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Realizing the Tobacco Endgame: Understanding and Mobilizing Public Support for Banning Combustible Cigarette Sales in the United States

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Background: There is little research on public support for banning the sale and purchase of combustible cigarettes even though a ban is an essential step towards achieving the endgame for tobacco products. *Purpose:* We report the first studies designed to (a) examine predictors of support for a ban (Study 1), and (b) test interventions to increase such support (Studies 2-4). *Methods:* In Study 1, current, former, and never smokers (N = 479) were randomized to conditions measuring their willingness to ban the sale of cigarettes vs. an unspecified product. Smokers were randomized to a persuasive communication in Study 2 and a paradoxical thinking intervention in Study 3 (Ns = 300 and 302, respectively). In Study 4 (N = 336), we randomized smokers to self-persuasion and issue framing interventions. *Results:* Whereas nonsmokers were willing to ban the sale of both cigarettes and equivalent products, current and former smokers exempted cigarettes from a ban. Reactance to prohibition and perceived effectiveness predicted willingness to ban cigarette sales in all three smoking status groups (Study 1). Neither persuasive communication nor paradoxical thinking increased support for banning cigarette sales in Studies 2-3. However, self-persuasion and framing the ban as "protecting Americans from avoidable harm" both led to increased support for banning cigarette sales (Study 4). *Conclusions:* Reactance and doubt about the effectiveness of banning the sale of cigarettes are key barriers to supporting a ban. Self-persuasion and issue framing may be effective means of mobilizing policy support among smokers. The present research offers new insights relevant to promoting the "Tobacco Endgame" and helps specify directions for future research on public support for health policies.

Keywords: Policy attitudes; Public opinion; Tobacco control policies; Framing; Self-persuasion

In 2020, 12.5% percent of U.S. adults – 30.8 million people – smoked combustible cigarettes (Cornelius et al., 2022) and more than 480,000 people died from tobacco-related causes (Centers for Disease Control and Prevention, 2020). The harms that accrue from smoking (e.g., cancer, heart disease) are serious and are listed on the product itself (U.S. Food and Drug Administration, 2020). These harms have led to proposals for *Tobacco Endgame* policies, that is, policies designed to put an end to tobacco use. Four types of endgame policies can be distinguished (McDaniel et al., 2016). *Product-focused* policies alter tobacco product design (e.g., reducing nicotine levels to make cigarettes less addictive). *User-focused* policies target smokers (e.g., requiring a license or prescription to purchase cigarettes). *Institutional structure-focused* strategies focus on industry regulation (e.g., requiring tobacco companies to meet "lookback" targets for smoking prevalence or face fines). *Market/supply-focused* policies involve managing the market for, or supply of, tobacco (e.g., imposing greater taxes on combustible tobacco products compared to less harmful products such as electronic cigarettes). The ultimate market/supply-focused strategy is a ban (Callard, 2013), that is, making the sale and purchase of combustible cigarettes illegal. According to Proctor (2011, p. 556), "[banning cigarette sales] is the simplest way to approach disease prevention and would obviate the need for most other solutions commonly proposed" (see also, Freudenberg, 2014; Proctor, 2013). Smith and Malone (2020) pointed out that banning cigarette sales would not only reduce tobacco use and curb smoking relapse rates, it would also denormalize the tobacco industry, depriving the industry of income and reducing its influence on government and policy making. Advancing public health policies such as banning cigarette sales requires the support of the general public, however (see Brooks & Manza, 2006; Burnstein, 2003; Ruggeri, 2018, for reviews, and Barberá et al., 2019, for evidence), and very little research has addressed public opinion about banning the sale and purchase of cigarettes. Accordingly, the present research adopted an Experimental Medicine approach (Sheeran et al., 2017) to (a) identify factors that promote support for banning cigarette sales, and (b) develop and test intervention strategies that could modify those factors and mobilize support for a ban.

Understanding Public Support for Health Policies

There is a large but piecemeal literature on public support for tobacco control policies. Studies have examined attitudes towards graphic warning labels (e.g., Glasgow et al., 2022; Rose et al., 2015), plain packaging (e.g., Rosenberg et al., 2012), smoke-free zones (e.g., Niederdeppe et al., 2018; Thomson et al., 2009), visibility of tobacco products in stores (e.g., Glasgow et al., 2022), as well as tobacco advertising (Glasgow et al., 2022) and flavors (e.g., Payán et al., 2023; Rose et al., 2015). We could

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locate just four studies that examined public support for banning the sale and/or purchase of cigarettes; one from the USA (Connolly et al., 2012), one from the UK (Shahab and West, 2010), one from Germany (Boeckman et al., 2018), and one from Pakistan (Siddiqi et al., 2022). Rates of support for a ban in these studies were 44.5%, 41.7%, 22.9%, and 82.1%, respectively. Research to date has not examined how different tobacco-control policies relate to one another so it is not clear whether support for particular tobacco-control policies predicts support for banning the sale and purchase of cigarettes. Similarly, studies of predictors of support for a ban have focused exclusively on non-modifiable factors such as demographic characteristics (age, gender, etc.) or past behavior (e.g., smoking history). Using the Experimental Medicine approach, the present research aims to assess potentially modifiable predictors of support and test interventions that may be effective in changing those predictors and thereby increase support for a ban.

The U.S. federal government has already banned or severely restricted the use of products that pose "unreasonable risk" (e.g., lead in gasoline, asbestos in flooring, arsenic in pesticides; U.S. Environmental Protection Agency, 2020). Banning cigarette sales is thus neither unrealistic nor unprecedented. McDaniel and Malone (2020) documented state and local efforts to prohibit tobacco sales from 1969 to 2020. They noted that two proposals have been successful to date (Beverley Hills in 2019 and Manhattan Beach in 2020) and point out that enhancing public support is likely key to more widespread adoption of policies to ban cigarette sales. Given the lack of prior research concerned with understanding support for public health policies, we drew upon a variety of theories to identify factors that could drive support. First, we used Ajzen's (1988) analysis of attitude objects to consider cigarettes vs. other products as targets of a ban. In this analysis, people's interactions with the relevant stimuli (cigarettes vs. other products) are the key determinant of attitudes, and not the person's dispositions. The implication is that familiarity, experience, enjoyment, or self-interest could mean that cigarettes are exempted from a ban compared to other (equally hazardous) products. Accordingly, we also examined smoking status (current, former, or never smoker) as a determinant of willingness to ban cigarettes vs. an unspecified product. Previous research indicates that smokers were less supportive of a ban than non-smokers (33% vs. 55%; Connolly et al., 2012). We also measured nicotine dependence and intentions to quit among smokers; the hypothesis was that willingness to ban cigarettes would be positively correlated with intentions to quit but negatively correlated with nicotine dependence.

Second, we drew upon protection motivation theory (PMT; Rogers, 1997) to understand people's motivation to protect public health via a ban on cigarette sales. PMT posits two processes – threat and coping appraisal – that determine protection motivation. Key elements of threat appraisal are perceived vulnerability (likelihood of harm) and perceived severity (degree of harm). Because we were particularly interested in the *accuracy* of participants' threat appraisals, we asked factual questions about the percentage of smokers who die from smoking (50% according to the World Health Organization [WHO], 2020) and the number of years of life lost due to smoking (11.5 years; Jha et al., 2013). Key elements of coping appraisal are response efficacy and response costs. We operationalized response efficacy in terms of the perceived effectiveness of banning cigarette sales in helping smokers to quit smoking. Hall et al. (2018) observed that as the perceived effectiveness of pictorial cigarette pack warnings increased, so did support for the policy of requiring pictorial warnings on cigarette packs. We operationalized response costs in terms of liking, or positive attitudes toward, smoking cigarettes. The hypotheses tested were that willingness to ban cigarettes would be positively associated with the prevalence and severity of harm and the perceived effectiveness of the ban, and would be negatively associated with attitude towards smoking.

Third, asking people about banning cigarette sales could elicit psychological reactance. Psychological reactance refers to negative cognitive and affective responses to the perception that one's freedom is being threatened (Dillard and Shen, 2005; Woller et al., 2007). Reactance is a common response to government policies (Proudfoot and Kay, 2014) and is negatively associated with support for pictorial warnings on cigarette packs Hall et al., 2018). Thus, we hypothesized that greater reactance to prohibition will result in less support for banning. A related factor is trust in government which is associated with support for certain tobacco control legislation (Schmidt et al., 2018). Accordingly, we hypothesized that trust in government would be positively associated with support for banning cigarette sales.

