



Published in final edited form as:

*Health Commun.* 2019 March ; 34(3): 361–369. doi:10.1080/10410236.2017.1407274.

## Systematic Review of Health Communication for Non-Cigarette Tobacco Products

Jennifer Cornacchione Ross<sup>1</sup>, Seth M. Noar<sup>2</sup>, and Erin L. Sutfin<sup>1</sup>

<sup>1</sup>Department of Social Sciences & Health Policy, Division of Public Health Sciences, Wake Forest School of Medicine

<sup>2</sup>School of Media and Journalism, University of North Carolina, Chapel Hill

### Abstract

The Food and Drug Administration, which now has regulatory authority over all tobacco products meeting the statutory definition, is tasked with communicating the risks of these products to the public through health warnings and public education. However, there have been no attempts to summarize what is known about NCTP health messaging. We conducted a systematic review to examine the existing literature on health communication for NCTPs and identify key research gaps. A total of 45 unique studies were retrieved and coded, with the majority focused on messaging for smokeless tobacco (SLT,  $k=32$ , 71.1%), followed by waterpipe tobacco ( $k=9$ , 20%), electronic nicotine delivery systems (ENDS,  $k=2$ , 4.4%), cigars ( $k=2$ , 4.4%), and a potentially reduced exposure product ( $k=1$ , 2.2%). Studies most commonly examined tobacco product warnings ( $k=26$ , 57.8%) and public education ( $k=19$ , 42.2%), which included mass media campaigns. Most studies examined knowledge, attitudes, and beliefs as outcomes ( $k=27$ , 60%), while behavior was an outcome in the minority of studies ( $k=8$ , 17.8%). Pictorial warnings and public education about NCTPs demonstrated positive impact in some studies, although the literature is nascent. Given the increasing use of NCTPs such as ENDS, waterpipe tobacco, and cigars, particularly among adolescents and young adults, more research is needed on effective ways to communicate product risk to those audiences most at risk.

---

There has been a substantial increase in availability and use of non-cigarette tobacco products (NCTPs), including several types of electronic nicotine delivery systems (ENDS), smokeless tobacco (SLT), waterpipe tobacco (WT), and little cigars and cigarillos (LCCs). Recently, NCTP use has substantially increased among adolescents and young adults (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016). High rates of use may be partially attributed to users' lack of knowledge about the products, including their health risks (e.g., Sutfin et al., 2011). Generally, people perceive NCTPs to be less risky compared to cigarettes because they are used infrequently, are perceived to have 'filtering' features (waterpipe), and are viewed as less addictive (e.g., Cornacchione et al., 2016; Wagoner et al., 2016). However, NCTPs are a threat to public health for several reasons: 1) the smoke/aerosol contains constituents that are harmful to human health (Koszowski et al., 2015;

Shihadeh et al., 2015); 2) they contain nicotine that can lead to and maintain addiction (Aboaziza & Eissenberg, 2014); and 3) they have known health risks, such as decreased lung function, cancer, and heart disease (e.g., Chang, Corey, Rostron, & Apelberg, 2015; Waziry, Jawad, Ballout, Akel, & Akl, 2016). Non-combustible tobacco products (ENDS, SLT) are believed to be less harmful than combusted tobacco products because the tobacco is not burned (e.g., Wagoner et al., 2016). Although they may be less harmful than cigarettes, these products still present some health risks, yet long-term health effects of ENDS are still unknown.

Across diverse health arenas, there is a substantial body of evidence demonstrating how health communication impacts individuals' knowledge, beliefs, attitudes, and behavior (e.g., Atkin & Rice, 2013; Snyder & LaCroix, 2013). In particular, there is evidence that messages in the form of health warnings (Brewer et al., 2016; Noar, Francis, et al., 2016; Noar, Hall, et al., 2016) and communication campaigns (Durkin, Brennan, & Wakefield, 2012), are effective in reducing tobacco use. For instance, exposure to anti-smoking campaigns has been shown to reduce smoking initiation (Farrelly, Nonnemaker, Davis, & Hussin, 2009), increase anti-tobacco attitudes and beliefs (Farrelly et al., 2002), and increase calls to cessation quitlines (Farrelly, Hussin, & Bauer, 2007). In a meta-analysis of experiments, Noar, Hall, et al. (2016) found pictorial warnings on cigarette packs to be more effective than text-only warnings on several outcomes, including negative pack/brand attitudes, and intention to not start smoking. Observational studies suggest that pictorial warnings on cigarette packs increase knowledge of smoking health risks and calls to quitlines (Noar, Francis, et al., 2016), and a recent trial found pictorial warnings on cigarette packs increased quit attempts (Brewer et al., 2016). Although messaging is effective, the majority of this research has focused on cigarettes.

Under the Family Smoking and Prevention and Tobacco Control Act, the Food and Drug Administration (FDA) recently "deemed" all tobacco products to be under their regulatory authority (FDA Deeming Regulations, 2016). This extends the FDA's regulatory authority to cover tobacco products that were not originally covered by the Tobacco Control Act, such as ENDS, WT, and cigars. As part of these rules, the FDA will require the display of at least one health warning message ("Warning: This product contains nicotine. Nicotine is an addictive chemical.") on all newly-deemed tobacco product packaging and advertisements for the protection of public health. Additionally, the FDA is required to communicate tobacco product risk to consumers (FDA Deeming Regulations, 2016), which could take the form of campaigns. Given this, the FDA has indicated that research on health communication about NCTPs – including warnings and campaigns – is a significant research priority (for example, see National Institutes of Health RFA-OD-17-003).

Despite a large literature on health communication to reduce cigarette smoking, including many reviews and meta-analyses, there have been no attempts to synthesize what is known about NCTP health messaging. Because the nature of NCTPs and their corresponding risk perceptions are different than for cigarettes (e.g., Wackowski & Delnevo, 2015) health communications that have been effective for cigarettes might not be effective or easily adapted for NCTPs. To gain a comprehensive understanding of what is known about NCTP messaging, we conducted a systematic review to examine studies on NCTP messaging to

date. Identifying what is effective for NCTPs is important to inform policy, withstand legal challenges, and guide future research. Thus, the current review aims to determine what health communication message approaches for NCTPs have been developed and tested in the extant literature. In so doing, we illuminate gaps in the literature and highlight needs for future research.

