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Recall of "The Real Cost" Anti-Smoking Campaign Is Specifically Associated With Endorsement of Campaign-Targeted Beliefs

Elissa C. Kranzler, **Laura A. Gibson**, and **Robert C. Hornik**

Annenberg School for Communication, University of Pennsylvania, Philadelphia, Pennsylvania, USA

Abstract

Though previous research suggests the FDA's "The Real Cost" anti-smoking campaign has reduced smoking initiation, the theorized pathway of effects (through targeted beliefs) has not been evaluated. This study assesses the relationship between recall of campaign television advertisements and ad-specific anti-smoking beliefs. Respondents in a nationally representative survey of nonsmoking youths age 13–17 (n = 4,831) reported exposure to four The Real Cost advertisements and a fake ad, smoking-relevant beliefs, and nonsmoking intentions. Analyses separately predicted each targeted belief from specific ad recall, adjusting for potential confounders and survey weights. Parallel analyses with non-targeted beliefs showed smaller effects, strengthening claims of campaign effects. Recall of four campaign ads (but not the fake ad) significantly predicted endorsement of the ad-targeted belief (Mean β = .13). Two-sided sign tests indicated stronger ad recall associations with the targeted belief relative to the non-targeted belief (p < .05). Logistic regression analyses indicated that respondents who endorsed campaign-targeted beliefs were more likely to have no intention to smoke (p < .01). This study is the first to demonstrate a relationship between recall of ads from The Real Cost campaign and the theorized pathway of effects (through targeted beliefs). These analyses also provide a methodological template for showing campaign effects despite limitations of available data.

Smoking, the leading cause of preventable death in the United States, typically begins during adolescence, with 90% of smokers initiating smoking before age 18 (Centers for Disease Control and Prevention, 2014b). Despite a substantial decrease in smoking prevalence among youth over the last 15 years (Centers for Disease Control and Prevention, 2014a), projections based on current smoking rates estimate that 5.6 million of today's American youth will die prematurely due to a smoking-related illness (Centers for Disease Control and Prevention, 2014b). Efforts to prevent smoking initiation among youth remain an important public health issue.

Address correspondence to Elissa Kranzler, Annenberg School for Communication, University of Pennsylvania, 3620 Walnut Street, Philadelphia, PA 19104, USA. ekranzler@asc.upenn.edu.

Orcid: Robert C. Hornik http://orcid.org/0000-0002-2148-8805

“The Real Cost” Campaign

“The Real Cost” campaign, the first national youth prevention campaign sponsored by the Food and Drug Administration (FDA), seeks to reduce tobacco use intentions and behavior by educating at-risk youth about the harmful effects of tobacco use (Duke et al., 2015). The campaign targets youth, aged 12–17, who are susceptible nonsmokers or smoking experimenters. Prior to campaign initiation, formative research was conducted to identify the most promising message themes under the FDA's regulatory authority for use in campaign messages (Brennan, Gibson, Kybert-Momjian, Liu, & Hornik, 2017). Results indicated that three promising themes for a prevention campaign aimed at 13–17-year-olds were *Addiction, Harmful Ingredients (found in cigarettes and in) Common Products,* and *Physical (Cosmetic) Effects.* Campaign developers opted to target beliefs related to each of these promising themes, using campaign messages that highlight consequences of smoking that youth are concerned about, including a loss of control due to addiction, dangerous chemicals, and cosmetic health effects like tooth loss and skin damage [i.e., cosmetic effects] (Food and Drug Administration, 2015).

Between February 2014 and October 2015, the FDA purchased television advertising for The Real Cost program to attain 1,177 Target Rating Points (TRPs) for the first 8 weeks of the campaign and more than 300 TRPs per 4-week period thereafter, surpassing CDC guidelines for effective campaigns (Schar, Gutierrez, Murphy-Hoefer, & Nelson, 2006). Evidence from evaluation data collected from July 2014 to October 2014 suggests this ad buy translated into high ad awareness, with 89% of youth reporting they had seen at least one TV ad (Duke et al., 2015). Results from the first two published evaluations of The Real Cost campaign offer evidence in support of campaign efficacy. One evaluation shows a cross-sectional association between aided recall of campaign ads and increased risk perceptions about adverse health problems due to cigarette smoking (Huang et al., 2017). Another evaluation, conducted with longitudinal survey data, demonstrates that frequent recall of campaign advertisements resulted in decreased odds of subsequent smoking initiation, which accounted for an estimated 348,398 U.S. youths aged 11–18 who did not initiate smoking between February 2014–March 2016 (Farrelly et al., 2017). Thus, there is evidence that the campaign has been effective at reducing smoking initiation. However, there is no evidence to suggest that exposure to campaign ads is associated with endorsement of the beliefs targeted by these ads, a pathway through which the campaign was expected to influence smoking behavior (Duke et al., 2015). Evidence of specific relationships between campaign ad exposure and ad-targeted beliefs would bolster existing claims of campaign effects, reducing the likelihood that alternative explanations account for these effects.