The Present Research

As the overarching goal of the research concerned understanding and mobilizing public support for a ban on the sale and purchase of cigarettes, we followed the steps specified by the Experimental Medicine approach (Riddle et al., 2015; Sheeran et al., 2017). That is, we used experimental designs to, first, identify mechanism of action that relate to the outcome (*target validation*) and, second, to determine the optimal strategies for modifying those targets (*target engagement*). Accordingly, Study 1 tested predictors of willingness to ban cigarette sales with the goal of specifying modifiable factors that could be targeted to promote support. Studies 2-4 tested interventions that aimed to modify those factors and thereby increase policy support (see Figure S1 in the Supplemental Materials for an overview of the treatment and control conditions in Studies 2-4).

Study 1: Understanding Willingness to Ban Cigarettes

In Study 1, we varied whether the target of a ban was either cigarettes or an unspecified, but equally hazardous, product. We measured relevant predictors from Protection Motivation Theory, trust in government, and reactance to prohibition. We recruited current, former, and never smokers. Current smokers' nicotine dependence and intentions to quit smoking were measured. The dependent variable was willingness to ban cigarettes.

Method

Participants and Procedure. Participants were U.S. residents recruited through Amazon Mechanical Turk and paid $0.60 for completing the study. We attempted to recruit equivalent numbers of current, former, and never smokers,

and excluded participants who completed the survey implausibly quickly or gave nonsensical responses to ensure high-quality data. The final sample (N = 479) comprised 168 current smokers, 155 former smokers, and 156 never smokers and thus had adequate power to test our hypotheses (see Table S1 in the Supplemental Materials for power analyses for all studies). Participants' mean age was 39.47 years (SD = 12.69), and 57% identified as female, 42.4% identified as male, and 0.6% identified as another category. Most of the sample was white (77.7%) and held at least an associate degree (59.5%). Participants indicated their smoking status and were randomized to either answer questions about their willingness to ban "cigarettes" or "products."

Measures. *Willingness to ban* was indexed by responses to two questions that varied by condition: (1) "What percentage of people would need to die from [smoking cigarettes/using a product] in order to ban [cigarettes (that is, to make it illegal to buy/sell cigarettes)/that product (that is, to make it illegal to buy/sell the product)]?", and (2) "How many years would [smoking cigarettes/using a product] need to take off a person's life in order to ban [cigarettes (that is, to make it illegal to buy/sell cigarettes)/that product (that is, to make it illegal to buy/sell the product)]?" The response options allowed participants to indicate the percentage (question 1) and number of years (question 2), or to respond, *"never ban."* Because specifying a percentage or the number of years indicates that participants are willing to ban the sale and purchase of cigarettes under some circumstances at least, we coded these responses as indicating willingness to ban. (Our goal was to designate participants as willing vs. unwilling to ban the sale and purchase of cigarettes, rather than specify the percentage and number of years that characterized the responses of participants who were willing to ban.) "Never ban" responses, on the other hand indicated an unwillingness to ban under any circumstances. The two items were highly correlated (r = .84, p < .001) and were therefore combined. Willingness to ban was coded as "1" if participants indicated that they would be willing to ban for both percentage and years; all other responses were coded as "0".

Harm prevalence was measured by the item, "What percentage of smokers die from smoking?" and *harm severity* was measured by the item, "How many years, on average, does smoking cigarettes take off a person's life?" *Perceived effectiveness of a ban* was measured by two items (5-point strongly agree-strongly disagree scales): "Banning the sale and purchase of cigarettes would be a great way to help people quit smoking" and "The most effective way to reduce smoking is to ban the sale and purchase of cigarettes" (α = .90). *Attitude to smoking* was measured by two items, "How much do you like vs. dislike smoking cigarettes?" (1 = strongly dislike, 5 = strongly like) and "How positive or negative are your feelings about smoking cigarettes?" (1 = extremely negative, 5 = extremely positive) (α = .84). Participants rated their *trust in government* on a 4-point scale (none at all to a great deal; Kowitt et al., 2017). We developed a novel *reactance to prohibition scale* (RTPS) based on Hall et al.'s (2017) measure. The RTPS included four items on 5-point, strongly disagree-strongly agree scales: "Banning products is about manipulating people," "Banning products annoys me," "The reasons for banning products are overblown," and "I hate the idea of banning products" (α = .90). *Quit intentions* were measured using Klein et al.'s (2009) scale (3 items, α = .92; e.g., "How interested are you in quitting smoking in the next 2 years?"). The Fagerström Test (Heatherton et al., 1991) was used to measure *nicotine dependence* (6 items, α = .68). Participants also completed standard demographic measures.

Results

Randomization check. There were no differences between the cigarette vs. product conditions on any of the demographic variables suggesting that randomization was successful.

Willingness to ban products vs. cigarettes. The percentage of participants willing to ban cigarettes vs. products in each smoking status group is displayed in Figure 1. Across the

sample as whole, participants were less willing to ban cigarettes (52.4%) than products (66.7%), $X^2(1, N = 479) = 10.18$, p = .002. Analyses conducted within each smoking status group indicated that current smokers were less willing to ban cigarettes than products, $X^2(1, N = 168) = 4.98$, p = .030. This was also true for former smokers, $X^2(1, N = 155) = 4.57$, p = .046. However, there was no difference in willingness to ban cigarettes (67.6%) and products (76.8%) among never smokers, $X^2(1, N = 156) = 1.67$, p = .21. Thus, current and former smokers exempted cigarettes from a ban whereas never smokers did not.

Estimates of harm caused by smoking cigarettes. Figure 2 indicates the estimated prevalence of harm (% of smokers that die from smoking) and estimated harm severity (years that smoking takes off life) by smoking status. One sample t-tests comparing the actual percentage of smokers that die from smoking (50%; World_Health_Organization, 2020) and participants' estimates indicated that current (M = 42.25, SD = 25.44), former (M = 35.89, SD = 23.03), and never smokers (M = 41.00 percent, SD = 25.97) each underestimated harm prevalence, ts > 3.94, ps < .001. A different picture emerged for estimated severity of harm. Current (M = 11.10 years, SD = 6.95) and former smokers (M = 12.65 years, SD = 7.41) were quite accurate in estimating the number of years smoking takes off one's life (11.5 years; ref (Jha, 2013)), ts < 1.93, ps > .055. Never smokers, on the other hand, significantly overestimated harm severity (M = 12.94 years, SD = 7.25), $t(153) = 2.46$, p = .02. Thus, participants appreciate the serious impact of smoking on longevity but do not realize how high is the proportion of smokers who die from smoking.

Variables predicting willingness to ban cigarettes. Table 1 presents logistic regression analyses predicting willingness to ban cigarettes for each smoking status group (correlations for each group are presented in Tables S2-S4 in the Supplemental Materials). Findings indicated that reactance to prohibition and perceived effectiveness of banning predicted willingness to ban cigarettes in all three smoking status groups. Willingness to ban cigarettes increased as the ban was perceived as more effective and reactance to prohibition declined. Threat appraisals and attitude to cigarettes did not predict willingness to ban though there was an anomalous negative association between harm severity and willingness to ban among never smokers. We also found that for current smokers, intentions

to quit smoking were positively associated with willingness to ban cigarettes.

Discussion

Findings from Study 1 indicated that most participants were willing to ban unspecified but harmful products but were less willing to ban cigarette sales. Smoking status predicted relative willingness. Current and former smokers were less willing to ban cigarettes compared to unspecified products. Never smokers, on the other hand, did not exempt cigarettes from a ban and were equally willing to ban products and cigarettes. The consideration that a substantial majority of never smokers (67.6%) and most former smokers (54.4%) supported banning the sale and purchase of cigarettes, suggests it will be important to target the opinions of smokers to mobilize public support for a ban. Smokers were least willing to ban (36.3%) and may be most likely to campaign against banning cigarette sales possibly with financial or logistical support from the tobacco industry (Apollonio & Bero, 2007).

Whereas participants made accurate or pessimistic estimates of the severity of harm (number of years smoking takes off one's life), the prevalence of harm (percentage of smokers that die from smoking) was underestimated by current, former, and never smokers. Such under-estimation of harm prevalence may even be graver than the present data suggest as evidence indicates that tobacco may kill two-thirds of long-term users (Banks et al., 2015; Pirie et al., 2013), and not one-half as the WHO (2020) proposed. However, neither of these harm estimates predicted willingness to ban cigarette sales among current or former smokers, and greater harm severity was associated with *less* willingness to ban among never smokers; this latter finding is difficult to explain. Only two factors – reactance to prohibition and perceived effectiveness of a ban – proved reliable predictors of willingness to ban in all three smoking status groups. Willingness was greater when the ban wasn't seen as a threat to freedom and was believed to be effective in promoting smoking cessation. Interestingly, stronger intentions to quit smoking were also associated with increased willingness to ban cigarettes among smokers. Attitudes to smoking, trust in government, and nicotine dependence were unrelated to willingness to ban. Study 1 was thus successful in identifying four targets that could be engaged to increase willingness to ban cigarettes: (1) reduce exemption of cigarettes compared to other products, (2) overcome reactance to prohibition, (3) increase the perceived effectiveness of a ban, and (4) promote quit intentions.

