complete, CINAHL, Communication Mass Media Complete, EconLit, ERIC, PsycINFO, (access via EBSCO), Cochrane Library, and ProQuest Central. Searches were not restricted to any timeframe, language, or article type. Database searches were completed, and references retrieved on June 8, 2017; search updates were conducted on January 3, 2020. The reference lists of systematic reviews identified through the search were also used as sources of additional references.

Study selection

We followed the Population-Concept-Context (PCC) framework [26] to define our inclusion criteria. The PCC framework is used to define the scope of a review according to the population of interest, the context, and the concepts that are investigated. To be included, records had to be peer-reviewed, original research articles, available in English, and discuss the development, implementation, or evaluation processes of SF/TF policies (concept) in university settings (context). As additional contextual elements, references had to either report on the process (e.g., the development of a policy, or the communication channels and methods used to promote it) or on the impact evaluation of the policy on knowledge, acceptability, cognitions related to the policy (e.g. attitudes towards the policy), or smoking-related behaviors (e.g. number of smokers before and after the policy, number of cigarette butts found on campus). We included any type of studies focusing on academic communities as targets of the policy.

We excluded records that: were not published in English, were not original research articles, and did not discuss the development, implementation, or evaluation of a university SF/TF policy. We also excluded records that discussed: a) SF/TF policies, not in university settings (e.g., nationwide smoking policies); b) other types of policies in university settings; c) general guidelines for implementing ideal or potential future policies; d) content analyses of SF/TF policies in university settings, or surveys that did not include information on the development, implementation, or evaluation of the policy in; e) smoking cessation trials (not linked to policies) in university settings.

Two research assistants independently screened the titles and abstracts of the retrieved records and applied the inclusion criteria. Two calibration exercises were performed with a randomly selected sample of 20 and 30 records, until acceptable levels of agreement and inter-rater reliability were achieved. The level of agreement in the first round was moderate (70% agreement, Gwet's AC1=0.52), and it became very good in the second round (90% agreement, Gwet's AC1=0.87) [27]. A third reviewer (MB) resolved all disagreements. The same procedure was followed during the full-text screening phase, in which two other research assistants did the review. All disagreements were resolved by a third reviewer (MB) and discussed with a fourth researcher (NEB).

Data extraction and charting process

From each included record, we extracted information related to the characteristic of the original research report: first author and year of publication, the purpose of the report (as reported by the authors in the methodology section of the papers), name of the university, country, and year of implementation of the policy, if available. This information was used to map records to "studies", representing the university where the policy was implemented. For each study we also extracted the following information: details about the type of the SF/TF policy (e.g., total ban vs. partial ban; presence of designated smoking areas, definition of tobacco or tobacco-free products, including e-cigarettes), as described in the documents by the authors; whether and how the academic community was engaged in the process; whether and how communication tools (e.g., messages) were reported; what indicators were used to establish the impact of the policy, categorized under "knowledge/awareness about the policy", "Attitudes towards the policy", "Behavioral indicators" related to the policy (e.g. observed compliance on campus, number of violations, cigarette butts). We also captured individual-level

indicators related to smoking behavior (e.g., number of quit attempts, number of cigarettes smoked), and cognitive predictors of smoking behavior (e.g., attitudes towards smoking, perceived behavioral control, intentions to quit, positive or negative beliefs about smoking-related consequences), as they can be considered important indicators of an effect of the policy.

Studies were inductively categorized according to the following variables: type of research design ("qualitative", "quantitative", or "mixed methods"), and research objective ("process" or "impact evaluation", or both). Characteristics of the ban were also inductively categorized into "total ban", when a complete ban of any tobacco, smokeless, and smoking products were included in the policy, including e-cigarettes); and "partial ban", when the ban included concessions (such as smoking outside a certain perimeter or in designated smoking areas, or allowed some products to be smoked). Process studies were those that reported information on community engagement and communication strategies used to promote a policy. Impact evaluation studies had to report data on the effects of the SF/TF policy on three main levels: knowledge or awareness about the policy, attitudes towards the SF/TF policy, and behaviors (e.g., number of cigarettes consumed, prevalence of smoking, compliance with the policy, etc.). We extracted information about the outcomes as defined in the study reports; each instance (type of variable) was recoded into sub-categories belonging to the overreaching categories of knowledge, socio-cognitive factors, behaviors related to the policy, and institutional and individual factors related to smoking behavior.

Two research assistants independently extracted the information using a standardized online form. A reviewer (MB) compared the results and combined the extracted

information in a table for the team to review. Another reviewer (NEB) completed the data extraction and charting of the selected studies. MB and NEB cross-checked the final charting database for consistency and resolved any inconsistencies through discussion with MB.