## Methods

### Search Strategy

A comprehensive, systematic detailed strategy was undertaken at two time points to search for all articles related to health communication messaging and NCTPs. First, two research assistants searched several computerized databases in September, 2014 and again in May, 2016 to locate all relevant articles. A list of search terms was generated by the authors to encompass different types of NCTPs and different forms of messaging. This systematic review was focused on messaging generally, rather than a specific message type (e.g., warning labels), so the list of keywords was broad to capture all such work. Communication- and tobacco-relevant keywords (including variations of these terms, especially for ENDS) were used in combination in the search, such as “waterpipe,” “e-cigarette,” “little cigar,” and “warning,” “campaign,” “media;” the keywords were searched in *Communication & Mass Media Complete*, *PsycInfo*, *PubMed*, *Web of Science*, and *Science Direct*. Second, to include grey and unpublished literature, we sent emails asking for conference work and unpublished studies to individual researchers and relevant listservs (Society for Research on Nicotine & Tobacco; Communication Research & Theory Network). We also included any unpublished work that came up in our database searches (e.g., dissertations). Third, once we identified the final sample of articles to include in the review, we searched the references cited in those articles to identify other possible articles to include. Finally, a Google Scholar search was conducted to see if any of the studies in our review were cited by other relevant studies to potentially include.

Inclusion criteria were kept broad so that a description of the current state of the research could be provided. Studies included in the review had to: 1) examine at least one NCTP, 2) examine health messaging for NCTPs using any communication channel, and 3) report original data using quantitative or qualitative methods. The two research assistants applied these inclusion criteria throughout the screening process. First, articles were screened based on title, with articles clearly not relevant to the review removed. Next, articles were screened based on abstracts. Finally, the remaining full articles were obtained and screened based on a full text review. Figure 1 displays the PRISMA flow diagram that demonstrates the retrieval and inclusion/exclusion process.

### Article Coding

The first author read through several of the final articles to develop the coding form, in collaboration with the study team. Operational definitions and examples were included in the codebook. Decisions were made to code characteristics that have been included in similar reviews on cigarette messaging (e.g., Noar, Hall, et al., 2016) and were of interest given the goals of the current review project. Given the early stage of this area of research,

we aimed to characterize the make-up of the current literature. Articles were extracted and coded by two research assistants in three major areas: sample/demographic characteristics, study characteristics, and message characteristics. Each article was coded by two independent coders, and the first author resolved any coding discrepancies.

Within *sample/demographic characteristics*, data extracted/coded included raw sample size, age cohort of study (adolescents, young adults, older adults), sex (percent male and female), race/ethnicity (percentage of each race/ethnicity reported in the study), and sexual orientation of study participants (heterosexual, LGBT, or not reported). For *study characteristics*, data extracted/coded included study type (experiment, non-experimental survey, focus groups, interviews, content analysis, other), study design (between or within subjects), type of study data (cross-sectional, longitudinal), dependent variables (construct name, definition, and items), and study findings for each dependent variable. To code study findings, we indicated for each DV whether 1) there was an effect (i.e., statistically significant at  $p < .05$  or a percentage  $> 50\%$ ); 2) there was no effect; or 3) there was an effect but in the unintended/undesired direction. This was done for each sub-variable included in Figure 2. Within *message characteristics*, data extracted/coded included message type studied (warnings, public education) and message theme (anti-industry, constituents, health effects, cosmetic effects, addiction, relative risk, other, not reported). For example, a message theme was defined as a health effect message if it referenced the general health effects of using the tobacco product or a specific health effect. Message themes were only coded if they were explicitly stated or presented in the article.

## Results

The final sample consisted of 42 articles reporting on 45 distinct studies. Most studies were about SLT ( $k=32$ , 71.1%), including snus ( $k=5$ ), chewing tobacco ( $k=4$ ), and dissolvable tobacco ( $k=4$ ); the remainder of these did not specify SLT type. Nine studies focused on messages for waterpipe (20%), two for ENDS (4.4%), two for all cigar types (4.4%), and one “potentially reduced exposure product” (2.2%).

### Study Characteristics

The 45 studies were conducted in 8 different countries, with the majority being conducted in the United States (71.1%; see Table 1). Sample sizes ranged from 20 participants to 36,451. Across all studies, males made up over half of the samples (58.9%). The most common participants were white (55.6%), other/mixed (51.1%), or black (42.2%) race. Forty-two percent were Hispanic/Latino. Income was reported in 32.6% of studies, and sexual orientation of participants was not reported in any studies. Fourteen studies included adolescent participants (31.1%), but only 9 of those studies (20%) either focused only on or reported results for adolescents. Young adults were included in the majority of study samples (77.8%) but only 15 studies (33.3%) reported young adult results, including college student samples. Most studies ( $k=43$ ; 95.6%) reported on tobacco use of its participants (both cigarettes and NCTPs), with many ( $k=26$ ; 57.8%) having tobacco use a component of the participant inclusion criteria.

Most studies used convenience samples (66.7%), and some used probability-based sampling (20%). Four study methodological approaches were used, with most being experiments (68.9%), followed by cross-sectional, non-experimental surveys (22.2%), qualitative focus groups or interviews (11.1%), and one content analysis (2.2%). Most studies were cross-sectional ( $k=38$ ; 84.4%), while 15.6% were longitudinal ( $k=7$ ). Six studies (13.3%) reported use of theory to guide the research.

Dependent variables were coded to examine study outcomes and evaluate key study findings. They were coded and organized into the Message Impact Framework (see Figure 2; Noar, Hall, et al., 2016). The most common outcomes studied were *knowledge, attitudes, and beliefs* (KAB; 60%), followed by *behavioral intentions* (44.4%). Forty-two percent of studies examined *message reactions*, while 37.8% assessed *attention and recall*. *Perceived message effectiveness* was assessed in 24.4% of studies. The least often assessed category was *social interactions* (6.7%).

### Message Characteristics

The message types studied fell into two major categories: warnings ( $k=26$ , 57.8%), such as labels on packaging or advertisements, and public education ( $k=19$ , 42.2%), including mass media campaigns. Warning studies mostly focused on manipulating warning design (e.g., size, colors, text v. pictorial, presence of warning), warning text (health effects, relative risk), or asking people to report their awareness, exposure, or recognition of existing warnings. Most public education studies designed or evaluated media campaigns or message-based interventions, or developed or tested campaign messages aimed to educate the public about the health risks of the tobacco product being studied.

The content of the messages was also coded to determine what themes were being communicated. The majority of studies included messages that focused on the health effects of using the NCTPs ( $k=37$ ; 82.2%), including causing cancer or gum disease. Several other studies focused on the toxic chemicals (constituents) found in the smoke of the products ( $k=13$ ; 28.9%). These messages were mostly focused on nicotine as a constituent, or discussed harmful chemicals vaguely, without specifying constituents. Other messages were focused on addiction to the products ( $k=12$ ; 26.7%), relative risk or reduced harm of the NCTPs compared to traditional cigarettes ( $k=13$ ; 28.9%), and anti-industry ( $k=4$ ; 8.9%) themes. Ten studies (22.2%) focused on an 'other' message theme, including social consequences of using the product, and four studies (8.9%) did not report on or provide enough information to code for message content.