Study 2: Persuasive Communication Intervention

In Study 2, we followed the next step in the Experimental Medicine approach by testing an intervention designed to change exemption, reactance to prohibition, intentions to quit, and perceived effectiveness of a ban. We used persuasive communication as the intervention strategy given its long history and efficacy in health-related attitude change (Petty et al., 2009; Zestcott and Stone, 2020). We drew upon previous research on overcoming reactance (Bessarabova et al., 2017; Miller et al., 2007) and avoided using controlling language (e.g., "ought", "should"), used concrete rather than abstract terms, and provided a restoration of freedom post-script (e.g., "you don't have to listen"). We recruited current smokers only in Study 2 because banning cigarette sales directly affects this group and, unlike former and never smokers, most current smokers do not support a ban (Study 1).

Method

Participants and Procedure. Participants (N = 300) were recruited through Amazon Mechanical Turk and paid $0.60. The mean age was 37.5 years (SD = 11.62), and 62.0% identified as female, 37.3% identified as male, and 0.7% identified as another category. Most participants were white (81.3%) and held at least an associate's degree (50.3%). Participants were randomized to a persuasive communication or control message about banning cigarette sales. Thereafter, we measured support for banning cigarette sales, reactance to the message, perceived effectiveness of banning, intentions to quit, and reactance to prohibition; other variables that are not directly relevant to the present discussion also were measured. We did not include attention checks because the study was relatively brief.

Messages. The messages used in Study 2 are presented in Table S4 in the Supplemental Materials. Control participants viewed a 123-word message entitled, "Here's Why Selling and Buying Cigarettes Should Be Banned" that described the harms of smoking based on current and forthcoming warnings on cigarette packs (e.g., "Tobacco smoke can harm your children"). Participants in the persuasive communication treatment viewed a 125-word message entitled, "Should Selling and Buying Cigarettes Be Banned?" To reduce reactance, we posed justifiable viewpoints as questions ("Would you want your son or daughter to smoke cigarettes?") rather than statements, and targeted intentions to quit ("… people who quit smoking are much happier than people who keep smoking?"), perceived effectiveness ("Banning is the most effective way to help smokers quit and prevent young people from starting to smoke"), and exemption of cigarettes from banning ("We ban dangerous drugs and unsafe products to prevent harm, especially to young people. Why should cigarettes be different?").

Measures. We used the same measures of perceived effectiveness of banning (α = .88), intentions to quit (α = .94), reactance to prohibition (α = .93), and demographics as Study 1. Support for banning cigarette sales was measured by two items measured on 7-point scales: "How much would you agree with a ban on the sale and purchase of cigarettes?" (strongly disagree- strongly agree) and "How much would you support a ban on the sale and purchase of cigarettes?" (*strongly oppose-strongly support*) (α = .95).

Reactance to messages. We modified the brief Reactance to Health Warnings Scale (Hall et al., 2017) to measure reactance to the control and treatment messages. Participants were asked "What was your reaction to the message about cigarettes?" and indicated agreement with 3 statements, "This message is trying to manipulate me," "This message is misleading," and "This message annoys me" (5-point scale, *strongly disagree-strongly agree*, α = .80).

Results and Discussion

Randomization checks showed no difference between conditions on age, education, or ethnicity. However, there were more women in the control than treatment condition

(70.5% vs. 53.6%), X^2 (1, N = 300) = 12.08, p = .002. Subsequent analyses that covaried gender revealed no substantive influence on the findings.

A MANOVA testing the effect of condition on reactance to messages, reactance to prohibition, perceived effectiveness of banning, intentions to quit, and support for banning cigarette sales was significant, $F(6, 293) = 2.53$, p = .02, Wilks' Λ = .95, partial $\eta 2$ = .05 (see Table S5 in the Supplemental Materials). Univariate F-tests indicated that there was a significant difference between conditions on reactance to the messages, $F(1, 298) = 9.34$, p = .002, that was in the opposite direction to that predicted (i.e., greater message reactance in the persuasive communication than the control condition; Ms = 3.06 and 2.66, respectively). None of the other effects were significant. Thus, our efforts to develop a message that offered compelling grounds for supporting a ban on cigarettes and did not threaten freedom were not successful. The persuasive communication intervention did not increase support for a ban.

Study 3: Paradoxical Thinking Intervention

Given that a persuasive communication intervention did not affect any of the specified targets (i.e., perceived effectiveness of a ban, reactance to prohibition, quit intentions) or increase support for banning cigarette sales in Study 2, we adopted a different approach in Study 3. Paradoxical thinking interventions aim to temper adamant views about an issue by drawing people's attention to the absurdity of extreme claims for their position (bHameiri et al., 2014). Paradoxical thinking has been shown to be effective in changing people's minds for issues where opinions are deeply entrenched such as Israeli-Palestinian relations (Hameiri et al., 2014). Mechanistic research indicates that paradoxical thinking interventions lead to attitude and behavior change due to greater unfreezing of beliefs and increased openness to alternative information (Hameiri et al., 2018). Unfreezing is the extent to which the person reevaluates strongly held beliefs, whereas openness to alternative information is the person's willingness to be exposed to information that offers a new perspective on entrenched beliefs. So far as we are aware, paradoxical thinking interventions have only been tested in intergroup contexts to date. We therefore adopted this approach in Study 3 and tested whether a paradoxical thinking intervention that greatly exaggerated the reasons why smoking should *not* be banned would promote support for banning the sale and purchase of cigarettes.

Method

Participants. We recruited current smokers in the U.S. on Amazon Mechanical Turk and paid them $0.60. Participants in Studies 1 or 2 were ineligible and we excluded participants who failed attention checks (n = 22). Participants' (N = 302) mean age was 37.71 years (SD = 1.08); 57.9% of the sample identified as female and 42.1% identified as male. The majority of participants was white (84.4%) and held a post-secondary degree (56.7%).

Procedure. Participants first responded to a pre-manipulation item regarding support for banning cigarettes. Next, participants were told "Thanks for your response! We asked people to tell us how they feel about banning cigarettes. Now, we're going to show you some of the responses that these other people provided, and then ask about your opinions." We then randomized participants to the control or paradoxical thinking condition. Thereafter, we measured unfreezing, openness to new information, a post-manipulation item on support for banning, perceived effectiveness of banning, reactance to prohibition, and intentions to quit; other variables that are not directly relevant to the present discussion also were measured.

Messages. The messages used in Study 3 are presented in Table S5 in the Supplemental Materials. Participants in the control condition viewed messages arguing that cigarettes should be banned (e.g., "Banning cigarettes would eliminate a lot of healthcare costs!"). The paradoxical thinking condition was meant to increase support for banning by presenting participants with exaggerated, possibly absurd reasons why cigarettes should not be banned (e.g., "Everyone should be able to smoke. Even kids should be able to smoke!"). When crafting these paradoxical thinking messages, we attempted to exaggerate the claims against banning as much as possible without making it clear to participants that these messages were written by the researchers rather than fellow research participants. The messages aimed to make smokers to realize the absurdity of the claims being made (e.g., "I would move to a different country just so I could smoke!") while also subtly suggesting solutions to their concerns in order to reduce reactance (e.g., "E-cigarettes are no substitute for the real thing!" acting to remind smokers that there are alternatives to combustible cigarettes). Like Study 2, we attempted to target exemption (by mentioning other substances that are banned, such as asbestos and heroin) and perceived effectiveness (by stating that "Nobody has ever actually quit smoking for good!").

Measures. The measures of perceived effectiveness of banning (α = .90), intentions to quit (α = .94), and reactance to prohibition (α = .87) were the same as Studies 1 and 2. *Support for banning* was measured both before and after the intervention. Prior to the intervention, support was measured by one item: "How much do you support or oppose a ban on cigarettes (that is, to make it illegal to buy and sell cigarettes)?" and participants responded on a scale of *1 - strongly oppose* to *7 - strongly support*. To prevent consistency bias and memory for one's previous response, we measured support for banning with the same item on a different scale (*0 = strongly oppose* to *100 - strongly support*) at post-test.