Decades of smoking prevention research indicate that anti-smoking campaigns can increase young people's anti-smoking cognitions, which in turn predict smoking intentions and behavior (Australian Government Department of Health and Ageing, 2005; Freedman, Nelson, & Feldman, 2011; Goldade et al., 2012; U.S. Department of Health and Human Services, 2012). In their reviews of anti-tobacco campaigns, Allen and colleagues (2014) and Brennan and colleagues (2012) find several evaluations that have established associations between campaign exposure and smoking-relevant knowledge or beliefs on topics like health consequences and addiction. However, evaluations of campaigns that

targeted beliefs in other topic areas, including cosmetic effects, do not show evidence of an effect (Brennan et al., 2012).

These findings suggest inconsistencies in the literature on the relationship between campaign exposure and campaign-targeted beliefs. However, it is unclear whether such inconsistencies can be attributed to the types of beliefs targeted, the ways in which exposure and belief endorsement have been measured, or to other persuasive elements of the campaigns, such as superior production quality or campaign branding. In two previous studies with null findings pertinent to cosmetic effects, exposure and belief endorsement were measured in different ways. In one experimental study, advertisements that focused on the cosmetic effects of smoking were not associated with perceived smoking risks (Pechmann, Zhao, Goldberg, & Reibling, 2003). However, these perceived risks were not specific to the themes targeted by advertisements, such as cosmetic effects; rather, they measured perceived severity of social disapproval risks due to smoking. In another study, recall of anti-smoking ads was not associated with knowledge about a cosmetic effect of smoking (Siegel & Biener, 2000). It is worth noting that in this study, ad recall reflected exposure to all anti-smoking advertisements, rather than exposure to specific ads targeting beliefs about the cosmetic effects of smoking.

Despite evidence that The Real Cost anti-smoking campaign has reduced smoking initiation, no one has tested the specific mechanisms through which the campaign was successful. This study aims to address one potential mechanism—an increase in the beliefs targeted by campaign advertisements—and offers evidence to suggest that this mechanism was successful for The Real Cost campaign in particular, and can be effective in the context of different anti-smoking themes more broadly.

Study Aims

Consistent with the integrative model of behavior prediction (Fishbein & Ajzen, 2011; Fishbein & Cappella, 2006; Fishbein & Yzer, 2003), The Real Cost campaign seeks to influence beliefs thought to underlie smoking intention and behavior, with an overarching goal of reducing intention to smoke and subsequent smoking behavior. Initial evidence indicates that the campaign succeeded in preventing smoking initiation. The present study then asks whether recall of television advertisements from The Real Cost campaign is related to the anti-smoking beliefs targeted by these ads. We hypothesized a specific positive association between recall of each ad and the belief targeted by that ad.

However, inferring campaign effects from merely showing that recall and targeted beliefs are associated is open to two major types of challenges: (a) the observed associations are the result of reversed causal direction, that is, anti-smoking beliefs lead respondents to better recall exposure to anti-smoking ads; or (b) the observed associations are merely a reflection of the influence of confounder variables affecting both anti-smoking beliefs and the likelihood of claiming recall of any anti-smoking ads. Comparing associations for campaign-targeted beliefs versus other anti-smoking beliefs allows us to distinguish the campaign effects hypothesis from the (selection and casual direction) alternative explanations for the observed associations. If these alternative explanations account for the observed

associations, we would expect that ad recall would be similarly correlated with all anti-smoking beliefs, whether the campaign targeted them or not. Instead, we hypothesized that similar beliefs not specifically targeted by the campaign are less associated with ad recall.

If ad recall is merely an artifact influenced by anti-smoking beliefs, or of confounders influencing both beliefs and recall, we would expect the association of beliefs and ad recall would be present even if we asked about recall of a fake ad. Contrarily, if recall of the campaign ads actually influence beliefs, then recall of a fake ad would not be associated with the ad-targeted beliefs. We address these risks by testing whether the ad recall-belief associations are specific to ad-targeted but not non-targeted beliefs, and by assessing the relationships between recall of a fake ad and ad-targeted beliefs. Furthermore, we control for a variety of factors that could be related to relationships between ad recall and smoking beliefs to account for possible third-variable explanations. To add to the relevance of this evidence for assessing campaign promise, we hypothesized that endorsing anti-smoking beliefs targeted by The Real Cost campaign is positively associated with having no intention to smoke cigarettes, as suggested by formative campaign research (Brennan et al., 2017).