### Key Study Findings

Given the range of NCTPs, message types, and study designs, a meta-analysis of study findings was not undertaken. However, whether an effect (significant at  $p<.05$  or a percentage  $>50\%$ ) was found was coded (yes, no). Results are presented by message type: warnings and public education.

For studies on NCTP warnings, *attention and recall* effects were found in 85.7% ( $k=14$ ) of studies that examined this outcome. For example, one study found that the majority of SLT users recalled being exposed to SLT warnings (Agaku, Singh, Rolle, & Ayo-Yusef, 2016).

Over half (63.6%,  $k=15$ ) found effects on *message reactions* for warnings studies. In particular, several studies demonstrated the effect of warnings on cognitive elaboration – i.e., thinking about the risks (e.g., Johnson, Wu, Coleman, & Choiniere, 2014). Warning messages also had an effect on *KAB*, with 71.4% ( $k=14$ ) of studies reporting a positive effect. For example, warnings resulted in increased negative attitudes towards SLT (Mutti et al., 2015). *Intentions* were positively influenced by messages in 55.6% ( $k=9$ ) of studies. However, this included the influence of warnings aiming to switch cigarette smokers to SLT (Callery, Hammond, O’Connor, & Fong, 2011). *Behavior* was assessed in 2 studies, with warnings influencing behavior in both of those studies, including quitting and quit attempts (Agaku et al., 2016; Mohammed, 2013). Finally, effects for *perceived effectiveness* were found in all ( $k=6$ ) of the studies, including rating the warning as being effective to quit using tobacco (Brubaker & Mitby, 1990).

For public education studies, *attention and recall* effects were found in all ( $k=3$ ) studies that looked at this outcome, such as a sample majority recalling SLT campaign messages (Vogeltanz-Holm, Holm, White Plume, & Poltavski, 2009). The studies that assessed *message reactions* found positive effects for public education messages in 50% of the studies ( $k=8$ ). For example, messages increased worry about the health effects of WT smoking (Lipkus, Eissenberg, Schwartz-Bloom, Prokhorov, & Levy, 2011). In the 13 studies that assessed *KAB*, 76.9% found effects for public education messages, such as changing relative risk of WT smoking compared to cigarettes in the correct direction (Mays, Tercyak, & Lipkus, 2016). Public education messages increased *intentions* in 72.7% of studies ( $k=11$ ). For example, intention to quit using SLT increased after campaign exposure (Murukutla et al., 2012). *Behavior change* was seen in 66.7% of studies that looked at this outcome ( $k=6$ ), including higher rates of SLT quitting after intervention exposure (Walsh et al., 2003). Public education messages also resulted in increased *social interactions* about the messages in all studies ( $k=3$ ). Finally, messages were rated high in *perceived effectiveness* in 75% of studies that looked at this outcome ( $k=4$ ), such as evaluating an intervention as being effective (Walsh et al., 2003). See the Online Supplement for an overview of each study, including key findings.

## Discussion

This systematic review is the first examination of the health communication literature about NCTPs. Our comprehensive literature search identified 42 articles that tested NCTP messaging, with 45 individual studies examined. Most were conducted in the US, focused on adults, and examined SLT. The majority were short-term and cross-sectional, with experiments as the most common method. Additionally, the majority of messages focused on the health effects of using the tobacco product and examined NCTP warnings.

This review demonstrates the dearth of research on health communication about diverse NCTPs, with very few studies for any NCTPs other than SLT. Thus, research needs to expand to other products. Research is urgently needed to inform FDA’s communication efforts for both warning labels and public education campaigns for NCTPs. At least one specific text-only warning will be required on all tobacco products (“Warning: This product contains nicotine. Nicotine is an addictive chemical”) beginning in May, 2018. This warning

will be the only warning for both ENDS and WT. All cigar products will require the display of 6 different text-only warnings. To our knowledge, there is currently no published research assessing the effectiveness of these warnings for the newly deemed products. It is particularly important to provide evidence demonstrating the effectiveness of these policies for the protection of public health, and to help withstand legal challenges that may claim that these policies do not advance the government's interest in increasing knowledge and decreasing tobacco use. The FDA has been challenged twice in regard to cigarette graphic warnings (*Discount Tobacco v. Food and Drug Administration* in 2009 (6<sup>th</sup> Circuit), and *RJ Reynolds Tobacco Co. v. Food and Drug Administration* in 2011 (DC Circuit)). In the *RJ Reynolds* case, which was the challenge to the cigarette warning images and text selected by the FDA in its rulemaking, the plaintiffs claimed that the warning images violated their First Amendment rights. The DC circuit ruled that the graphic warnings did not directly advance the government's interest in decreasing smoking rates, and found specific warnings to be "neither factual nor accurate" because the images did not necessarily represent the text warning and they were designed to evoke emotions, rather than educate consumers about risks. Lessons learned from these court cases should be considered as researchers develop and implement studies on NCTP warnings. For example, it is important for studies to assess appropriate images for text warnings and to demonstrate the effects that emotional reactions have on message processing and knowledge to counteract arguments that pictorial warnings *only* evoke emotions without increasing knowledge, which is not the case (see Popova, Owusu, Jensen, & Neilands, 2017). Although research has grown in this area for cigarette warnings, relatively little published work has been conducted with NCTP warnings that FDA is preparing to implement.

Research is needed not only on NCTP warning content, but also on placement, such as location and size, and ways to improve the ability of warnings to have impact (e.g., inclusion of images). Substantial evidence exists for the superiority of pictorial over text-only warnings for cigarettes (e.g., Brennan, Maloney, Ophir, & Cappella, 2016; Noar, Francis, et al., 2016; Noar, Hall, et al., 2016), but there is not yet a large enough literature for other tobacco products, making drawing conclusions about their effectiveness for NCTPs difficult.

The review also identified an area of research that merits future studies to provide scientific evidence for the FDA's ability to communicate NCTP risk through public education efforts, such as mass media campaigns. Many studies in this review included messages/campaigns that contained multiple themes, such as health risks, constituents, and addiction. It is possible that including a variety of message themes may be a promising approach for effective messaging, as it may reduce message staleness by providing a variety of novel information that is not typically communicated to the public, especially youth and young adults, who typically underestimate the health risks of NCTPs (e.g., Cornacchione et al., 2016). The FDA has recently implemented a specific NCTP campaign that includes multiple message themes; a portion of "The Real Cost" campaign is aimed at decreasing SLT use among rural adolescent males. This campaign communicates the message that "smokeless doesn't mean harmless," with message themes including health effects, cosmetic effects, and constituents. Future research should test the relative effectiveness of a single message theme vs. multiple themes within a given campaign.