Results

Search results

Searches in the 10 selected databases, up to January 3, 2020, yielded 2,363 records (see PRISMA flow diagram in Figure 1). After duplicates were removed, the titles and abstracts of 1,385 unique records were screened for relevance. At the title-abstract stage, 1,076 records were excluded (85% agreement, Gwet's AC1=0.81) and 309 references were screened in full-text. Of these, 204 were excluded because they: were duplicates (n = 38); were only in abstract format (n = 5); were not in English (n=7); were systematic reviews on the topic (n = 7); discussed SF/TF policies not in specific university settings (n=35); discussed other kinds of university policies (n = 2); were commentaries, not original research, general overviews, and reviews related to SF/TF policies (n = 61); content analyses or desk reviews of SF/TF policies (n=12); reported smoking cessation trials, but not linked to a specific SF/TF policy (n=37). A list of the excluded references is provided in Supplemental Material 2.

<< Insert Figure 1 about here >>

Charting results

We included 105 references, published between 1993 and 2019, representing 75 unique studies, which described the development or implementation and evaluation of SF/TF university policies in various universities. As shown in Figure 2, most studies

were conducted in North America (50/75, 66.7%), including the United States (46

studies), and Canada (4 studies: [9,28–31]); one study was conducted in Brazil [32]; 10

studies (14.7%) were conducted in Asian countries, such as Japan (3 studies: [33–35]),

China [36], South Korea [37], Taiwan [38], Vietnam [39], India [40], Pakistan [41], and

Malaysia [42]; 4 studies came from Europe (Germany [43], Ireland [44–46], Switzerland

[47], and Russia [48]); 6 from the Middle East and North Africa (Bahrain [49], Egypt

[50], Israel [51], Lebanon [52], Saudi Arabia [53], and Sudan [54]; and 4 from Oceania (3

studies from Australia [55–58], 1 from New Zealand [59]). While the majority of the

studies were of single universities, some reported case studies or analyses of multiple

universities based in Australia [55], Canada [28], China [36], India [40], New Zealand

[59], Russia [48], Sudan [54], and USA [60–69].

<< Insert Figure 2 about here >>

Type of research design and research objectives

Table 1 provides a summary of the studies according to the type of research design and

research objectives (process, impact, or both), which are further summarized in Table 2.

Thirty-five studies out of 75 were categorized as impact evaluations only (46.7%), 28 as

both process and impact evaluations (37.3%), and 12 as process only (16.0%). All in all,

information on the process was extracted from 40 studies (53.3%), and information on

outcomes used to measure impact was extracted from 63 impact evaluation studies

(84.0%). Most research was classified as quantitative (45/75, 60.0%), followed by

qualitative (16/75, 21.3%) and mixed methods (14/75, 18.7%). Process only studies

were predominantly qualitative (8/12, 66.7%), based on case studies describing the

development of policies (e.g. [28,30,40,55,63,70–73]), or reporting observations,

interviews [59,74], and focus groups [28] used to gain insight from different

stakeholders. Impact only studies were predominantly quantitative (30/35, 85.7%), mostly based on cross-sectional surveys collecting information about various indicators of impact (further described below). Some impact studies included empirical research used to test interventions aimed at improving the acceptance or use of a policy, such as before-after studies [33,39,47,62,75–79], or quasi-experimental interventions [37,48].

<< Insert Table 1 about here >>

Research question 1: How are policies developed and communicated?

All studies reported information that allowed us to categorize the type of ban described or analyzed. Most studies described the institutionalization of total bans (43/75, 57.3%); 20 studies (26.7%) reported partial bans only; 10 studies (13.3%) reported a mix of partial and total bans, as they analyzed the situation in various institutions; the remaining 2 studies described a progressive policy development from a partial to a total ban in the same institution (one in Brazil [32] and one in Ireland [44–46]). A total of 8 studies (all published between 2016 and 2019 and all coming from the United States) specifically mentioned electronic cigarettes (or e-cigarettes) in the policy [69,78–84]; only 3 studies looked at the prevalence of e-cigarette smoking before and after the introduction of a ban [79,80,84], reporting mixed results, with no changes [80], or an increase in e-cigarette consumption after adoption of a SF/TF policy [79,84].

Studies that reported information related to the process of developing a SF/TF policy (n=40) employed some "community engagement" activities (i.e., involving various stakeholders in a bottom-up participatory approach), and in using a variety of communication tools to disseminate information about the new policies.