Unfreezing (Hameiri et al., 2018) was measured by 5 items: "To what extent did the responses that others wrote make you…" "…think that banning cigarettes could be a good idea?", "…think that banning cigarettes wouldn't be all that bad?", "…feel that you would be fine even if cigarettes were banned?", "…think that banning cigarettes might help people quit smoking?", and "…think that banning cigarettes might be the most effective way to reduce smoking?" (*0 = not at all* to *100 = very much so*) (α = .92). *Openness to new information* (Hameiri et al., 2018) was measured with three items on 7-point scales (*not at all-to a very large extent*): "How willing are you to learn more about banning cigarettes?", "How willing are you to find out why policy makers think banning cigarettes would be effective?", and "How willing are you to consider using alternatives to cigarettes?" on a scale of *1 - not at all* to *7 - to a very large extent* (α = .83).

Results and Discussion

A randomization check indicated that there were no differences between the conditions on age, gender, education, or ethnicity. However, participants in the control condition exhibited greater support for banning prior to the intervention (M = 3.29, SD = 2.06) than participants in the paradoxical thinking condition (M = 2.77, SD = 1.97), $t(300) = 2.24$, $p < .03$. Thus, in subsequent analyses, we covaried pre-intervention support for banning.

The effect of condition was significant in a MANCOVA, $F(7, 293) = 2.20$, $p = .03$, Wilks' $\Lambda = .95$, partial $\eta^2 = .05$. There was a significant difference between conditions for unfreezing, $F(1, 299) = 6.94$, $p = .009$. However, unfreezing was greater in the control condition than the paradoxical thinking intervention (Ms = 51.35 and 39.45, respectively). The paradoxical thinking intervention did not influence openness to new information, reactance to prohibition, perceived effectiveness of a ban, or intentions to quit (see Table S6 in the Supplemental Materials). Just like Study 2, the intervention was not effective in promoting support for banning the sale and purchase of cigarettes.

Study 4: Self-Persuasion and Issue Framing Interventions

Persuasive communication and paradoxical thinking did not increase support for banning cigarette sales and even had counterproductive effects on message reactance (Study 2) and unfreezing (Study 3). Three issues seemed crucial to address in any new intervention to promote support for banning cigarette sales. First, it could be worthwhile to avoid the didactic approaches used in Studies 2 and 3 that may cause smokers to question or react against the motives of the message source. Accordingly, we tested the efficacy of a self-persuasion intervention (Aronson, 1999) in Study 4. Second, the use of the term 'ban' or 'banning' might inevitably provoke reactance (Kellermann, 2007; Plous, 1993; Rugg, 1941). We therefore set out to test whether an alternative framing of the issue could engender greater support for banning cigarette sales. Finally, the interventions in Studies 2-3 did not directly tackle the issue of smokers' *self-interest* in the continued availability of cigarettes. Although smokers adduce a variety of reasons for smoking (e.g., pleasure, stress relief, addiction; Fidler and West, 2009; McEwen et al., 2008)), most smokers want to quit (Centers for Disease Control and Prevention, 2020) and 71.5% of smokers indicate that they regret ever having started to smoke (Nayak, 2017). Thus, in Study 4 we aimed to counter smokers' vested interest in cigarette availability by emphasizing smokers' self-interest in banning cigarette sales – as a means to quit smoking.

Accumulated research suggests that inducing self-persuasion (e.g., by posing questions) generates greater opinion change compared to traditional persuasive communications (Aronson, 1999; Maio and Thomas, 2007). For instance, when cigarette warning labels were framed as questions (e.g., "What are the consequences of smoking for your lungs?") rather than declarative statements (e.g., "Smoking causes fatal lung cancer"), smokers believed they had a higher likelihood of developing smoking-related diseases (Glock et al., 2013), and waited longer before lighting a cigarette (Müller et al., 2016). There are several reasons why self-persuasion is more effective than traditional persuasive appeals. Formulating warnings as queries rather than statements reduces reactance-related negative affect (i.e., the extent to which participants felt "irritated," "annoyed," and "angry;" (Loman et al., 2018) and recognition of persuasive intent (e.g., "This message is trying to manipulate me!"). When people are invited to generate their own arguments about an issue (self-persuasion), they generate more pro-arguments (Loman et al., 2018) and attitude change is greater (Baldwin et al., 2013; Müller et al., 2009). Importantly, self-persuasion is more successful than direct persuasion for consumers that are highly involved with the target behavior (Bernritter et al., 2017), as might be the case for smokers, whose identity and habits may be tied to cigarettes.

The effectiveness of self-persuasion in promoting attitude change could depend on how the focal issue is framed. If the term "banning cigarettes" invariably prompts reactance, then self-persuasion and direct persuasion could both be ineffective and alternative framing may be needed to promote opinion change. Research indicates that issue framing can dramatically alter policy attitudes (Kellermann, 2007; Plous, 1993) including support for health policies (Calo et al., 2021; Deslatte, 2020). For instance, when participants were asked, "Do you think that the United States should ["allow" vs. "forbid"] public speeches against democracy?", 62% said "no" to "allow" whereas only 46% said "yes" to "forbid" (Rugg, 1941). Rugg (1941) pointed out that "the 'forbid' phrasing makes the threat to civil liberties more apparent, and fewer people are willing to advocate suppression of anti-democratic speeches when the issue is presented this way" (p. 92). Accordingly, in Study 4, we explored whether framing the issue of banning cigarette sales in terms of "protecting Americans from avoidable harm" (protecting frame) elicits less reactance and more support than framing the issue as "a ban on cigarettes (that is, to make it illegal to buy and sell cigarettes)" (banning frame).

We predicted that self-persuasion would be more effective than a direct persuasion, control condition in promoting support for a ban on the purchase and sale of cigarettes and that the protecting framing would lead to greater support compared to the banning frame. We also anticipated an interaction between persuasion condition and issue framing such that support for banning cigarette sales would be greatest in the self-persuasion plus protecting frame condition.

Method

Participants, design, and procedure. We recruited current smokers residing in the USA using Prolific (https://www.prolific.co) and paid them $1.80 for taking part. Participants were randomized to a 2-between (persuasion condition: self-persuasion vs. direct persuasion) x 2-within (issue framing condition: protecting vs. banning) experimental design. Issue framing was manipulated by randomizing participants to the measure of support for banning cigarette sales framed one way first (e.g., protecting) and the other way second (e.g., banning). Participants underwent the persuasion condition first, and then completed the framed measures of support for banning. Measures of self-interest, perceived effectiveness of

banning, intentions to quit, reactance to prohibition, and reactance to messages, were presented next in randomized order; other variables that are not directly relevant to the present discussion also were measured.

Persuasion conditions. Participants in the direct persuasion (control) condition read new FDA health warnings (e.g., "Smoking can cause heart disease and strokes by clogging arteries") that are slated to be placed on cigarette packs in 2022 and then read a short passage about the research supporting the warnings (e.g., "The FDA's research indicates that these revised warnings provided new information to participants compared to previous warnings"). Participants in the self-persuasion, treatment condition were exposed to 6 questions that were designed to target self-interest, intentions to quit, perceived effectiveness, exemption, and reactance. We asked multiple-choice questions on the grounds that participants would have to generate arguments and convince themselves which response is correct (i.e., engage in self-persuasion). Participants were first asked about the percentage of smokers that regret starting to smoke and the odds of success for smokers that try to quit on their own and were also asked about the most effective way to promote cessation and prevent uptake. We anticipated that these questions would activate participants' own misgivings about smoking and would target both self-interest and perceived effectiveness of a ban by reminding smokers that banning cigarette sales would help them quit smoking. We targeted exemption of cigarettes by asking, "Are there any other products besides cigarettes that shorten people's lives by 11.5 years and kill 1-in-2 long-term users that are not illegal to buy or sell?" Reactance was targeted in three ways – by using queries rather than statements, by reminding smokers about less harmful alternatives to cigarettes, and by harnessing reactance *to tobacco companies* rather than reactance to banning ("Why is it so difficult for smokers to quit? What did tobacco companies do to get and keep smokers addicted?"). The control and intervention materials are presented in Table S5 in the Supplemental Materials.

Issue framing conditions. Participants viewed two items measuring support for banning that varied whether the issue was framed in terms of *protecting* or *banning*: "How much would you support or oppose protecting Americans from avoidable harm by preventing the sale and purchase of cigarettes?" and "How much would you support or oppose a ban on cigarettes (that is, to make it illegal to buy and sell cigarettes)?" Both items were on a scale of *1 - strongly oppose* to *7 - strongly support*. The items were presented in a randomized order and the second item was not visible as participants completed the first item.

Measures. After the manipulation, participants completed the same measures of perceived effectiveness of banning (α = .92), quit intentions (α = .94), reactance to prohibition (α = .90), and reactance to messages (α = .78) as Studies 2-3. In addition, *self-interest* was measured by two items: "I could see how banning cigarettes would benefit me" and "It would help me if cigarettes were banned" (7-point scales, *strongly disagree- strongly agree,* α = .95).