Methods

Sample

We obtained the data for this study from a large nationally representative, ongoing observational study of 13–17-year-olds, the goal of which is to examine whether exposure to tobacco-relevant content predicts subsequent tobacco-relevant beliefs, attitudes, and use behavior (Hornik & Lerman, 2013). As such, the 20-minute telephone survey includes questions pertinent to both general media use and exposure to specific tobacco-relevant media content, including recall of The Real Cost TV advertisements. Similarly, survey questions include both general smoking-relevant beliefs and those specifically targeted by The Real Cost ads.

This analysis is based on the first 132 weeks of survey data, which Social Science Research Solutions (SSRS) collected from June 18, 2014, through December 30, 2016. During the data collection period, a total of 4,964 respondents (age 13–17) completed the survey. The sampling plan included landline (30.2%) and cell phone (69.8%) recruitment, and an oversampling of households that indicated the presence of a person aged 13–17. SSRS obtained parental consent for participants aged 13–15[1] and respondent assent for all participants prior to survey administration. SSRS conducted surveys through a combination of list-assisted and random-digit dialing frames, with a response rate of 22% (AAPOR response rate #3). The Institutional Review Board at the University of Pennsylvania approved this study.

Measures

Anti-Smoking Beliefs—The primary dependent variables are anti-smoking beliefs targeted by The Real Cost campaign TV advertisements (see Table 1). To assess beliefs,

[1]The Institutional Review Board at the University of Pennsylvania did not require parental consent for respondents aged 16-17.

respondents were read the following statement: “The next set of questions is about tobacco cigarettes. I'll read a statement, then please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.” Respondents answered 13 belief items about the consequences of smoking tobacco cigarettes, asked in random order. Responses were coded as 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. To determine which belief was targeted by each ad, we analyzed the audiovisual content of each ad within the context of the overarching themes of the campaign. We assigned the three targeted beliefs listed in Table 1 to each The Real Cost ad on the basis of these characterizations. The other 10 smoking-relevant beliefs not targeted by the ads addressed in this study are listed below Table 1. Respondents completed recall items prior to belief items to reduce the influence of belief items on recall responses.

Intention to Smoke—The secondary dependent variable is self-reported intention to smoke in the next 6 months. To assess intention, respondents were asked the following question: “How likely is it that you will smoke a tobacco cigarette, even one or two puffs, at any time in the next 6 months? Would you say definitely will not, probably will not, probably will, or definitely will?” This item was adapted from the 2010 National Survey on Drug Use and Health (Resource Center for Minority Data, 2010). We dichotomized the smoking intention variable (1 = definitely will not and 0 = probably will not, probably will, or definitely will) to facilitate comparisons between the desired and undesired categories for this variable, as past work has shown that any level of susceptibility to smoking is predictive of future uptake (Jackson, 1998; Pierce, Choi, Gilpin, Farkas, & Merritt, 1996).

Aided Recall of Ads—The primary independent variables are self-reported, aided recall of TV advertisements from The Real Cost campaign modeled after previous campaign evaluations (e.g., Farrelly et al., 2002; Sly, Heald, & Ray, 2001). Respondents were first asked the following question: About how many times in the past 30 days have you seen or heard of each of the following? Subsequently, they were read brief descriptions of each advertisement (Table 1), and responses were coded between 0–100. The first four of these ads—Your Skin, Your Teeth, Bully, and Alison—are actual campaign ads, and the fifth, Mouse, is a description of a fake ad. For the first 4 weeks of the survey, respondents were asked about all five ads in random order. For the remaining 128 weeks, respondents were asked about 2–3 ads randomly selected from a pool of ads that included the larger set of airing The Real Cost ads and the fake Mouse ad. Ads were removed from the pool of ads once they were continuously off the air for 3 months and were not scheduled to be rebroadcast.

Potential Covariates—Potential covariates were selected a priori on the basis that 1) they might be associated with targeted beliefs, 2) they are temporally prior to ad exposure, and 3) they are not expected to mediate the relationship between ad recall and targeted beliefs. These include continuous covariates: respondents' age (13–17 years), sensation seeking (1–4, where 1 = low sensation seeker and 4 = high sensation seeker; Zuckerman, 2007), parental disapproval of smoking with different response items for users and nonusers (1 = don't/wouldn't mind, 2 = would/disapprove a little, and 3 = would/disapprove a lot), grades (1 = mostly A's, 2 = mostly B's, 3 = mostly C's, 4 = mostly D's, and 5 = mostly F's), and average

TV watching in a week (0–168 hours). Average hours per week of TV watching is assessed with two questions: average hours per weekday and average hours per weekend. Two binary covariates include sex and household cigarette use. Finally, two categorical covariates are race (reference category = non-Hispanic White) and parent education (reference category = high school degree or less).