Interestingly, no studies in this review looked at public education or campaign evaluation for ENDS, despite several existing state- and county-level anti-ENDS campaigns, such as in Alaska, California (stillblowingsmoke.org), and Orange County, CA (notsosafe.org), as well as a Public Service Announcement released alongside the 2016 Surgeon's General Report on ENDS. Given that ENDS present risks, but are likely to be less harmful than combusted tobacco products, optimal messaging for this product is urgently needed. A major challenge is how to most effectively communicate ENDS product risk to the public, which was recently identified as a significant priority by the US Surgeon General (US Department of Health & Human Services [USDHHS], 2016). The public health community generally believes that youth should not use any tobacco product, including ENDS, given the potential for addiction and the adverse effects of nicotine on the adolescent brain (USDHHS, 2016). Caution should be taken when developing these messages, and evaluations should examine whether these messages result in unintended consequences such as increased use of combustible products. Similarly, there is a lack of consensus about the best way to message on SLT because relative risk messages may not encourage people to quit SLT use, and health warnings could drive people to use combustible tobacco products. Research is needed to understand the most effective ways to communicate a continuum of tobacco product risk to the public. Specifically, research is needed on how different populations might be affected differently by these messages (e.g., youth vs. adult smokers), unintended consequences of anti- or pro- ENDS messages (e.g., driving people to smoke cigarettes because they believe ENDS are no safer), and the best delivery channels.

This systematic review also highlighted other research gaps. Priority populations for tobacco use have not been well-studied, for example. Most studies in this review focused on adults, while very few targeted youth and young adults. Youth and young adults use NCTPs at higher rates than older adults (Johnston et al., 2016) and tobacco initiation starts most often during the teenage years, so it is imperative to understand how to most effectively communicate product risk to these younger age groups. Additionally, no studies reported the sexual orientation of its participants – i.e., there were no studies examining impact of messages on lesbian, gay, bisexual, and transgender (LGBT) populations. Disparities in tobacco use exist for LGBT people, who use tobacco at higher rates than their heterosexual counterparts (Lee, Griffin, & Melvin, 2009). Studying message effects for specific priority populations such as LGBT is important because it will inform prevention efforts for tobacco product initiation and cessation targeted to the highest risk groups, ultimately reducing health disparities. Indeed, the FDA views the LGBT population as a priority and itself recently launched a campaign targeting tobacco use among this population – the “This Free Life” campaign.

This systematic review is not without limitations. Given the heterogeneity of studies in this review, we were not able to conduct a meta-analysis of the effects of NCTP messaging on various outcomes. However, this review provides an overview of published studies that currently exist, describing their make-up and findings. This area of research is young and growing quickly, and as more studies are published, topic specific meta-analyses can be undertaken. Another limitation is that there is likely much in progress research in this area not captured in this review, and there are campaigns ongoing that will fill some gaps once



their evaluations are complete. Thus, there will be much knowledge generation in this area in the coming years.

## Conclusion

This is the first systematic examination of health communication studies about NCTPs. Most notably, this investigation demonstrates a significant need for more research in this area, particularly for recently-deemed tobacco products, and especially for priority populations such as youth and LGBT. It also demonstrates a need for longitudinal studies with larger samples examining behavioral outcomes. New research will provide a better understanding of effective (and ineffective) NCTP messages and will facilitate effective implementation of such messages to communicate product risk, ultimately improving public health. Research on product messaging such as warnings will help the FDA withstand the inevitable legal challenges that seek to halt the implementation of effective risk communications. The public health potential of the new deeming rule will ultimately be realized when such research is undertaken and the FDA is able to implement effective communications for all NCTPs, reducing death and disease from tobacco use and thereby improving public health.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

**Funding:** Research reported in this publication was supported by grant number P50 CA180907 from the National Cancer Institute and FDA Center for Tobacco Products (CTP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

## References

References in the systematic review are marked with an asterisk

- Aboaziza E, Eissenberg T. 2014; Waterpipe tobacco smoking: What is the evidence that it supports nicotine/tobacco dependence? *Tobacco Control*. 24:i44–i53. DOI: 10.1136/tobaccocontrol-2014-051910 [PubMed: 25492935]
- \*. Adkison SE, Bansal-Travers M, Smith DM, O'Connor RJ, Hyland AJ. 2014; Impact of smokeless tobacco packaging on perceptions and beliefs among youth, young adults, and adults in the U.S: findings from an internet-based cross-sectional survey. *Harm Reduction Journal*. 11:2.doi: 10.1186/1477-7517-11-2 [PubMed: 24433301]
- \*. Agaku IT, Singh T, Rolle IV, Ayo-Yusuf OA. 2016; Exposure and response to current text-only smokeless tobacco health warnings among smokeless tobacco users aged 18years, United States, 2012–2013. *Preventive Medicine*. 87:200–206. DOI: 10.1016/j.ypmed.2016.02.014 [PubMed: 26892913]
- \*. Anjum Q, Ahmed F, Ashfaq T. 2008; Knowledge, attitude and perception of water pipe smoking (Shisha) among adolescents aged 14–19 years. *The Journal of the Pakistan Medical Association*. 58:312–317. [PubMed: 18988390]
- Atkin, CK, Rice, RE. Advances in public communication campaigns. In: Scharrer, E, editor *The international encyclopedia of media studies: Vol. 5: Media effects/Media psychology*. London, UK: Wiley-Blackwell; 2013. 526–551.
- \*. Biener L, Bogen K, Connolly G. 2007; Impact of corrective health information on consumers' perceptions of "reduced exposure" tobacco products. *Tobacco Control*. 16:306–311. DOI: 10.1136/tc.2006.019240 [PubMed: 17897988]