Community engagement: Twenty out of 40 process studies (50.0%) reported information about the engagement of different stakeholders within an academic community with the aim to develop a policy or to ensure its acceptance. Eleven studies out of 40 (27.5%) described a "bottom-up" approach, with the establishment of a task force, inclusive of employees, faculty, staff, and students, with the task of drafting the policy and of developing initiatives to promote it, obtaining feedback on the policy from university personnel (student, staff, faculty) before implementing it [40,47,63,67,70–72,85–87]. These task force groups developed comprehensive plans, providing assistance with tobacco cessation (e.g., Nicotine Replacement Therapy, educational sessions). They also were tasked to train university personnel on the policy and how to deal with violators; developing an enforcement strategy; and changing the university's physical environment (e.g., removing ashtrays or smoking areas). A few other studies described the establishment of student ambassador programs [74,78,83] or coalitions within the same institutions [88,89] or among different universities [55].

<< Insert Table 2 about here >>

Communication tools and strategies used: Thirty-four of the selected process studies (34/40, 85.0%) reported information about communication tools used to promote SF/TF policies in universities. Communication activities were generally aimed to increase awareness about the policy, increase compliance, promote tobacco cessation programs, or enforce the policy. A notable case is the well-documented experience of the University of Kentucky [90–102], which introduced the "3Ts framework: Tell, Treat, Train", supporting the awareness, enforcement, and skill-building components on a comprehensive policy implementation program. Campaigns aimed at raising awareness about the new policy generally utilized a wide variety of communication tools, such as

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printed materials, digital, or face-to-face channels. Messages to describe an SF/TF policy were printed on posters, leaflets, brochures, manuals, message cards, signage, panels, banners, letters with weekly fact sheets, or even on staff paychecks [32], or on the handbook for new students and staff [68,69,103]. Some universities developed also branded merchandise (e.g., slogan labeled lighters, bookmarks, pencils [47], napkins, calendars, coffee stands [88]). Digital modes included on-campus display screens, emails, letters, websites, and social media such as Facebook or MySpace [63]. Some other studies reported conducting media campaigns to reach out to national press and radio networks [88,90].

Research question 2: What type of impact indicators?

Information on the outcomes used to establish the impact of SF/TF policies was extracted from 63 studies. Overall, the research considered outcome effects of SF/TF policies at three main levels: knowledge or awareness about the policy (28/63, 44.4%), socio-cognitive factors related to policy implementation (33/63, 52.4%), and behaviors (58/63, 92.1%). Thirteen studies reported the impact of SF/TF policies on all three levels (13/63, 20.1%), while a few focused either on attitudes (3 studies, 4.8%) or on behavior alone (17 studies, 27.0%). Across all 63 studies that reported indicators, we identified 299 instances of impact indicators (k), which were coded and grouped according to five categories: knowledge (k=32, 2 unique indicators), socio-cognitive factors (k=114, 16 unique indicators), behaviors related to the policy (k=71, 16 unique indicators), institutional factors (k=16, 11 unique indicators), and individual factors related to the behavior (k=88, 14 unique indicators) (Table 3). Institutional factors came mostly from the Montana State University (USA) case [3] which included an evaluation of the costs associated with the implementation of the policy. For each main

category, the most frequently reported sub-categories of indicators were respectively: "knowledge about the policy" (k=31), "support of specific aspects of the policy" (k=35), "observed compliance" (e.g., number of violations, smokers on campus or designated areas, cigarette butts littered) (k=25), "institutional costs" (k=5), and "self-reported prevalence of smoking/tobacco use" (k=62).

<< Insert Table 3 about here >>

Discussion

Principal findings

The aim of this scoping review was to map the global research evidence discussing the development process and reporting impact evaluations of SF/TF policies in university settings. Based on our strategy, we identified 75 studies from 23 countries in the world, a larger number compared to the systematic review evidence published to date [12,15–18]. With the earliest evidence dating back 30 years, the variety of studies we included in this review demonstrate the global nature of the SF/TF universities' movement. The United States is still spearheading this movement, consistent with the previous reviews, but important lessons can be learned from the Far East or other Asian countries, as well. More research is needed from Europe, the Middle East, South America, and, most importantly, from the African continent. While there is a general absence of published research from this continent [104], African-based institutions that decide to become 100% tobacco-free or smoke-free should document their efforts and report how they have done it (the process) and the effects they have achieved (impact).

Research design and objectives

In this review, we presented a valuable reference of studies for researchers interested in developing SF/TF university policies. We found a considerable body of evidence on the process that leads to the development of such policies. More than half of the 75

studies included in this review reported information on how policies were developed and implemented or enforced (n=40). A large majority of these studies (34/40, 85.0%) reported information on communication tools used to create awareness about the policy, or to change beliefs, or to enforce behaviors.