Statistical Analysis

Analyses were conducted on the subset of survey respondents (n = 4,831) who fell within the campaign's target population (13–17-year-old nonsmokers or experimenters, defined as having smoked fewer than 100 cigarettes in their lifetime). Data were analyzed using Stata version 13.1 (StataCorp, 2013). Distributions of ad recall were highly skewed with greater levels of lower recall. In all The Real Cost ad analyses, ad recall responses were log transformed, reducing the influence of the few cases reporting very high levels of exposure. Additionally, we excluded responses to recall items assessed more than 2 months after ads were continuously off-air. We chose this period of time because respondents were asked to report past 30-day recall of ads, and we anticipated lingering reports of ad recall beyond the 30-day period. Given the low proportion of respondents who reported any recall of the fake Mouse ad, this variable was dichotomized, such that 1 = any recall and 0 = no recall. We regressed targeted beliefs on logged recall variables, adjusting for potential confounders including age, sex, race, sensation seeking, and average weekly TV watching.

To assess the relative influence of recall on targeted versus non-targeted beliefs, we compared the standardized regression coefficient of the targeted belief predicted from recall of each specific ad with the 10 coefficients for non-targeted beliefs predicted in separate regressions from that same ad, controlling for the same set of covariates. We conducted two-sided sign tests for matched pairs to compare each recall/targeted belief association with the corresponding set of recall/non-targeted belief associations.

In line with criteria for evaluating the potential impact of national campaigns (Farrelly, Niederdeppe, & Yarsevich, 2003), we assessed whether endorsement of campaign-targeted beliefs is related to having no intention to smoke. We conducted separate logistic regressions for having no intention to smoke on each of the targeted beliefs, adjusted for confounders. We conducted similar regressions using the original, continuous version of the outcome variable (definitely do not intend to smoke–definitely intend to smoke) to ensure that the association between belief and intention remained significant, regardless of whether a continuous or dichotomous outcome variable was used.

Responses to recall items that participants were not randomly assigned to answer were *missing completely at random* (MCAR; Allison, 2009). To account for this MCAR missing data, we conducted all regressions involving recall with maximum likelihood missing value (MLMV) estimation.[2] Additionally, we weighted analyses to adjust for sampling procedures

[2]Generally, there were very low rates of missing data. However, the Wrinkle belief, Teeth belief, and parent education variables had missing values for more than 1% of responses. To test whether these missing cases influenced our results, we employed Manski-Horowitz logical bounds (Horowitz & Manski, 2006), separately replacing the missing values with the lowest and highest value on each variable and rerunning regression models. We recoded all missing values for the Wrinkle belief to “strongly disagree” in one

and to be representative of the U.S. population of 13–17-year-olds in terms of sex, age, region, parental education, and race/ethnicity.

Results

We present the unweighted and weighted demographic distributions of the study sample in Table 2. Respondents in the unweighted sample were approximately evenly distributed by age group (13–15 and 16–17) and sex (male and female). Just over half of respondents were non-Hispanic Whites (51.5%) and nearly a quarter were Hispanic (24.0%), with the remaining respondents reporting they were Black/African-American (13.2%) or other/more than one race (11.3%). One quarter of respondents' parents attained less than or equal to a high school degree (24.8%), and the remaining respondents' parents completed at least some college (75.2%).

Ad Recall

Among the four ads studied, Your Skin had the highest recall, with 67.9% of respondents who were asked this question reporting they had seen the ad at least once in the previous 30 days (Table 1). Sixty-four percent of respondents reported Your Teeth recall, while less than half of respondents reported Bully and Alison recall (47.1% and 44.0%, respectively). Fewer respondents, 16.9%, indicated that they had seen the fake Mouse ad. There was a monotonic relationship between ad recall and TRPs, an exogenous measure of campaign reach and frequency, during the study period (Figure 1), suggesting that self-reported ad recall reflected opportunities for ad exposure.

Association of Ad Recall With Targeted and Non-Targeted Beliefs

We regressed targeted beliefs on ad recall for each of the four targeted belief/ad recall pairs. Recall of all four of The Real Cost ads significantly predicted endorsement of the associated targeted belief (see Table 3). Recall of the ads Your Skin, Your Teeth, Bully, and Alison all showed associations with their targeted beliefs (models 1–4, with standardized coefficients of 0.142, 0.112, 0.136, and 0.148, $p < .05$). As anticipated, there were no significant associations between recall of the fake Mouse ad and any of the three campaign-targeted beliefs (Table 4). Additionally, we tested for moderation of these associations by looking at the interactions between ad recall and two high-risk subgroups relative to their less risky peers, smoking experimenters (ever tried) and high sensation-seekers (top 25% of scores); none of these interactions were statistically significant.