Results

Data quality and randomization check. We embedded two attention check items within the study, and participants who failed both checks (n = 26) were excluded from analysis. We also excluded participants who were flagged by Qualtrics' Captcha Verification as potential bots (n = 5). The final sample comprised 336 participants with a mean age of 39.70 years (SD = 11.15); 40.8% identified as a woman, 57.1% identified as a man, and 2.1% identified as another category. Most participants were white (88.1%) and held a post-secondary degree (61%).

Randomization checks showed no differences between the persuasion conditions on age, gender, education, or ethnicity. However, as socioeconomic status (SES) was higher in the self-persuasion treatment than the control condition, $t(320.92) = -2.43$, $p = .02$, all analyses were repeated using SES as a covariate.

Impact of self-persuasion and issue framing on support for banning cigarette sales. A mixed-model ANOVA showed main effects of both persuasion condition, $F(1, 334) = 24.34$, $p < .001$, $\eta_p^2 = .07$, and issue framing, $F(1, 334) = 46.27$, $p < .001$, $\eta_p^2 = .12$). Support for banning was greater in the self-persuasion condition (M = 4.54, SD = 2.16) than the control condition (M = 3.39, SD = 2.12). Support was also greater when the issue was framed in terms of protecting Americans from harm (M = 4.17, SD = 2.29) than banning cigarette sales (M = 3.72, SD = 2.30).

We also observed a significant persuasion condition x issue framing interaction, $F(1, 334) = 19.61$, $p < .001$, $\eta_p^2 = .06$ (see Figure 3). Tests of simple main effects showed that self-persuasion increased support for banning cigarette sales in both the banning frame, $F(1, 334) = 36.40$, $p < .001$, $\eta_p^2 = .10$) and the protecting frame ($F(1, 334) = 12.34$, $p = .001$, $\eta_p^2 = .04$, but had a larger effect when the issue was framed in terms of banning. We also examined the effect of issue framing within each persuasion condition. The protecting frame increased support for banning within the control condition, $F(1, 334) = 65.39$, $p < .001$, $\eta_p^2 = .16$, but did not increase support within the self-persuasion treatment, $F(1, 334) = 2.72$, $p = .10$, $\eta_p^2 = .01$). Covarying SES in the analyses made no difference to the findings.

Impact of self-persuasion on other outcomes. MANOVA revealed a difference between the persuasion conditions across the outcomes tested, $F(5, 330) = 6.16$, $p < .001$, Wilks'' $\Lambda = .92$, $\eta_p^2 = .09$. The self-persuasion intervention did not increase reactance to messages compared to the control condition and proved effective in reducing reactance to prohibition and at increasing both perceived effectiveness of, and self-interest in, banning cigarette sales (see Table S9 in the Supplemental Materials). There was no effect of self-persuasion condition on intentions to quit.

Discussion

Self-persuasion and issue framing interventions both increased support for a ban on the sale and purchase of cigarettes. Self-persuasion better promoted support than direct persuasion and there was evidence that the effectiveness of self-persuasion accrued from overcoming reactance to banning products and from strengthening beliefs in both the effectiveness of a ban and self-interest in banning. We also observed a significant interaction between persuasion condition and issue framing though the shape of the interaction was different to what we anticipated. Whereas we predicted that support would be greatest in the

self-persuasion plus protecting frame, it turned out that support was lowest in the direct persuasion plus banning frame. In fact, the self-persuasion intervention proved effective irrespective of issue framing whereas issue framing only mattered in the direct persuasion, control condition. The implication is that self-persuasion is a more powerful intervention than issue framing and framing the ban in terms of protecting Americans from avoidable harm is mainly effective when self-persuasion is not feasible. However, it should be acknowledged that issue framing was tested within-participants in Study 4, and additional tests using a full factorial (persuasion condition x issue framing) design are warranted to bolster conclusions about the efficacy of issue framing.

General Discussion

Banning the sale and purchase of cigarettes may be one of the most effective means of realizing the tobacco endgame (Proctor, 2011, 2013; Smith and Malone, 2020). Very little research has addressed support for banning cigarette sales, and previous studies merely documented levels of public support (Connolly et al., 2012; Kamran et al., 2022). We used the Experimental Medicine approach (; Sheeran et al., 2017) to develop a suite of studies that were designed to understand and mobilize support for a ban. Our research offered the first comprehensive assessment of factors predicting willingness to ban cigarettes among current, former, and never smokers in the U.S. (Study 1). Findings indicated that current and former smokers were less likely to support banning cigarette sales than an unnamed, equally hazardous product whereas nonsmokers were equally willing to ban both targets. We also observed that the perceived effectiveness of banning cigarette sales for promoting smoking cessation and negative beliefs and affect about banning products *per se* (reactance to prohibition) predicted willingness to ban. Intending to quit was also related to support for a sales ban among smokers.

We then attempted to modify these predictive factors in interventions (Studies 2-4) and thereby increase support for banning cigarette sales. The interventions focused on current smokers, as only a minority of this group supported a ban, unlike former and never smokers. Constructing an intervention that targeted exemption, quit intentions, and perceived effectiveness – and did not elicit reactance – proved difficult. We used an established intervention technique in Study 2, namely, persuasive communication (Petty et al., 2009; Zestcott and Stone, 2020) and deployed a recent technique that has demonstrated considerable promise in changing attitudes about contentious issues in Study 3 (paradoxical thinking) (Hameiri et al., 2014, 2018). Findings showed that both these techniques led to increased reactance or less unfreezing and failed to increase support for a ban. In Study 4, we turned to a technique that circumvents reactance by giving participants an active role in elaborating messages – self-persuasion. Whereas previous self-persuasion interventions presented open-ended questions (Loman et al., 2018) or asked participants to generate their own arguments (Baldwin et al., 2013), we adapted the technique to instead ask multiple choice questions. So doing preserves the core elaboration component of self-persuasion while simultaneously making the intervention brief and engaging. Findings supported the effectiveness of self-persuasion in promoting support for banning cigarette sales. Compared to a direct persuasion, control condition, self-persuasion did not increase reactance to the intervention and attenuated reactance to prohibition. Self-persuasion also enhanced perceived effectiveness and self-interest.

Study 4 also tested the impact of issue framing on support for a ban – whether the issue concerned "banning cigarettes" or "protecting Americans from avoidable harm by preventing the sale and purchase of cigarettes." Findings indicated that the protecting frame was highly effective in promoting support for the policy. However, this was only true in the direct persuasion, control condition. When self-persuasion was used, issue framing no longer influenced support for a ban. The implication is that protecting framing should be the default frame for promoting prohibition of the sale and purchase of cigarettes. Our findings also align with previous research showing that use of terms such as 'ban' or 'forbid' engenders opposition to relevant policies (Holleman et al., 2016; Rugg, 1941). Whenever feasible, the optimal strategy for mobilizing public support for a ban on cigarettes would seem to be self-persuasion.

Limitations and directions for future research. We acknowledge that the research has several limitations. First, the present studies recruited online convenience samples that may not be representative of smokers in the United States. Previous tobacco-related research indicates that experimental findings from such convenience samples yield similar findings to findings from probability samples, even when the relevant demographic characteristics are very different (Jeong et al.,, 2019). Nonetheless, it would be useful to replicate the present studies with probability samples. Second, the measure of willingness to ban used in Study 1 is novel and unorthodox, and was specifically developed to enable us (a) to compare banning cigarettes vs. an equally hazardous (unspecified) product on the same metric, and (b) clearly demarcate participants' willingness vs. unwillingness to ban. While the measure proved reliable, it could be argued that important information about willingness is lost by dichotomizing the measure and not incorporating participants' views about the number of years of life lost and the percentage of participants who die from using the product. Additional studies thus are needed to validate the measure. Third, self-report attitudinal measures were used to index policy support and the behavioral impact of these measures remains to be determined. Future studies should endeavor to include behavioral indicators of policy attitudes (e.g., signing a petition). Fourth, our experiments were conducted in a single session and the durability of intervention effects on policy support is not yet established. Testing the impact of interventions in both the near and longer term would be valuable. Fifth, Study 4 offered an efficacy test of self-persuasion as a strategy for promoting policy support but additional research is needed to ensure that this strategy is scalable. Research on the use of the interrogative form (e.g., Glock et al., 2013; Loman et al., 2018) and self-affirming implementation intentions may offer useful precedent in this regard (e.g., Armitage et al., 2011). Sixth, our interventions targeted smokers only (Studies 2-4) on the grounds that attitude change was especially needed among this group. New studies with samples of nonsmokers and former smokers are needed to confirm the promise of the self-persuasion and protecting

framing interventions with these groups. Relatedly, it remains to be determined whether these interventions would be effective in promoting policy support among smokers after a ban on the sale and purchase of cigarettes has been introduced.