Most impact evaluation studies included in this review were based on quantitative research (43/63, 68.3%), based on cross-sectional surveys or observations. Only 7 studies out of 63 (11.1%) were based on qualitative research, and 13 out of 63 (20.6%) were based on both qualitative and quantitative methods. While it is important to quantify the impact of a policy in numeric terms, as it will allows researchers to conduct meta-analyses (e.g. [16,17]), it would be useful to assess and document the reasons why people do not support a policy. Hence, we recommend that more research is done to provide a comprehensive understanding of how and why a policy is accepted, using a combination of qualitative and quantitative methods.

In line with the ANRF's recent report [14], more than half of the studies included in this review reported the enforcement of a 100% TF policy, banning any smoking and smokeless products, including e-cigarettes and vapor products. Eight out of 75 (10.7%) studies mentioned e-cigarettes as part of a SF/TF policy, but only 3 studies, all published in 2019, looked at how a policy affected their consumption [79,80,84]. The evidence in this area is scarce and immature and more studies are needed to determine the impact of this phenomenon on young generations of students.

Research question 1: How are policies developed and communicated?

Aligned with the recommendations for comprehensive SF/TF university policies presented in Rodgers' review [12], 11 studies among the 40 process studies suggested that policies need to be promoted using a participatory approach, creating task forces or committees with representation from administrative staff, faculty, students, and non-administrative staff. Communication channels and delivery modes should also be aligned with this inclusive approach and follow the "3-Ts" framework (Tell, Treat, and Train) [91] to communicate, provide support for those willing to stop or quit smoking, and for those enforcing the policy.

Research question 2: What type of impact indicators?

More than 80% of the included studies provided information on the impact of SF/TF university policies on various levels, including knowledge about the policy, attitudes towards it, and, most importantly, on smoking-related behaviors. About half of the included impact evaluation studies (33/63, 52.4%) documented the assessment of attitudes towards the policy as a proxy indicator of the policy's acceptability. This demonstrates the attention of researchers in documenting how university constituencies perceive the policy. The available studies may complement the information included in Lupton's review [17], which reported evidence only from US-based studies. Only a few studies (13/63, 20.6%) reported outcomes related to all levels of knowledge, attitudes, and behaviors together, limiting our understanding of the processes of behavior change, including cognitive, belief, and behavioral systems.

Unlike other recent systematic reviews on the topic [12,15–18], we can conclude there is a sufficient number of studies that report on the impact of SF/TF policies. Overall, 63

studies documented the impact on behaviors. Future systematic reviews and meta-analyses may quantify the effects sizes of interventions of objective measures of compliance (e.g., observed number of violations, cigarette butts collected), or on the presence of enforcement, as well as knowledge related to the policy and support of the policy (as a proxy indicator of acceptability). The process studies may allow identifying potential sources of heterogeneity, which was not explained in previous systematic reviews that included a meta-analysis [16,17].

Conclusions

There is a considerable body of literature describing the development of SF/TF university policies, including important insight on the processes of developing, implementing, and evaluating these policies. Future systematic reviews and meta-analyses could be conducted to estimate the effects of SF/TF policies combined with process indicators, considering the different modalities of their implementation as potential moderating factors.

Strengths and limitations

To the best of our knowledge, this is the first systematic scoping review of the evidence that looked at the development process and the impact evaluation of SF/TF policies, specifically quantifying the type of research and methodologies adopted to establish the process or the impact of these policies. Unlike other systematic reviews on the topic [11,12,15–18], we included global evidence, with a relevant amount of studies coming from outside the US. This is also the first review that looked at the process of developing an SF/TF policy, not only focused on estimating its effects. We considered strategies of community engagement and communication tools as necessary elements for diffusing

the policy among the various stakeholders of an academic community. One of the strengths of this scoping review is that we searched a broad range of academic databases, more than those utilized in the existing reviews. We did not restrict our searches to a specific time period, country, or population. Another strength is that we followed a systematic process for selection and data extraction.

Limitations of this review include the fact that we did not publish a review protocol and that we included only peer-reviewed articles available in English. For feasibility reasons, we included among our 'grey literature' sources, databases that include dissertations and theses (e.g., ProQuest Central or Academic Search Complete); however, we did not search in open-access journal repositories nor we did look at reports that were not submitted to refereed journals. It is possible that some evidence on the process and on the impact of TF policies could be included in non-peer-reviewed literature. Another limitation is the intrinsic subjectivity in using an inductive approach used in scoping reviews for categorizing the literature. We tried to minimize this bias by using a standardized charting/data extraction form and by discussing the categorizations within our review team.

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