In contrast, for each of The Real Cost ads, the average of the non-targeted belief and ad recall associations was less than half the magnitude of the comparable targeted belief association (0.059, 0.041, −0.017, and 0.020, respectively). To directly test whether the association of each ad with its targeted belief was larger than its association with the 10 non-targeted beliefs, we conducted a sign test, examining how many of the 10 associations of

model and “strongly agree” in another, completed the same procedure for the Teeth belief, and reran the regression models. Using the same approach, we created two new parent education variables in which missing values were separately replaced with the lowest and highest parent education value. We then ran two additional models for each ad recall/targeted belief pair, separately replacing parent education with the new bounded parent education variables. The results from all new models did not differ substantially from the original models. We believe this provides sufficient evidence that the missingness of these items did not affect study outcomes.

each ad with non-targeted beliefs were larger than the association of each ad with the targeted belief. The two-sided sign tests showed that for each of the 4 ads studied ad recall/targeted belief associations were stronger than ad recall/non-targeted belief associations for all 10 comparisons ($Z = 2.0$, $p < .05$ across all ads). This finding supports our central hypothesis, that the recall-belief association is stronger for the specific beliefs targeted by each campaign advertisement than for the non-targeted beliefs.

Association of Targeted Beliefs With Having No Intention to Smoke

If the campaign was successful at changing the targeted beliefs, is there reason to think that the campaign would successfully reduce smoking initiation? Confirming the findings from formative analyses, results of logistic regression analyses adjusting for relevant confounders indicate that all three campaign-targeted beliefs are significantly associated with having no intention to smoke: Wrinkle belief (OR = 1.29, CI: 1.12, 1.49), Teeth belief (OR = 1.40, CI: 1.20, 1.64), and Control belief (OR = 1.27, CI: 1.11, 1.45). We conducted a sensitivity analysis using the continuous version of the intention variable to ensure that the aforementioned associations between beliefs and intention were not attributed to the dichotomized outcome variable; all three associations between beliefs and the continuous version of having no intention to smoke were statistically significant at $p < .01$.

Discussion

This study evaluated the relationship between recall of television advertisements from The Real Cost campaign, anti-smoking beliefs targeted by these ads, and having no intention to smoke. Results established significant, positive associations between recall of four campaign ads and the beliefs targeted by these ads, after adjustment for confounders. Specifically, results indicated relationships between Your Skin recall and the Wrinkle belief, Your Teeth recall and the Teeth belief, Bully recall and the Control belief, and Alison recall and the Control belief. Furthermore, these associations were larger than the association of ad recall with beliefs not targeted by The Real Cost campaign ads, supporting our central hypothesis. Also, the targeted beliefs were associated with having no intention to smoke, suggesting that increasing endorsement of these beliefs may increase the likelihood that youths will have no intention to smoke.

Contrary to the null findings from evaluations of campaigns that targeted beliefs associated with cosmetic effects (Brennan et al., 2012), our results demonstrate associations between campaign exposure and beliefs about the negative cosmetic effects of smoking, suggesting that these beliefs can be influenced by campaign messages. These findings may indicate that ads from The Real Cost campaign are more persuasive than cosmetic effect ads from previous studies, or that ad exposure and ad-targeted belief endorsement have not been measured in a consistent way across studies. Indeed, in two previous studies with null findings pertinent to cosmetics effects, these variables were measured in different ways (Pechmann et al., 2003; Siegel & Biener, 2000). Thus, neither of these studies measured the relationship between exposure to ads that specifically target beliefs about the cosmetic effects of smoking and endorsement of those specific beliefs. This comparison underscores

the importance of measuring such variables distinctly when examining the specific pathways through which campaign effects may occur.

Are these results enough to support a claim that The Real Cost campaign has been effective in influencing beliefs related to smoking? The strongest support comes from the specificity of the results. Our analyses show ad recall was less related to the non-targeted than the targeted anti-smoking beliefs; it is then less likely that observed recall-targeted belief associations are driven by reverse causation or third variable influence. Furthermore, the lack of association between recall of a fake Mouse ad and campaign-targeted beliefs also reduces such concerns. Moreover, our findings suggest that endorsement of specific, targeted beliefs is related to having no intention to smoke. This structure of evidence is consistent with a claim of The Real Cost effects on campaign-targeted beliefs associated with intention.

Readers may be curious about how the two sets of results, the association of exposure and belief and of belief and intention might translate into an estimated magnitude of effect of exposure to each ad on intention, if we assume both relationships are causal. These estimates are generated through the following process: We first estimate what the expected belief scores would be for those who were not exposed, and for those who were highly exposed to the ad (defined as the mean recall plus one standard deviation), then use the regression of intention on the belief score to estimate the difference in predicted intention for individuals, contingent on those expected belief scores, translated into predicted probabilities. If the observed difference in belief between those unexposed and exposed to the ad is translated into an expected difference in having no intention to smoke, we would project an increase in having no intention to smoke of 5% for Your Teeth and Bully ads and 6% for Your Skin and Alison ads. These likely represent the maximum potential effect on intention of exposure to the individual ads, although they are likely to overestimate the actual effect.

