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INTRODUCTION

Globally, more than 80,000 young people begin using tobacco every day.[1] Almost all tobacco use initiation occurs before age 26, and it is estimated that one of every three young smokers will die from a tobacco-related illness.[2] As such, preventing the initiation and continued use of tobacco among youth and young adults is essential for reducing tobacco-related illness and death. Mass media interventions have been widely used in past efforts to reduce tobacco use,[2, 3] and are poised to continue playing a central role in comprehensive tobacco control programs worldwide.[4, 5]

Several recent reviews have concluded that mass media interventions can effectively reduce tobacco use among youth and young adults.[2, 3, 6, 7] In particular, the 2012 Surgeon General's report on *Preventing Tobacco Use Among Youth and Young Adults*[2] provided a comprehensive assessment of the effects of campaigns on young people's smoking behaviors. Considering the findings from more than 60 cross-sectional, longitudinal, and controlled field trials published between 1981 and June 2008, the reviewers found sufficient evidence to conclude that increasing youth exposure to antitobacco campaigns could change attitudes, beliefs, intentions, and behaviors in the desired direction.[2] Importantly, this body of studies also provided some insight into the determinants of campaign success by demonstrating: a) dose-response relationships between exposure and reduced smoking behavior; b) the particular effectiveness of messages that evoke negative emotions by focusing on the health effects of smoking and secondhand smoke or the deceptive practices of the tobacco industry; c) positive effects of messages designed for adults on youth smoking prevalence; and d) little evidence of systematic differences in effectiveness by audience sub-groups.[2] Consistent conclusions were reached in a

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recent Cochrane Review, although this review's more stringent inclusion criteria (controlled trials or time series studies) meant that the findings from only seven studies were considered.[6]

Objective

We built on these previous reviews by assessing the extent to which recent research has continued to show that mass media interventions can effectively reduce smoking among youth (12-17) and young adults (18-25 year olds). Picking up where the Surgeon General's report (the most comprehensive of the recent reviews) left off,[2] we used empirical studies published between July 2008 and August 2013 to address one primary and four secondary research questions.

> RQ1: Can antitobacco mass media interventions reduce smoking intentions and behaviors among youth and young adults?
>
> RQ2: Is the effectiveness of antitobacco mass media interventions among youth and young adults affected by: the duration and intensity of message exposure (RQ2a); interactions between exposure and audience demographic and personality characteristics (RQ2b); chosen message themes, strategies and executional characteristics (RQ2c); and interactions between message characteristics and audience characteristics (RQ2d)?

METHOD

Data sources

Our search strategy replicated the approach used in three similar recent reviews.[2, 3, 8] We searched five databases: PubMed, PsycInfo, Web of Science, Scopus and Embase. Our search string for the PubMed database was: ((tv OR television OR radio OR broadcast* OR mass media

OR advertis* OR marketing OR countermarketing) AND (prevent* OR cessation OR initiat*) AND (tobacco OR smoking)); a version of this string was used for all other databases. We excluded non-English articles, as well as letters and editorials. Our initial search covered articles published (in print or online ahead of print) between July 1 2008 and April 30 2013. Search alerts in each database identified articles published between May 1 and August 31 2013.

Study selection

The initial search yielded 3123 records. Following the PRISMA 2009 Flow Diagram,[9] we screened all records and identified 1219 duplicates, leaving 1904 unique records. An additional 231 unique records were identified by search alerts. All unique records were then screened for potential relevance based on the title and abstract. Of the 2135 unique records, 392 appeared to assess the impact of antitobacco mass media interventions and were categorized as potentially relevant. Thirty-two records were then excluded because they were published prior to July 2008 (n=27; not all databases allowed us to specify the month of publication), were reviewed in the Surgeon General's Report[2] even though they were published after July 2008 (n=3), or provided insufficient information in their results sections (n=2), leaving 360 potentially relevant articles.