- \*. Biener L, Nyman AL, Stepanov I, Hatsukami D. 2014; Public education about the relative harm of tobacco products: an intervention for tobacco control professionals. *Tobacco Control*. 23:385–388. DOI: 10.1136/tobaccocontrol-2012-050814 [PubMed: 23481906]
- \*. Borland R, Li L, Cummings KM, O'Connor R, Mortimer K, Wikmans T, McNeill A. 2012; Effects of a fact sheet on beliefs about the harmfulness of alternative nicotine delivery systems compared with cigarettes. *Harm Reduction Journal*. 9:19.doi: 10.1186/1477-7517-9-19 [PubMed: 22687137]
- \*. Boyle RG, Stilwell J, Vidlak LM, Huneke JT. 1999; "Ready to quit chew?" Smokeless tobacco cessation in rural Nebraska. *Addictive Behaviors*. 24:293–297. DOI: 10.1016/S0306-4603(98)00043-4 [PubMed: 10336111]
- Brennan E, Maloney EK, Ophir Y, Cappella JN. 2016; Potential effectiveness of pictorial warning labels that feature the images and personal details of real people. *Nicotine & Tobacco Research*. doi: 10.1093/ntr/ntw319
- Brewer NT, Hall MG, Noar SM, Parada H, Stein-Seroussi A, Bach LE, Ribisl KM. 2016; Effect of pictorial cigarette pack warnings on changes in smoking behavior: A randomized clinical trial. *JAMA Internal Medicine*. 176:905–912. DOI: 10.1001/jamainternmed.2016.2621 [PubMed: 27273839]
- \*. Brubaker RG, Mitby SK. 1990; Health-risk warning labels on smokeless tobacco products: Are they effective? *Addictive Behaviors*. 15:115–118. DOI: 10.1016/0306-4603(09)90014-O [PubMed: 2343784]
- \*. Callery WE, Hammond D, O'Connor RJ, Fong GT. 2011; The appeal of smokeless tobacco products among young Canadian smokers: The impact of pictorial health warnings and relative risk messages. *Nicotine & Tobacco Research*. 13:373–383. DOI: 10.1093/ntr/ntn013 [PubMed: 21357730]
- \*. Capella ML, Taylor CR, Kees J. 2012; Tobacco harm reduction advertising in the presence of a government-mandated warning. *Journal of Consumer Affairs*. 46:235–259. DOI: 10.1111/j.1745-6606.2012.01229.x
- Chang CM, Corey CG, Rostron BL, Apelberg BJ. 2015; Systematic review of cigar smoking and all cause and smoking related mortality. *BMC Public Health*. 15:390.doi: 10.1186/s12889-015-1617-5 [PubMed: 25907101]
- Cornacchione J, Wagoner K, Wiseman K, Kelley D, Noar SM, Smith MH, Sutfin EL. 2016; Adolescent and young adult perceptions of hookah and little cigars/cigarillos: Implications for risk messages. *Journal of Health Communication*. 21:818–825. DOI: 10.1080/10810730.2016.1177141 [PubMed: 27337629]
- Durkin S, Brennan E, Wakefield E. 2012; Mass media campaigns to promote smoking cessation among adults: An integrative review. *Tobacco Control*. 21:127–138. DOI: 10.1136/tobaccocontrol-2011-050345 [PubMed: 22345235]
- Farrelly MC, Hussin A, Bauer UE. 2007; Effectiveness and cost effectiveness of television, radio and print advertisements in promoting the New York smokers' quitline. *Tobacco Control*. 16:i21–i23. [PubMed: 18048625]
- Farrelly MC, Heaton CG, Davis KC, Messeri P, Hersey JC, Haviland ML. 2002; Getting to the Truth: Evaluating national tobacco countermarketing campaigns. *American Journal of Public Health*. 92:901–907. DOI: 10.2105/AJPH.92.6.901 [PubMed: 12036775]
- Farrelly MC, Nonnemaker J, Davis KC, Hussin A. 2009; The influence of the national truth® campaign on smoking initiation. *American Journal of Preventive Medicine*. 36:379–384. DOI: 10.1016/j.amepre.2009.01.019 [PubMed: 19211213]
- Food and Drug Administration. Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act, as Amended by the Family Smoking Prevention and Tobacco Control Act; Regulations on the Sale and Distribution of Tobacco Products and Required Warning Statements for Tobacco Products. 2016
- \*. Gupta PC, Mehta FS, Pindborg JJ, Aghi MB, Bhonsle RB, Daftary DK, Sinor PN. 1986; Intervention study for primary prevention of oral cancer among 36,000 Indian tobacco users. *Lancet*. 1(8492):1235–1239. DOI: 10.1016/S0140-6736(86)91386-3 [PubMed: 2872391]