Notwithstanding these limitations, the present research breaks new ground by using the Experimental Medicine approach (Sheeran et al., 2017) to analyze public support for health policies. Several avenues for future research are apparent. A key lesson of the Experimental Medicine approach is the need for "competitive tests of target engagement". That is, future studies should endeavor to test the effectiveness of alternative intervention techniques in reducing exemption and reactance and in promoting perceived effectiveness, quit intentions, and self-interest in banning *using self-persuasion and issue framing as the control conditions*. This approach should serve to identify techniques that optimize changes in policy attitudes. There is also scope for further analyses of tobacco policies. We defined banning cigarettes in terms of the prohibition of the sale and purchase of cigarettes. However, 'banning' could also be considered in relation to the manufacture, or even the possession, of cigarettes. It is an empirical question whether there would be greater public support for banning the manufacture vs. the possession vs. the sale and purchase of cigarettes. The present research examined a single market/supply-focused strategy (banning purchase and sales), and tests of other market/supply-focused strategies such as price caps for tobacco sales (Branston and Gilmore, 2014) or advantaging reduced-harm products (e.g., e-cigarettes) are warranted. Relatedly, it remains to be determined whether different intervention techniques are needed to promote support for different Tobacco Endgame strategies. For instance, it is not yet clear whether self-persuasion or issue framing would also prove effective in relation to product-focused, user-focused, and institutional structure-focused strategies. Finally, although tobacco use is of particular concern for public health, the Experimental Medicine approach adopted here could prove valuable in promoting support for health policies in other domains such as obesity (e.g., soda taxes, health warnings on high-calorie foods), excess alcohol consumption (e.g., minimum unit pricing for alcohol), or physical inactivity (e.g., mandatory physical activity in schools).

Conclusions

Whereas previous research documented support for banning the sale and purchase of cigarettes and the role of demographic factors and smoking history in predicting such support (e.g., Connolly et al., 2012; Shahab and West, 2010; Siddiqi et al., 2022), the present studies used the Experimental Medicine approach to (a) identify modifiable determinants of support for a ban, and (b) test intervention strategies to modify those determinants and thereby increase support. We found that nonsmokers were willing to ban both cigarettes and other, equally harmful products but current and former smokers exempted cigarettes from a ban. General hostility to prohibition and believing that a ban would be ineffective in promoting smoking cessation were key barriers to support for a ban, for all three smoking status groups. Neither persuasive communication nor paradoxical thinking interventions proved effective in modifying these predictors or increasing support for a ban among smokers. However, both self-persuasion and framing the ban in terms protecting Americans from avoidable harm were both successful in mobilizing current smokers' support for banning the sale and purchase of cigarettes. The present research offers new impetus for studies targeting the Tobacco Endgame and for research concerned with mobilizing support for policies that promote public health.

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Figure 1

Percentage Willing to Ban by Condition (Cigarettes vs. Products) and Smoking Status in Study 1

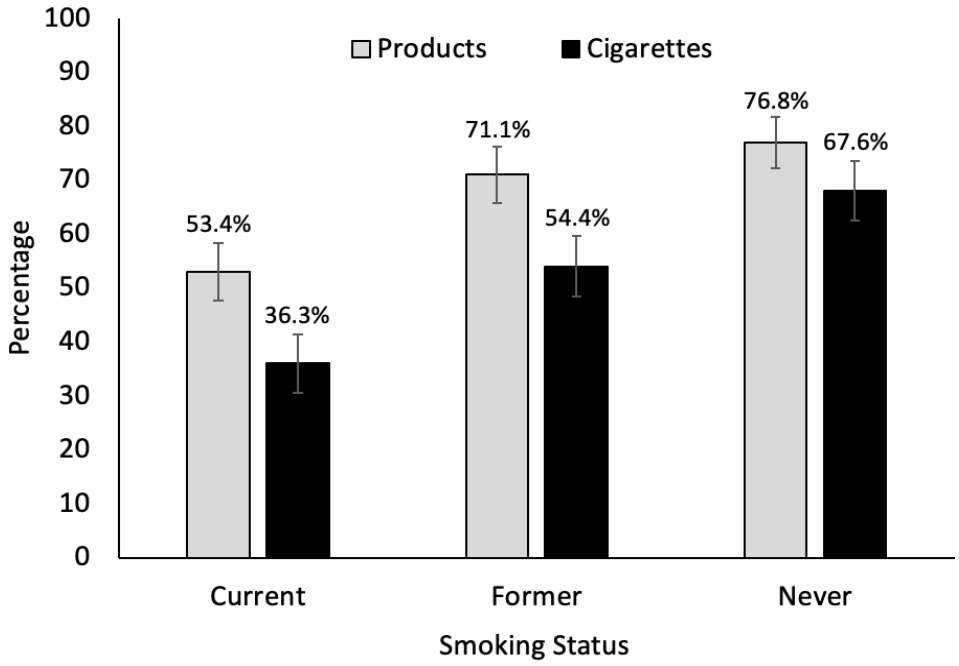


Figure 2

Harm Prevalence (Estimated % of Smokers that Die from Smoking) and Harm Severity (Estimated Years that Smoking Takes from Life) by Smoking Status in Study 1

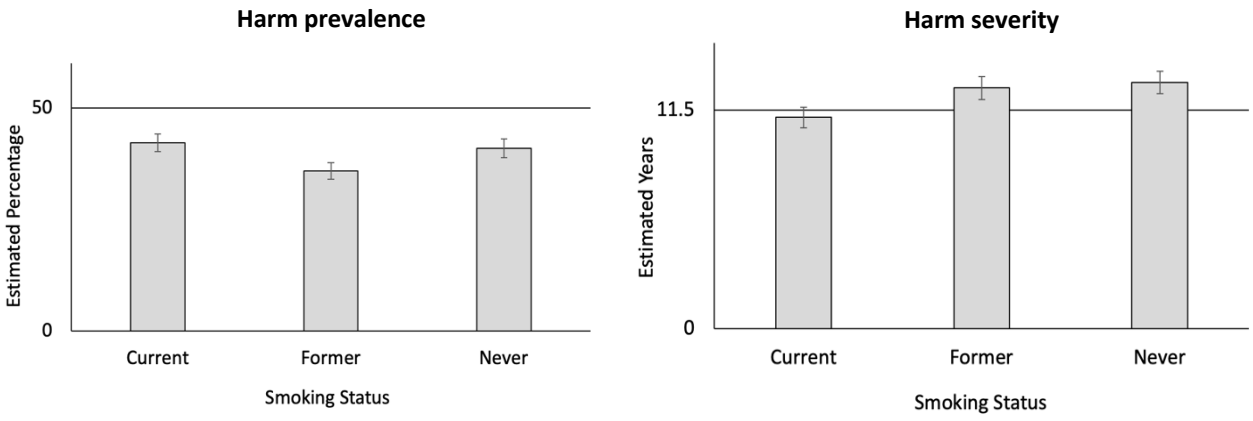
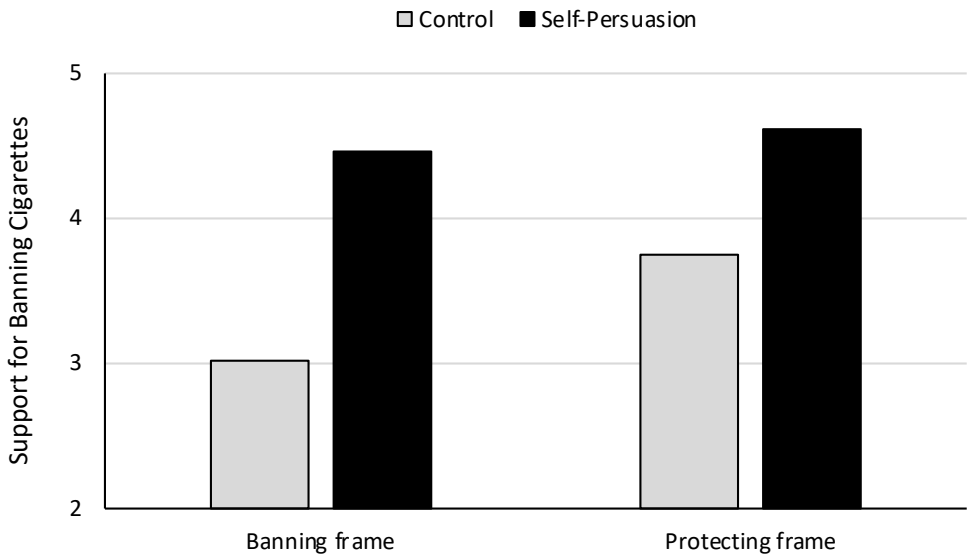


Figure 3

Support for Banning Cigarettes by Persuasion Condition and Issue Framing in Study 4



Realizing the Tobacco Endgame: Understanding and Mobilizing Support for Banning Combustible Cigarette Sales in the United States

SUPPLEMENTAL MATERIALS

Table S1. Power Analyses and Missing Data in Studies 1-4

Study 1. We determined the necessary sample size for Study 1 by conducting a power analysis in G*Power. In the power analysis, we assumed that 43% of participants would support a ban on cigarettes in line with the most recent published, nationally representative U.S. study (Connolly et al., 2012). To estimate the proportion of participants that would support a ban on products, we used the proportion of Americans who support stricter gun control (66%; Quinnipiac University National Poll, 2018). We conducted a two-tailed z-test for difference between two independent proportions, $\alpha = .05$, power = .80, proportion 1 = 0.43, and proportion 2 = 0.66. The results of the power analysis indicated that we would need 146 participants (73 per randomized condition) to detect a significant effect. Accordingly, we endeavored to recruit 146 current smokers, 146 former smokers, and 146 never smokers in Study 1.