Given recent evidence suggestive of campaign effects on smoking initiation (Farrelly et al., 2017) and the theoretical models upon which the campaign was developed (Duke et al., 2015), our findings are consistent with the idea that campaign ads indirectly reduced youth smoking initiation through ad-targeted beliefs. Though we have speculated about how the cross-sectional associations might translate into an effect of exposure to each ad on intention, we do not think such cross-sectional data can support a formal analysis of whether ad-targeted beliefs mediated this relationship. We will need to wait for additional evidence to fully establish that beliefs targeted by The Real Cost campaign ads mediate the relationships between campaign exposure and smoking intention/behavior.

Limitations and Conclusion

There are several limitations to this study. Analyses were conducted with cross-sectional data, which limits our ability to draw causal inferences. Though the targeted belief specificity of the observed associations and the lack of association between recall of the fake Mouse ad and beliefs reduce concerns about unmeasured confounders, there is one circumstance where the specificity of the results does not eliminate the concern about reverse causation. If general anti-tobacco sentiment made it more likely that people would claim to recall the ads, then we would expect to see that all of the beliefs, targeted or not, would be associated with ad recall (and with fake ad recall), which is not what we found.

However, if endorsement of specific beliefs only affected recall of ads targeted to those beliefs, but endorsement of non-targeted beliefs does not affect recall of target-belief linked ads, then reverse causation might still account for the observed pattern of associations. Recall measures rely on self-report and may not reflect actual ad exposure, or may exclude influential first exposures as recall items assess past 30-day exposure. Recall of the fake Mouse ad was dichotomized due to the low proportion of respondents who reported any recall; therefore, it is possible that we were unable to detect relationships between fake Mouse ad recall and campaign-targeted beliefs due to limited variability. However, the fact that reported recall of the fake Mouse ad was so low suggests that respondents distinguished between fake and real ads, reflecting the validity of these measures. Finally, non-response bias may limit inferences about national populations made from study results; we attempted to address this bias by weighting the survey to known characteristics of the population.

According to Farrelly and colleagues (2003), criteria for evaluating the potential impact of national campaigns include establishing that higher levels of exposure are associated with targeted outcomes. Our results largely satisfy this criterion; for all four of The Real Cost ads studied, higher levels of recall were associated with targeted beliefs, which were in turn associated with having no intention to smoke. While there are always limitations to the interpretation of evaluations that rely on cross-sectional survey data, researchers do not always have the luxury of evaluating media campaigns with more robust types of data collected over time (e.g., repeated cross-sectional or longitudinal data). Our methodological approach offers a tool to support claims about media campaign effects within the confines of feasible data collection approaches.

The results from this study provide evidence consistent with published evaluations of The Real Cost campaign (Farrelly et al., 2017; Huang et al., 2017). Our analysis is the first to show discriminating associations between recall of The Real Cost anti-smoking campaign and targeted, rather than non-targeted, beliefs in a sample of adolescents. This study represents only a first step toward evaluating the pathway of effects through which The Real Cost campaign was expected to influence smoking behavior. Future research should examine whether campaign-targeted beliefs mediate the relationship between campaign exposure and smoking behavior, which would offer additional evidence in support of campaign effects. Furthermore, future studies should incorporate exogenous measures of campaign exposure to complement self-reported campaign recall.

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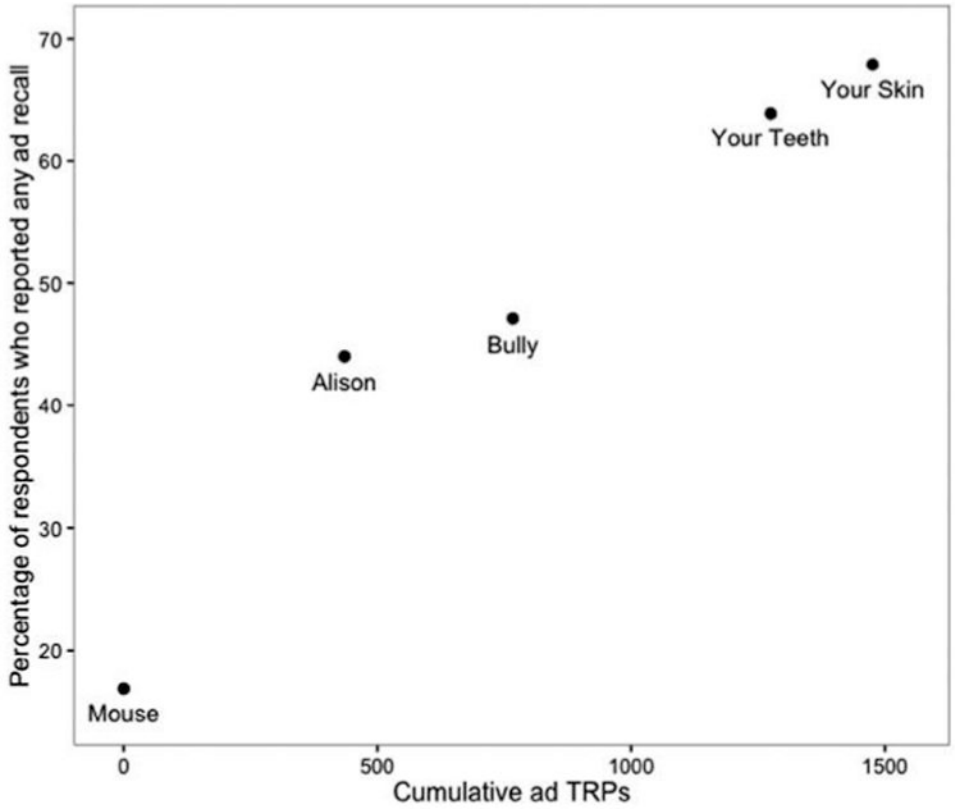