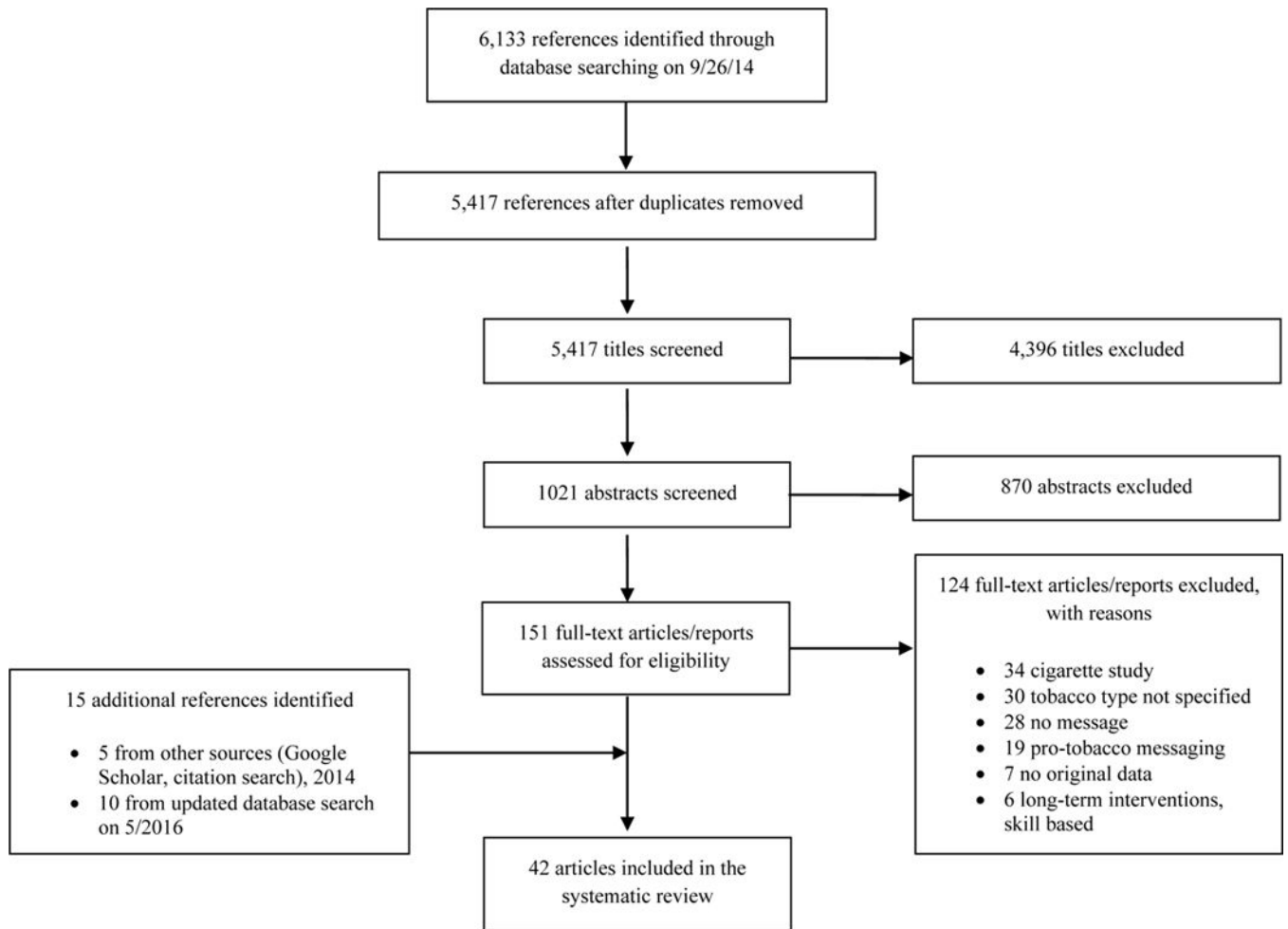
- \*. Islam F, Salloum RG, Nakkash R, Maziak W, Thrasher JF. 2016; Effectiveness of health warnings for waterpipe tobacco smoking among college students. *International Journal of Public Health*. doi: 10.1007/s00038-016-0805-0
- \*. Jawad M, Abass J, Hariri A, Akl EA. 2015; Social media use for public health campaigning in a low resource setting: The case of waterpipe tobacco smoking. *BioMed Research International*. doi: 10.1155/2015/562586
- \*. Jawad M, Bakir A, Ali M, Grant A. 2015; Impact of waterpipe tobacco pack health warnings on waterpipe smoking attitudes: A qualitative analysis among regular users in London. *BioMed Research International*. 2015:745865. doi: 10.1155/2015/745865 [PubMed: 26273642]
- \*. Johnson SE, Wu CC, Coleman BN, Choiniere CJ. 2014; Self-reported exposure to tobacco warning labels among U.S. middle and high school students. *American Journal of Preventive Medicine*. 47:S69–75. DOI: 10.1016/j.amepre.2014.05.005 [PubMed: 25044198]
- Johnston, LD, O'Malley, PM, Bachman, JG, Schulenberg, JE, Miech, RA. *Monitoring the Future national survey results on drug use, 1975–2015: Volume II, college students and adults ages 19–55*. Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2016.
- Koszowski B, Rosenberry ZR, Kanu A, Viray LC, Potts JL, Pickworth WB. 2015; Nicotine and carbon monoxide exposure from inhalation of cigarillo smoke. *Pharmacology, Biochemistry, and Behavior*. 139:7–14. DOI: 10.1016/j.pbb.2015.10.007
- Lee JGL, Griffin GK, Melvin CL. 2009; Tobacco use among sexual minorities in the USA, 1987–May 2007: A systematic review. *Tobacco Control*. 18:275–282. DOI: 10.1136/tc.2008.028241 [PubMed: 19208668]
- \*. Lipkus IM, Eissenberg T, Schwartz-Bloom RD, Prokhorov AV, Levy J. 2011; Affecting perceptions of harm and addiction among college waterpipe tobacco smokers. *Nicotine & Tobacco Research*. 13:599–610. DOI: 10.1093/ntr/ntr049 [PubMed: 21471304]
- \*. MacKinnon DP, Fenaughty AM. 1993; Substance use and memory for health warning labels. *Health Psychology*. 12:147–150. DOI: 10.1037/0278-6133.12.2.147 [PubMed: 8500442]
- \*. Mays D, Moran MB, Levy DT, Niaura RS. 2016; The impact of health warning labels for Swedish snus advertisements on young adults' snus perceptions and behavioral intentions. *Nicotine & Tobacco Research*. 18:1371–1375. DOI: 10.1093/ntr/ntv140 [PubMed: 26116085]
- \*. Mays D, Tercyak KP, Lipkus IM. 2016; The effects of brief waterpipe tobacco use harm and addiction education messages among young adult waterpipe tobacco users. *Nicotine & Tobacco Research*. 18:777–784. DOI: 10.1093/ntr/ntv223 [PubMed: 26438650]
- \*. Mohammed, HT. The efficacy of viewing health warnings on shisha smoking among shisha smokers. 2013. Retrieved from <https://uwspace.uwaterloo.ca/handle/10012/7419>
- \*. Murukutla N, Turk T, Prasad CVS, Saradhi R, Kaur J, Gupta S, Wakefield M. 2012; Results of a national mass media campaign in India to warn against the dangers of smokeless tobacco consumption. *Tobacco Control: An International Journal*. 21:12–17. DOI: 10.1136/tc.2010.039438
- \*. Mutti S, Reid JL, Gupta PC, Pednekar MS, Dhumal G, Nargis N, Hammond D. 2015; Perceived effectiveness of text and pictorial health warnings for smokeless tobacco packages in Navi Mumbai, India, and Dhaka, Bangladesh: findings from an experimental study. *Tobacco Control*. 25:437–443. DOI: 10.1136/tobaccocontrol-2015-052315 [PubMed: 26202320]
- Noar SM, Francis DB, Bridges C, Sontag JM, Ribisl KM, Brewer NT. 2016; The impact of strengthening cigarette pack warnings: Systematic review of longitudinal observational studies. *Social Science & Medicine*. 164:118–129. DOI: 10.1016/j.socscimed.2016.06.011 [PubMed: 27423739]
- Noar SM, Hall MG, Francis D, Ribisl KM, Pepper JK, Brewer NT. 2016; Pictorial cigarette pack warnings: A meta-analysis of experimental studies. *Tobacco Control*. 25:341–354. DOI: 10.1136/tobaccocontrol-2014-051978 [PubMed: 25948713]
- \*. Oswal KC, Raute LJ, Pednekar MS, Gupta PC. 2011; Are current tobacco pictorial warnings in India effective? *Asian Pacific Journal of Cancer Prevention*. 12:121–124. [PubMed: 21517243]
- \*. Parr, V, Ell, P. *Market testing of new health warnings and information messages for tobacco product packaging: Premium cigars, cigarillos/little cigars and roll your own*. Sydney, Australia: 2011.

Retrieved from <http://www.tobaccolabels.ca/wp/wp-content/uploads/2013/12/Australia-2011-Market-testing-Graphic-health-warnings-on-products-other-than-cigarettes.pdf>