Study 2. The power analysis was conducted using G*Power. We aimed to increase willingness to ban cigarettes among smokers from 33% to 50% (33% of smokers supported a ban on cigarettes in Connolly et al., 2012). Thus, we used a two-tailed Fisher's exact test for proportions with two independent groups, $\alpha = .05$, power = .80, proportion 1 = 0.33, and proportion 2 = 0.50 to calculate the necessary sample size. This power analysis indicated that we needed a total of 288 participants to find an effect of that size. Therefore, we recruited 300 participants to Study 2.

Study 3. We utilized the same power analysis as Study 2 and determined that our target sample for Study 3 should be 300 participants.

Study 4. We utilized G*Power to conduct a power analysis and determine the sample size needed for a 2 x 2 ANOVA with the following specifications: $f = .15$ (small-medium effect size), $\alpha = .05$, power = .80, number of groups = 2, number of measurements = 2, and correlation

among repeated measures = .5. This power analysis indicated that we need a sample size of 264 participants, so we aimed to recruit 400 participants to account for a portion of missing or unusable data.

Missing data. We used the Request Response function in Qualtrics in all four experiments which meant that participants had to deliberately decide not to provide responses to questions. This meant that there was virtually no missing data in each study. Responses were not provided for one item in Study 1, one item in Study 2, zero items in Study 3, and one item in Study 4. Missing values for these single items did not result in any data loss because it was possible to compute a mean score for respective scales based on responses to other items in the scale.

Table S2. Means and Standard Deviations for Harm Prevalence and Harm Severity and Findings for One-Sample t*-Tests in Study 1*

	Estimated Harm	
	Prevalence [a]	**Severity** [b]
Current smokers	42.25 (25.44)***	11.10 (6.95)
Former smokers	35.89 (23.03)***	12.65 (7.41)†
Never smokers	41.00 (25.97)***	12.94 (7.25)*

Note. [a] Compared to 50%, [b] Compared to 11.5 years.
† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Explanatory text:

One-sample t-tests were used to compare harm severity estimations to the correct values for current smokers, former smokers, and never smokers: $t(163) = -.73$, $p = .47$, $t(153) = 1.92$, $p = .056$, and $t(153) = 2.46$, $p = .02$, respectively. Current ($M = 11.10$ years, $SD = 6.95$) and former smokers ($M = 12.65$ years, $SD = 7.41$) were accurate in estimating harm severity (the number of years smoking takes off one's life, 11.5 years; Jha et al., 2013), while never smokers ($M = 12.94$ years, $SD = 7.25$) overestimated this value.

Table S2. Correlations Between Predictors and Willingness to Ban for Current Smokers (Study 1)

	2.	3.	4.	5.	6.	7.	8.	9.
1. Est. harm prevalence	.34**	.16	-.02	.09	-.05	-.11	-.01	.13
2. Est. harm severity	---	-.13	.03	.00	-.19†	-.24*	-.15	-.02
3. Trust in government		---	.10	.06	.12	.14	.09	-.01
4. Reactance to prohibition			---	-.44***	.28*	.24*	-.22†	-.49***
5. Response efficacy				---	-.25*	-.03	.42***	.57***
6. Liking cigarettes					---	.23*	-.39***	-.35**
7. Nicotine dependence						---	.05	-.22*
8. Intentions to quit							---	.44***
9. Willingness to ban								---

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table S2. Correlations Between Predictors and Willingness to Ban for Former Smokers (Study 1)

	2.	3.	4.	5.	6.	7.
1. Est. harm prevalence	.30**	-.09	.01	-.02	-.02	-.05
2. Est. harm severity	---	-.23*	.26*	-.14	.03	-.03
3. Trust in government		---	-.45***	.36**	.12	.26*
4. Reactance to prohibition			---	-.53***	.10	-.46***
5. Response efficacy				---	-.17	.46***
6. Liking cigarettes					---	-.18
7. Willingness to Ban						---

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table S2. Correlations Between Predictors and Willingness to Ban for Never-Smokers (Study 1)

	2.	3.	4.	5.	6.	7.
1. Est. harm prevalence	.15	.08	-.25*	.15	-.14	.12
2. Est. harm severity	---	-.06	.13	.12	-.01	-.27*
3. Trust in government		---	-.23†	.20†	-.14	.21†
4. Reactance to prohibition			---	-.54***	.31**	-.68***
5. Response efficacy				---	-.32**	.50***
6. Liking cigarettes					---	-.25*
7. Willingness to ban						---

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table S4. Control and Intervention (Persuasive Communication) and Messages Used in Study 2

Here's Why Selling and Buying Cigarettes Should Be Banned

Smoking causes lung cancer, heart disease, emphysema, and may complicate pregnancy.
Quitting smoking now greatly reduces serious risks to your health.
Cigarette smoke contains carbon monoxide.
Tobacco smoke can harm your children.
Tobacco smoke causes fatal lung disease in nonsmokers.
Smoking causes head and neck cancer.
Smoking causes bladder cancer, which can lead to bloody urine.
Smoking can cause heart disease and strokes by clogging arteries.
Smoking causes COPD, a lung disease that can be fatal.
Smoking reduces blood flow to the limbs, which can require amputation.
Smoking causes type 2 diabetes, which raises blood sugar.
Smoking causes age-related macular degeneration, which can lead to blindness.
Smoking causes cataracts, which can lead to blindness.

Should Selling and Buying Cigarettes Be Banned?

Would you want your son or daughter to smoke cigarettes?

Would banning cigarettes lead to longer, happier lives? Maybe you know that nonsmokers live 11-12 years longer than smokers? And that people who quit smoking are much happier than people who keep smoking? But did you know that smokers who want to quit support a ban on cigarettes?

We ban dangerous drugs and unsafe products to prevent harm, especially to young people. Why should cigarettes be different? People will still be free to consume nicotine from electronic devices, gum, and patches.

Banning cigarettes is *the* most effective way to help smokers quit and prevent young people from starting to smoke. Can you find a way to support it?