Figure 1.
Cumulative ad target rating points (TRPs) and percentage of respondents who reported any ad recall.

Table 1

Advertisements, targeted beliefs, and corresponding survey questions

Advertisement (time aired)[a]	Survey Question Describing Advertisement: "A television ad where…	Recall[b] *Mean* (*SD*)	Percentage with any recall	Targeted Belief[c]	Survey Question Assessing Belief: "If I smoke every day…	Belief[d] *Mean* (*SD*)
Your Skin (74 weeks)	a girl tears off a piece of her skin to pay for a pack of cigarettes"	6.7 (13.6)	67.9%	Wrinkle	I will get wrinkles"	3.09 (0.70)
Your Teeth (90 weeks)	a guy yanks out a tooth to pay for a pack of cigarettes"	6.0 (12.7)	63.9%	Teeth	I will lose my teeth"	3.20 (0.68)
Bully (19 weeks)	a tiny man bullies young people into smoking cigarettes"	4.7 (10.8)	47.1%	Control	I will be controlled by smoking"	3.29 (0.74)
Alison (9 weeks)	a girl in a cafeteria complains about cigarettes being bossy"	3.5 (8.5)	44.0%	Control	I will be controlled by smoking"	3.29 (0.74)
Mouse[e]	a cartoon mouse becomes addicted to cigarettes"	1.2 (6.5)	16.9%	N/A	N/A	N/A

[a] Weeks the ad aired between May 19, 2014, and December 30, 2016 (i.e., the time during which participants reported past 30-day recall).

[b] Recall is the number of times the ad was seen in the past 30 days.

[c] The 10 non-targeted beliefs are that as a result of daily smoking, respondents will develop headaches, develop sexual and/or fertility problems, develop cancer, get yellow fingers, become addicted to nicotine, look uncool, feel relaxed, enjoy life more, breathe in thousands of toxic chemicals, and be a turnoff to other people.

[d] Beliefs are rated on a 4-point scale where 4 = *strongly agree* and 1 = *strongly disagree.*

[e] Mouse is a fake ad that is not part of The Real Cost campaign but is included as a comparison.

SD = standard deviation.

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Table 2

Unweighted and weighted demographic distribution of the study sample (*n* = 4,831)

	Unweighted				Weighted		
Characteristic	**Frequency**	**Percentage**	**Mean**	**SD**	**Percentage**	**Mean**	**SD**
Age			15.37	1.83		15.10	2.12
13–15	2,306	47.8			59.5		
16–17	2,521	52.2			40.4		
Sex							
Male	2,528	52.4			50.5		
Female	2,297	47.6			49.5		
Race							
White (non-Hispanic)	2,475	51.5			51.2		
Hispanic	1,154	24.0			22.1		
Black or African American (non-Hispanic)	635	13.2			14.1		
Other or more than one race	545	11.3			12.6		
Grades			4.36	0.77		4.33	0.80
Mostly A	2,413	50.7			49.1		
Mostly B	1,780	37.4			37.6		
Mostly C	467	9.8			10.9		
Mostly D	68	1.4			1.6		
Mostly F	35	0.7			0.8		
Sensation seeking (1–1)			2.41	0.52		2.40	0.52
Average weekly hours TV watching			24.0	21.2		24.4	21.6
Parent educational attainment							
Less than or equal to a high school degree	1,036	24.8			33.7		
Some college	654	15.7			22.7		
College degree	1,380	33.0			23.5		
Completed graduate school	1,109	26.5			20.1		
Parental disapproval of smoking			2.90	0.35		2.90	0.36
Don't/wouldn't mind	77	1.6			1.7		
Would/disapprove a little	346	7.2			7.0		

Characteristic	Unweighted				Weighted			
	Frequency	Percentage	Mean	SD	Percentage	Mean	SD	
Would/disapprove a lot	4,393	91.1			91.3			
Household cigarette use								
No/Lives alone	3,603	75.5			73.0			
Yes	1,168	24.5			27.0			

Note. All analyses were conducted using weights representative of the U.S. population of 13–17-year-olds.