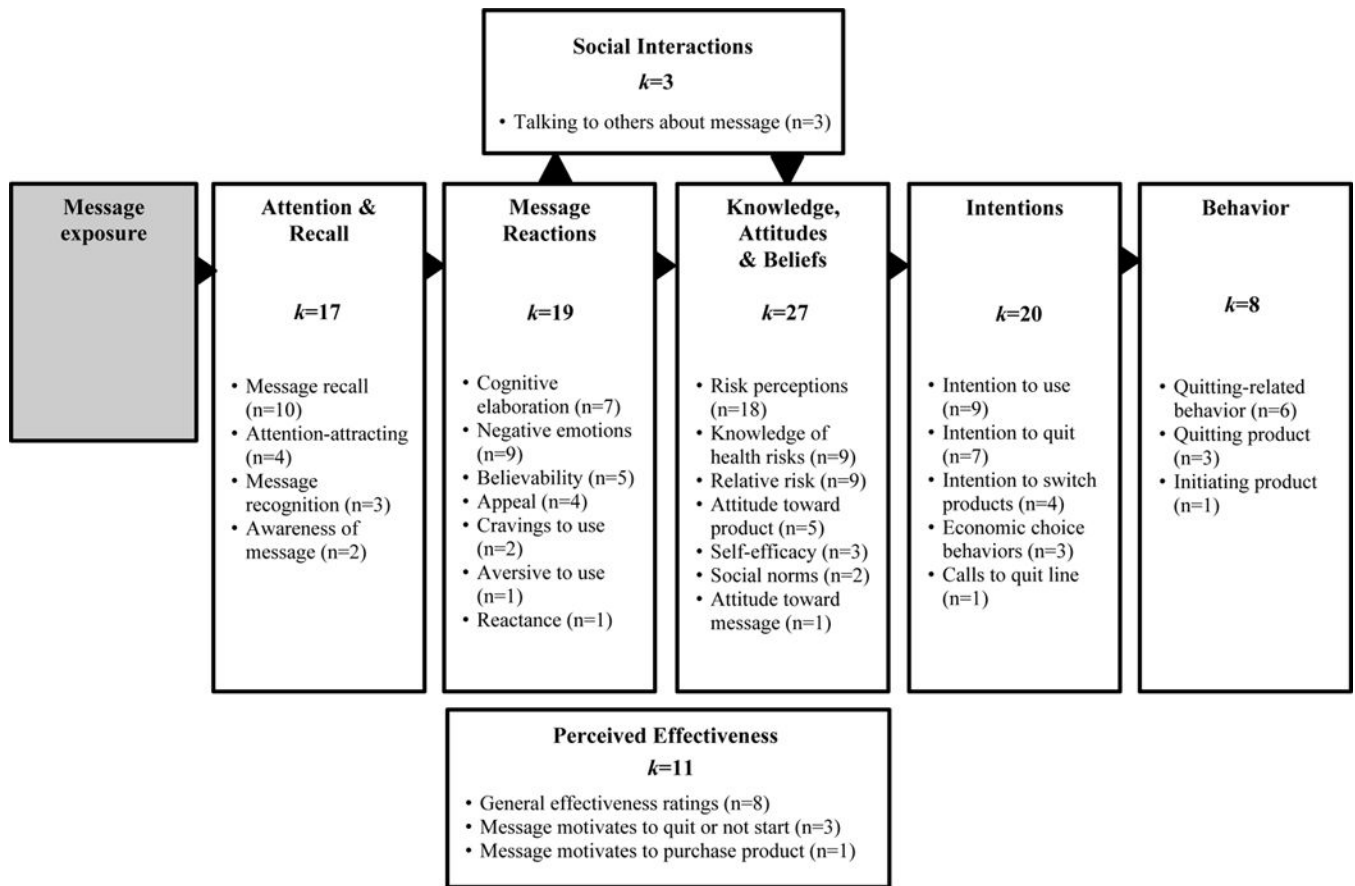
- \*. Popova L. 2014; Scaring the snus out of smokers: Testing effects of fear, threat, and efficacy on smokers' acceptance of novel smokeless tobacco products. *Health Communication*. 29:924–936. DOI: 10.1080/10410236.2013.824063 [PubMed: 24359298]
- \*. Popova L, Kostygina G, Sheon NM, Ling PM. 2014; A qualitative study of smokers' responses to messages discouraging dual tobacco product use. *Health Education Research*. 29:206–221. DOI: 10.1093/her/cyt150 [PubMed: 24441592]
- \*. Popova L, Ling PM. 2014; Nonsmokers' responses to new warning labels on smokeless tobacco and electronic cigarettes: an experimental study. *BMC Public Health*. 14:997.doi: 10.1186/1471-2458-14-997 [PubMed: 25253295]
- \*. Popova L, Neilands TB, Ling PM. 2014; Testing messages to reduce smokers' openness to using novel smokeless tobacco products. *Tobacco Control*. 23:313–321. DOI: 10.1136/tobaccocontrol-2012-050723 [PubMed: 23467655]
- Popova L, Owusu D, Jensen D, Neilands TB. 2017; Factual text and emotional pictures: Overcoming a false dichotomy of cigarette warning labels. *Tobacco Control*. doi: 10.1136/tobaccocontrol-2016-053563
- \*. Popper ET, Murray KB. 1989; Communication effectiveness and format effects on in-ad disclosure of health warnings. *Journal of Public Policy & Marketing*. 8:109–123.
- \*. Rodu B, Plurphanswat N, Hughes JR, Fagerström K. 2016; Associations of proposed relative-risk warning labels for snus with perceptions and behavioral intentions among tobacco users and nonusers. *Nicotine & Tobacco Research*. 18:809–816. DOI: 10.1093/ntr/ntv168 [PubMed: 26253616]
- \*. Rousu MC, O'Connor RJ, Thrasher JF, June KM, Bansal-Travers M, Pitcavage J. 2014; The impact of product information and trials on demand for smokeless tobacco and cigarettes: evidence from experimental auctions. *Preventive Medicine*. 60:3–9. DOI: 10.1016/j.ypmed.2013.11.001 [PubMed: 24321456]
- \*. Salloum RG, Maziak W, Hammond D, Nakkash R, Islam F, Cheng X, Thrasher JF. 2015; Eliciting preferences for waterpipe tobacco smoking using a discrete choice experiment: implications for product regulation. *BMJ Open*. 5(9):e009497.doi: 10.1136/bmjopen-2015-009497
- \*. Sanders-Jackson A, Schleicher NC, Fortmann SP, Henriksen L. 2015; Effect of warning statements in e-cigarette advertisements: An experiment with young adults in the United States. *Addiction*. 110:2015–2024. DOI: 10.1111/add.12838 [PubMed: 25557128]
- \*. Sarkar S, Sharma A, Basu D. 2013; Comparison of craving between smoked and smokeless tobacco across a variety of cue exposures. *Substance Use & Misuse*. 48:233–238. DOI: 10.3109/10826084.2012.752851 [PubMed: 23302058]
- \*. Shah VR, Dave VR, Sonaliya KN. 2013; Impact of anti-tobacco warning labels on behaviour of tobacco users in one of the cities in Gujarat, India. *Journal of Preventive Medicine & Hygiene*. 54:109–113. [PubMed: 24396992]
- Shihadeh A, Schubert J, Klaiany J, El Sabban M, Luch A, Saliba NA. 2015; Toxicant content, physical properties and biological activity of waterpipe tobacco smoke and its tobacco-free alternatives. *Tobacco Control*. 24:i1–i9. DOI: 10.1136/tobaccocontrol-2014-051907 [PubMed: 25618894]
- Snyder, LB, LaCroix, JM. How effective are mediated health campaigns? A synthesis of meta-analyses. In: Rice, RE, Atkin, CK, editors *Public communication campaigns*. 4th. Thousand Oaks, CA: Sage; 2013. 113–129.
- \*. Stark E, Kim A, Miller C, Borgida E. 2008; Effects of including a graphic warning label in advertisements for reduced-exposure products: Implications for persuasion and policy. *Journal of Applied Social Psychology*. 38:281–293. DOI: 10.1111/j.1559-1816.2007.00305.x
- \*. Strasser AA, Orom H, Tang KZ, Dumont RL, Cappella JN, Kozlowski LT. 2011; Graphic-enhanced information improves perceived risks of cigar smoking. *Addictive Behaviors*. 36:865–869. DOI: 10.1016/j.addbeh.2011.03.005 [PubMed: 21481542]
- \*. Sussman S, Dent CW, Flay BR, Burton D, Craig S, Mestel-Rauch J, Holden S. 1989; Media manipulation of adolescents' personal level judgements regarding consequences of smokeless