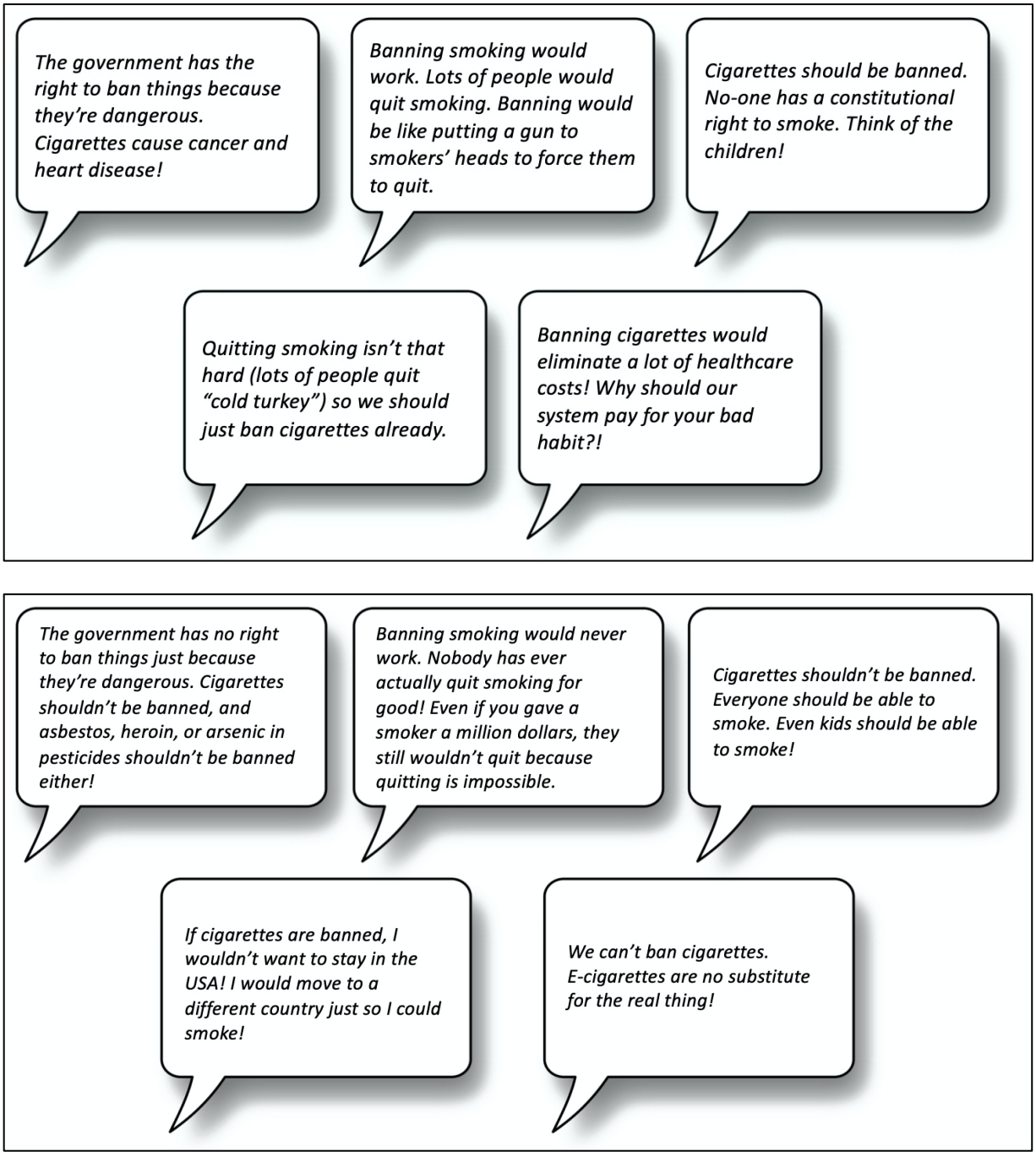
Note. Control message is at the top, intervention message is at the bottom.

Table S5. Effect of Persuasive Communication Treatment on Outcomes in Study 2

Outcome	***Control***	***Treatment***	***F***	***p***	η_p^2
Reactance to messages	2.66 (1.09)	3.06 (1.19)	9.34	.002	.030
Reactance to prohibition	3.30 (1.11)	3.37 (1.24)	.28	.60	.001
Perceived effectiveness of ban	3.04 (1.39)	3.03 (1.43)	.002	.97	.000
Intentions to quit	5.20 (1.54)	4.83 (1.92)	3.33	.07	.011
Support for banning cigarettes	3.74 (2.09)	3.57 (2.27)	.47	.50	.002

Note. Standard deviations are in parentheses.

Table S6. Control and Intervention (Paradoxical Thinking) Messages Used in Study 3



Note. Control message is at the top, intervention message is at the bottom.

Table S7. Effect of Paradoxical Thinking Treatment on Outcomes in Study 3

Outcome	**Control**	**Treatment**	**F**	**p**	**η_p^2**
Unfreezing	51.35 (28.97)	39.45 (30.35)	6.94	.009	.023
Openness to new information	4.55 (1.77)	4.42 (1.75)	.35	.56	.001
Reactance to prohibition	3.73 (0.95)	3.67 (1.02)	1.20	.28	.004
Perceived effectiveness of a ban	3.01 (1.37)	2.81 (1.45)	.06	.80	.000
Intentions to quit	5.03 (1.80)	4.70 (1.86)	.33	.56	.001
Support for banning cigarettes	44.18 (35.66)	36.24 (34.84)	.11	.74	.000

Table S8. Control and Intervention Materials Used in Study 4

Control Condition

[Instructions]

First, we would like you to read several statements about cigarettes. Then, you will learn where the information you read comes from.

[First page]

Tobacco smoke can harm your children.
Tobacco smoke causes fatal lung disease in nonsmokers.
Smoking causes head and neck cancer.
Smoking causes bladder cancer, which can lead to bloody urine.
Smoking during pregnancy stunts fetal growth.
Smoking can cause heart disease and strokes by clogging arteries.

[Second page]

Smoking causes COPD, a lung disease that can be fatal.
Smoking reduces blood flow, which can cause erectile dysfunction.
Smoking reduces blood flow to the limbs, which can require amputation.
Smoking causes type 2 diabetes, which raises blood sugar.
Smoking causes cataracts, which can lead to blindness.

[Third page]

The statements that you read are health warnings for cigarette packs. The U.S. Food and Drug Administration (FDA) will require these new, revised health warnings to be implemented in 2022. The warnings cover various diseases (e.g., cancer, COPD, diabetes) and various symptoms (e.g., bloody urine, reduced blood flow, raised blood sugar) that are associated with smoking cigarettes. The warnings also mention the different people that are affected (e.g., children, nonsmokers). The FDA conducted research to test whether these revised warnings improve people's understanding of the risks related to smoking cigarettes.

Half of the participants in the research were current smokers, while the other half were people who had never smoked before but were at risk of starting to smoke. The FDA's research indicates that these revised warnings provided new information to participants

compared to previous warnings. Participants generally learned something from the new warnings. The new health warnings also led participants to think more about the health risks of smoking and to link the health consequences described in the warnings to smoking.

Self-Persuasion Treatment

[Instructions]

First, we would like you to consider several questions about cigarettes. Then, you will receive some information about the questions.

[First page]

What is the percentage of smokers who wish they never started smoking?

___ %

If a smoker tries to quit on their own, what is the chance that their quit attempt will be successful?

___ %

Why is it so difficult for smokers to quit? What did tobacco companies do to get and keep smokers addicted? (select all that apply)

- ☐ Increased the amount of nicotine in cigarettes
- ☐ Added ammonia to cigarettes so that nicotine moves to the brain faster
- ☐ Added chemicals called *bronchodilators* to cigarettes so that cigarette smoke can enter the lungs more easily
- ☐ Added sugars and flavors to cigarettes to reduce the harshness of cigarette smoke so it's easier to inhale

[Second page]

Are there any other products **besides** **cigarettes** that shorten people's lives by 11.5 years and kill 1 in 2 long-term users that are not illegal to buy or sell?

- ○ Yes
- ○ No

What do you think is the **most** **effective** way to help smokers quit and make sure that future generations of children do not start smoking?

- Health warnings on cigarette packs
- Preventing the sale and purchase of cigarettes
- Increasing stop smoking services (such as counseling, helplines)

Do you believe there are any alternatives to cigarettes that are less harmful to a person's health? (select all that apply)

- ☐ Electronic cigarettes (e-cigarettes)
- ☐ Vape pens
- ☐ Nicotine gum
- ☐ Nicotine patches
- ☐ Electronic cigars (e-cigars)
- ☐ Electronic pipes (e-pipes)

[Third page]

72% of smokers regret ever starting to smoke cigarettes, and only 5% of attempts to quit on one's own remain successful after one year. One of the reasons that it's so difficult to quit is that tobacco companies manipulated nicotine dosing in cigarettes and added ammonia, bronchodilators, sugars, and flavors to get and keep smokers addicted.

In the U.S., products that pose "unreasonable risk" to users are typically banned. However, cigarettes have not yet been banned, and warning Americans about the harms of smoking has not helped most people to stop smoking cigarettes. It's not smokers' fault they find it hard to quit - our current policies have failed to protect smokers from the tobacco companies, who engineered cigarettes to make them highly addictive. We need new policies to help people quit smoking and ensure a new generation does not start to smoke. The best way to do that is to prevent the sale and purchase of cigarettes. E-cigarettes, vape pens, and other products can satisfy nicotine cravings with less harm to smokers.

Table S9. Impact of Persuasion Condition on Reactance, Perceived Effectiveness, Quit Intentions and Self-Interest in Study 4

Outcome	Control	Treatment	*F*	*p*	η_p^2
Reactance to messages	2.18 (1.04)	2.10 (0.92)	.58	.45	.002
Reactance to prohibition	3.28 (1.21)	2.79 (1.10)	15.08	< .001	.043
Perceived effectiveness of a ban	2.75 (1.43)	3.54 (1.36)	27.14	< .001	.075
Intentions to quit	4.95 (1.81)	5.21 (1.72)	1.81	.18	.005
Self-interest	4.12 (2.22)	5.12 (1.93)	19.08	< .001	.054

Note. Values for persuasion conditions are means (*SD*s).

Figure S1. Overview of Conditions in Studies 2-4