Two authors assessed the full text of each potentially relevant article for eligibility. We developed two sets of inclusion criteria, as appropriate for our research questions. Part A of Box 1 presents the inclusion criteria for studies used to assess the overall effectiveness of antitobacco mass media interventions among youth and young adults (RQ1). From the 360 potentially relevant articles, 21 met these criteria. We also used these 21 studies to summarize evidence regarding the impact of exposure duration and intensity (RQ2a), and the impact of audience

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characteristics on campaign effectiveness (RQ2b). Part B of Box 1 details the inclusion criteria for studies used to assess the impact of different message themes, strategies, and executional characteristics (RQ2c). We also used these studies to summarize evidence of interaction effects between message characteristics and audience characteristics (RQ2d). Of the 360 potentially relevant articles, 22 met these criteria (only one of which overlapped with the 21 studies used for RQ1, RQ2a and RQ2b).

Box 1 Inclusion Criteria

Part A: Inclusion Criteria for Studies Assessing the Effectiveness of Anti-Tobacco Mass Media Interventions (RQ1, RQ2a, RQ2b)

- Study must be published after July 1 2008
- Study must present original data that has not been previously reported
- Study must measure the effectiveness of an antitobacco mass media intervention among 12–25 year olds
    - Campaign may be adult-targeted as long as the effectiveness of the campaign was evaluated among 12–25 year olds
    - Study may include respondents older than 25 so long as results are presented separately for younger and older age groups or the majority of the sample is younger than 25
- Study must present quantitative data relating exposure to mass media messages to a measured outcome that is indicative of campaign impact
    - Exposure can be measured using objective measures (e.g., naturally-occurring variation in GRPs over time or between geographical areas), self-reported measures (e.g., recall), or through a comparison between exposed and unexposed groups (e.g., in controlled field studies and forced exposure studies)
    - Include pre/post studies that do not measure exposure but provide enough other information to give us confidence that the observed effects are due to the campaign and not to some other external historical influence

- o Exclude simulation studies
- Study must include at least one measure of smoking-related intentions or behaviors as an outcome (this includes smoking urges/desires), unless the campaign targeted a specific smoking-related belief and measured this belief as the primary outcome
- Study must measure the effectiveness of an intervention that employed mass media channels such as television, radio, print and/or outdoor advertising where exposure is passive or involuntary, and not the result of active seeking
  - o Exclude studies that evaluate the effectiveness of an intervention that largely required respondents to "opt-in" to be exposed to informational materials (e.g., tailored online interventions, participatory radio campaigns)
- Study must report the overall effects of exposure to a campaign, or to specific campaign messages (i.e., compared to those who were not exposed)
- Effects of exposure must be evaluated in a real-world setting, and the interventions being studied must resemble interventions that could realistically be implemented in the world
  - o Exclude laboratory experiments and forced exposure studies where exposure occurs as part of an educational intervention due to unnatural exposure conditions
  - o Include controlled field trials where exposure conditions represent conditions of natural exposure

Part B: Inclusion Criteria for Studies Assessing the Effectiveness of Different Message Themes, Strategies and Executional Characteristics (RQ2c, RQ2d)

- Study must be published after July 1 2008
- Study must present original data that has not been previously reported
- Study must compare the effectiveness of different antitobacco messages or different message characteristics among 12–25 year olds
  - o Messages may be adult-targeted so long as they are evaluated among 12–25 year olds
  - o Study may include respondents older than 25 so long as results are presented separately for younger and older age groups or the majority of the sample is younger than 25
- Study must present quantitative data relating exposure to different mass media messages to

a measured outcome that is indicative of campaign impact

- o Exposure can be measured using objective measures, self-reported measures, or through a comparison between groups exposed to different messages
- o Exclude simulation studies
- Message effectiveness can be measured using recall, perceived effectiveness, cognitive and affective responses, beliefs, attitudes, intentions, behaviors, or other measures deemed to be indicative of campaign impact
- Study must measure the effectiveness of an intervention that employed mass media channels such as television, radio, print and/or outdoor advertising where exposure is not the result of active seeking
  - o Exclude studies that evaluate the effectiveness of an intervention that largely required respondents to "opt-in"
- The interventions being studied must resemble interventions that could realistically be implemented in the real world

Data extraction

Data from all eligible studies was extracted by one author, and then reviewed by a second, with the first three authors each reading two-thirds of all eligible studies.