tobacco use. *Journal of Drug Education*. 19:43–57. DOI: 10.2190/51YX-L5HD-Y78B-5E5D [PubMed: 2723951]

- Sutfin EL, McCoy TP, Reboussin BA, Wagoner KG, Spangler J, Wolfson M. 2011; Prevalence and correlates of waterpipe tobacco smoking by college students in North Carolina. *Drug and Alcohol Dependence*. 115:131–136. DOI: 10.1016/j.drugalcdep.2011.01.018 [PubMed: 21353750]
- \*. Truitt L, Hamilton WL, Johnston PR, Bacani CP, Crawford SO, Hozik L, Celebucki C. 2002; Recall of health warnings in smokeless tobacco ads. *Tobacco Control*. 11:ii59–ii63. DOI: 10.1136/tc.11.suppl\_2.ii59 [PubMed: 12034984]
- \*. Turk T, Murukutla N, Gupta S, Kaur J, Mullin S, Saradhi R, Chaturvedi P. 2012; Using a smokeless tobacco control mass media campaign and other synergistic elements to address social inequalities in India. *Cancer Causes & Control*. 23(Suppl 1):81–90. DOI: 10.1007/s10552-012-9903-3 [PubMed: 22350861]
- U.S. Department of Health and Human Services. E-cigarette use among youth and young adults: A report of the Surgeon General. Atlanta, GA: USDHHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2016.
- \*. Vogeltanz-Holm N, Holm JE, White Plume J, Poltavski D. 2009; Confirmed recall and perceived effectiveness of tobacco countermarketing media in rural youth. *Prevention Science*. 10:325–334. DOI: 10.1007/s11121-009-0134-0 [PubMed: 19495977]
- Wackowski OA, Delnevo CD. 2015; Young adults' risk perceptions of various tobacco products relative to cigarettes: Results from the National Young Adult Health Survey. *Health Education & Behavior*. 43:328–336. DOI: 10.1177/1090198115599988 [PubMed: 26304709]
- Wagoner KG, Cornacchione J, Wiseman KD, Teal R, Moracco KE, Sutfin EL. 2016; E-cigarettes, hookah pens and vapes: Adolescent and young adult perceptions of electronic nicotine delivery systems. *Nicotine & Tobacco Research*. 18:2006–2012. DOI: 10.1093/ntr/ntw095 [PubMed: 27029821]
- \*. Walsh MM, Hilton JF, Ellison JA, Gee L, Chesney MA, Tomar SL, Ernster VL. 2003; Spit (smokeless) tobacco intervention for high school athletes: Results after 1 year. *Addictive Behaviors*. 28:1095–1113. DOI: 10.1016/S0306-4603(02)00228-9 [PubMed: 12834653]
- Waziry R, Jawad M, Ballout RA, Al Akel M, Akl EA. 2016; The health effects of waterpipe tobacco smoking on health outcomes: An updated systematic review and meta-analysis. *International Journal of Epidemiology*. 46:32–43. DOI: 10.1093/ije/dyw021



**Figure 1.** PRISMA Diagram Showing the Flow of Studies through the Screening Process



**Figure 2. Message Impact Framework: Summary of Outcome Variables**

Note. Variable numbers may exceed the category numbers because multiple DVs were assessed in some studies. Quitting-related behaviors include reducing use.

**Table 1**Characteristics of Studies (*k*=45)

Variable	<i>k</i>	%
<b>Participant Characteristics</b>		
<i>Age groups</i>		
Adolescents only	6	13.3
Adolescents & young adults	1	2.2
Young adults only	14	31.1
Young adults and older adults	11	24.4
Older adults only (26+)	5	11.1
Adolescents, young adults, and older adults	7	15.6
NR	1	2.2
<i>Race/ethnicity</i>		
White/Caucasian	25	55.6
Black/African American	19	42.2
Hispanic/Latino	19	42.2
Asian/Pacific Islanders	14	31.1
American Indian	5	11.1
Other/mixed	23	51.1
NR	17	37.7
<b>Study Characteristics</b>		
<i>Country</i>		
United States	32	71.1
India	7	15.6
Australia	2	4.4
Canada	2	4.4
United Kingdom	2	4.4
Bangladesh	1	2.2
Pakistan	1	2.2
Sweden	1	2.1
<i>Sampling</i>		
Probability	9	20.0
Convenience	30	66.7
Both Probability & Convenience	3	6.7
NR	3	6.7
<i>Study Methodology</i>		
Experiments	31	68.9
Non-experimental surveys	10	22.2
Qualitative focus groups/interviews	5	11.1
Content analysis	1	2.2
<b>Message Characteristics</b>		
<i>Message Types by Product<sup>1</sup></i>		



Variable	<i>k</i>	%
Warnings	26	57.8
<i>SLT</i>	19	69.2
<i>Waterpipe</i>	4	15.4
<i>ENDS</i>	2	7.7
<i>Cigars</i>	1	3.8
<i>PREP</i> <sup>2</sup>	1	3.8
Public education	19	42.2
<i>SLT</i>	13	68.4
<i>Waterpipe</i>	5	26.3
<i>ENDS</i>	0	0
<i>Cigars</i>	1	5.3
<i>PREP</i> <sup>2</sup>	0	0
<i>Message Themes</i>		
Health effects	37	82.2
Constituents	13	28.9
Relative risk/reduced harm	13	28.9
Addiction	12	26.7
Anti-industry	4	8.9
Other	10	22.2
NR	4	8.9

Note. NR = not reported

Note. Many numbers add up to over *k*=45 or over 100% because some studies included multiple options for each characteristic.

<sup>1</sup> Percentages reported for products are a proportion of the total of that message type.

<sup>2</sup> Potentially reduced exposure product