SD = standard deviation.

Table 3

Multiple regression analysis of targeted beliefs on "The Real Cost" ad recall

	Model 1			Model 2			Model 3			Model 4		
	Wrinkle belief on Your Skin recall *n* = 1,558			Teeth belief on Your Teeth recall *n* = 1,655			Control belief on Bully recall *n* = 563			Control belief on Alison recall *n* = 470		
	β	B	SE	β	B	SE	β	B	SE	β	B	SE
Ad recall	**.142*****	.088	.022	**.112*****	.068	.018	**.136***	.087	.042	**.148***	.104	.044
Age	**.034***	.011	.005	.019	.006	.005	.018	.006	.007	.026	.009	.007
Sex	−.009	−.012	.028	−.030	−.041	.026	**−.051****	−.076	.029	**−.044***	−.065	.030
Race (White = *Ref.*)												
Hispanic	**−.072****	−.124	.040	−.021	−.036	.036	**−.092*****	−.165	.042	**−.095*****	−.171	.042
Black/AA	**−.074****	−.151	.047	−.025	−.049	.046	−.039	−.082	.047	**−.051***	−.109	.053
Other race	.005	.010	.039	−.022	−.046	.043	−.034	−.075	.042	−.029	−.064	.043
Sensation seeking	−.031	−.043	.032	**−.084*****	−.112	.030	**−.086*****	−.123	.033	**−.092*****	−.131	.033
Parental Education (HS = *Ref.*)												
Some college	.015	.025	.048	.027	.045	.043	**.067***	.119	.049	**.058***	.103	.048
College degree	.036	.060	.040	.007	.011	.038	**.061***	.106	.045	**.055***	.096	.044
Graduate degree	**.070****	.124	.044	**.050***	.087	.042	**.083****	.154	.045	**.078****	.144	.046
Parent disapproval	**.069*****	.140	.037	**.102*****	.200	.039	**.075****	.159	.046	**.076****	.162	.047
Household cigarette use	−.009	−.014	.032	−.024	−.037	.033	−.021	−.035	.034	−.023	−.039	.035
Grades in school	.013	.012	.019	−.005	−.004	.019	**.050***	.047	.021	.037	.035	.020
TV watching	−.027	−.001	.001	.030	.001	.001	−.028	−.001	.001	−.017	−.001	.001

Note. Boldface indicates statistical significance

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

All analyses were weighted and used maximum likelihood estimation to account for values missing completely at random (MCAR).

B = unstandardized coefficient. SE = standard error, β = standardized coefficient. *Ref.* = reference category. AA = African American. HS = high school or less.

Table 4

Multiple regression analysis of targeted beliefs on fake mouse ad recall

	Model 1			Model 2			Model 3		
	Wrinkle belief on Fake Mouse ad recall *n* = 1,727			Teeth belief on Fake Mousse ad recall *n* = 1,742			Control belief on Fake Mouse ad recall *n* = 1,765		
	β	B	SE	β	B	SE	β	B	SE
Ad recall	.026	.049	.057	.043	.079	.057	.050	.100	.056
Age	**.039****	.013	.004	.024	.008	.004	−.001	−.000	.005
Sex	−.015	−.022	.028	−.029	−.040	.026	**−.046***	−.069	.028
Race (White = *Ref.*)									
Hispanic	**−.065****	−.113	.039	−.016	−.026	.036	**−093*****	−.168	.040
Black/AA	**−.063****	−.128	.046	−.010	-.021	.044	−.025	−.054	.044
Other race	.008	.018	.039	−.016	−.033	.044	-.030	−.067	.040
Sensation seeking	−.015	−.021	.031	**−.080*****	−.106	.030	**−.084*****	−.120	.032
Parental Education (HS = *Ref.*)									
Some college	.010	.018	.047	.029	.048	.043	.045	.080	.044
College degree	.030	.050	.039	.011	.018	.038	.043	.075	.040
Graduate degree	**.067****	.118	.043	**.054***	.093	.042	**.073****	.136	.042
Parent disapproval	**.087*****	.175	.035	**.106*****	.208	.039	**.071****	.150	.045
Household cigarette use	.005	.009	.031	−.010	−.016	.032	−.018	−.030	.033
Grades in school	.007	.006	.019	−.003	−.002	.019	.035	.033	.019
TV watching	−.015	−.000	.001	.036	.001	.001	−.006	−.000	.001

Note. Boldface indicates statistical significance

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$). All analyses were weighted and used maximum likelihood estimation to account for values missing completely at random (MCAR).

B = unstandardized coefficient. SE = standard error, β = standardized coefficient. *Ref.* = reference category. AA = African American. HS = high school or less.