For studies relevant to RQ1, RQ2a and RQ2b, our focus was on analyses examining associations between campaign exposure and campaign effectiveness, with effectiveness defined as changes in smoking-related intentions or behaviors. For each study, we extracted: campaign details; study design, analytic sample, and location; exposure measures used for 1) analysis, and 2) descriptive purposes only; outcome measures and control variables; effects; and sub-group differences. All data is documented in Appendix A; a summary of each study and its findings are presented in Table 1. For studies relevant to RQ2c and RQ2d, our focus was on analyses comparing the effectiveness of different message themes and strategies and/or different executional

characteristics, with effectiveness measured using a broader set of outcome measures including recall, beliefs, attitudes, and other proximal indicators of message impact. We extracted: message details (themes/strategies compared; executional characteristics compared; medium); study design, message exposure, sample, and location; outcome measures; effects of different message themes/strategies; effects of different executional characteristics; and sub-group differences. All data is documented in Appendix B, with a summary presented in Table 2.

RESULTS

Effectiveness of mass media interventions among youth and young adults

In the 2012 Surgeon General's report[2] the authors considered the findings from 17 previous reviews that in combination reviewed more than 60 cross-sectional, longitudinal, and controlled field trials, as well as the findings from seven newer studies not previously reviewed. The authors concluded there was "convincing evidence that antismoking media campaigns can be effective in reducing youth smoking [p. 685]", and that evidence was consistent across studies with different methodological approaches. Building on this, we identified 21 additional studies—published between July 2008 and August 2013—that assessed the effectiveness of antitobacco mass media interventions among youth and young adults (RQ1). Of these 21 studies, 14 reported positive effects of campaign exposure,[10-23] and seven reported no effects[24-30] (Table 1).

As described elsewhere,[2, 3, 8, 31] our confidence in the inferences drawn from a given study is determined by various aspects of the study's research design. Therefore, we considered the extent to which evidence of positive (and no) campaign effects was provided by studies using each of three broad methodological approaches: controlled field trials, and longitudinal, and

cross-sectional designs.

Controlled field trials

One of the 21 studies employed a controlled field trial design to test the effectiveness of a four-year multi-themed campaign with high school students in four states in the United States (US). However, the intervention did not reduce smoking prevalence or intentions. These null results are likely attributable to a strong tobacco control environment, the concurrent airing of the national *truth®* campaign, and national declines in prevalence over the study period, such that there was effectively little more that the campaign could achieve.[24]

One additional study used a quasi-experimental design to examine the effects of screening a single antitobacco advertisement before a movie.[25] In a cinema in Germany, the advertisement was shown before movies in weeks one and three of the study, but not in weeks two and four. Although this study observed a trend towards differences between individuals in the intervention and control conditions, there was no effect of condition on smoking intentions among 10-17 year olds.[25]

Longitudinal studies

Ten of the 21 studies employed some type of longitudinal design; eight found positive effects,[10-17] while two found no evidence of campaign effects.[26, 27]

Particularly strong evidence for campaign effects was provided by three studies,[10-12] each of which took advantage of the natural experiment created when there is variability in campaign

activity between different media markets and over long periods of time. In these studies, changes in smoking measured through cohort studies or repeated cross-sectional surveys were related to objective measures of campaign activity: gross rating points (GRPs) or targeted rating points (TRPs). Such measures are used by the advertising industry to estimate the number of people potentially exposed to an advertisement, and they capture the reach and frequency of exposure. For example, 1000 GRPs could indicate that 100% of those in the population were exposed 10 times, or that 50% were exposed 20 times.[8] Evaluating the national *truth*® campaign in the US, Farrelly and colleagues showed that the risk of smoking initiation among 12-17 year olds decreased by 20% for every 10,000 *truth*® GRPs that respondents were potentially exposed to over a period of up to five years.[10] An Australian study conducted over a 16-year period found that smoking prevalence among high school students was inversely associated with cumulative antitobacco TRPs in the three months and 12 months prior to each survey.[11] In a similar study with young adults in the US, greater exposure to antitobacco advertisements over 24 months was associated with higher rates of quitting.[12]

Individual-level exposure effects on smoking susceptibility and initiation were observed in two cohort studies.[13, 14] Youth who had often seen the national *truth*® campaign were less likely to initiate smoking than those who reported seeing the campaign only rarely, whereas exposure to the tobacco industry-sponsored *Think. Don't Smoke* campaign was not associated with initiation, but did increase intentions to try cigarettes.[13] Another study found evidence of an indirect effect of exposure on smoking susceptibility, mediated through young people's perceptions about the influence of antitobacco messages on their friends.[14]

Changes over time in population levels of smoking prevalence, consumption, and intentions were examined in three studies, all of which observed positive changes from pre- to post-campaign surveys.[15-17] Smoking prevalence in Florida declined when the Florida *truth®* campaign was on air, but started to increase again once the campaign ended (among those aged 16+).[15] Similarly, over the 10 years that the *Smarter than Smoking* campaign aired in Western Australia, smoking prevalence reduced from 28% to 7% among 14 year olds, and from 43% to 14% among 15 year olds.[16] Also in Australia, consumption, intentions, and smoking susceptibility all changed in a favorable direction from before to after the introduction of graphic health warnings on cigarette packs and the airing of two television advertisements supporting their introduction.[17] However, in each of these three studies, the absence of an analysis linking individual-level exposure with outcomes makes it difficult to attribute these effects solely to the campaign, particularly because all three campaigns were implemented in conjunction with other tobacco control interventions.[15-17]

Of the two longitudinal studies that did not find evidence of campaign effects,[26, 27] one evaluated a campaign targeting 25-49 year old smokers, and so unsurprisingly, did not observe increased quit attempts among 18-24 year olds,[26] while the other had limited power to detect campaign effects due to a very small sample size and short follow-up period.[27]

Cross-sectional studies

Nine of the 21 studies examined cross-sectional associations between campaign exposure and outcomes. Six observed positive effects,[18-23] while three found no effects.[28-30]

Positive effects of the *truth®* campaign were found in two studies: intentions not to smoke among 12-17 year olds were positively associated with confirmed awareness of the ads[18, 19] and with objective measures of campaign exposure.[19] One study reported positive associations between awareness of North Carolina's *Tobacco. Reality. Unfiltered.* campaign and lower smoking prevalence among high (but not low) sensation seekers.[20] In addition, two studies reported that individuals who recalled seeing any antitobacco advertising over the past 30 days tended to have lower intentions to smoke[21] and a lower likelihood of being a current or former smoker (versus never smoker),[22] and one additional cross-sectional study also found positive associations between exposure and intentions, conditional on factors such as age, parental monitoring, and participation in school anti-smoking programs.[23]

Three cross-sectional studies found no effects of campaign exposure.[28-30] Contrasting with the positive effects of the *truth®* campaign described above, *truth®* recall among 18-24 year olds was not significantly associated with intentions not to smoke (possibly attributable to a ceiling effect, with 92% of non-smokers holding the desired intention) or with intentions to quit (although this effect was positive and approaching significance).[28] Smoking rates among youth in Indiana was unrelated to self-reported exposure to anti-smoking advertising,[30] and there was no effect of recalling antitobacco advertising on smoking susceptibility among adolescents in Malaysia and Thailand.[29]

Table 1 Studies assessing the effectiveness of antitobacco mass media interventions among youth and young adults

Authors & Campaign	Campaign Target Audience	Campaign Goal/s	Study Design	Sample Age, Size and Location (Country)	Effect of Exposure on Intentions?	Effect of Exposure on Behaviors?	Effects of Audience Characteristics?
Cowell et al., 2009[18]; national "truth"	Youth (12-17 year olds)	Prevention & cessation	Cross-sectional	12-17; N=5,3079 – 22,220; US	Positive	N/A	Yes (race/ethnicity)
Davis et al., 2009[13]; national "truth" & Philip Morris' "Think. Don't Smoke"	Youth (12-17 year olds)	Prevention & cessation	Longitudinal (cohort) x 3 waves	6–12th grade; N=10,919 – 13,195; US	Positive	Positive	N/A
Dietz et al., 2010[15]; Florida "truth"	Youth (12-17 year olds)	Prevention & cessation	Longitudinal (cross-sectional) x 8 waves	12-17; N=1800 in each wave; US	N/A	Positive	N/A
Farrelly et al., 2009[19]; national "truth" & Phillip Morris' "Think. Don't Smoke"	Youth (12-17 year olds)	Prevention & cessation	Cross-sectional	12-17; N=35,074; US	Positive	N/A	N/A
Farrelly et al., 2009[10]; national "truth"	Youth (12-17 year olds)	Prevention & cessation	Longitudinal (cohort) x 8 waves	12-17; N=8904; US	N/A	Positive	N/A
Flynn et al., 2010[24]; created for study	Youth (3 different target age groups:	Prevention & cessation	Controlled field trial	7-12th grade; N=19,966 – 23,246; US	No effect	No effect	N/A

grades 4-6; 7-8; 9-12)							
Hanewinkel et al., 2010[25]; "Factual Romance"	General audience (i.e., they measured effects among both youth and adults)	Cessation	Quasi-experimental field experiment	10-17; N=1148; Germany	No effect	N/A	No (age)
Kandra et al., 2013[20]; "Tobacco. Reality. Unfiltered"	Youth (11-17 year olds)	Prevention & cessation	Cross-sectional	11-17; N=604 – 1,154; US	N/A	Positive	No (sensation seeking)[b]
Nasim et al., 2009[21]; any ads recalled	Mixed	Mixed	Cross-sectional	Middle school and high school students; N=353 – 1,338; US	Positive	N/A	Yes (race/ethnicity)
Paek, 2008[23]; any ads recalled	Mixed	Mixed	Cross-sectional	Middle school & high school students; N=987 – 2,176; US	Positive	N/A	No (smoking status)[b]
Paek et al, 2011[14]; any ads recalled	Mixed	Mixed	Longitudinal (cohort) x 2 waves	6th and 8th grade; N=654; US	N/A	Positive	N/A
Richardson et al., 2010[28]; national "truth"	Youth (12-17 year olds)	Prevention & cessation	Cross-sectional	18-24; N=19,701; US	No effect	N/A	N/A
Richardson et al., 2011[26];	Adult smokers (25-	Cessation	Longitudinal (cohort) x 2 waves	18-24; N=552; US	N/A	No effect	No (age)[b]

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"EX"	49 year olds)						
Schmidt et al., 2009[27]; "Changing Social Norms"	Youth (12-18 year olds)	Prevention	Longitudinal (cohort) x 2 waves	12-18; N=149; Canada	No effect	N/A	N/A
Seo et al., 2009[30]; any ads recalled	Mixed	Mixed	Cross-sectional	Middle school and high school students; N=1,416 – 3,433; US	N/A	No effect	N/A
Shah et al., 2008[22]; any ads recalled	Mixed	Mixed	Cross-sectional	13-15; N=58,876; India	N/A	Positive	No (sex)[b]
Terry-McElrath et al., 2013[a][12]; all antismoking TV ads	Mixed	Mixed	Longitudinal (cohort) x at least 2 waves	20-30; N=26,315; US	N/A	Positive	N/A
White et al., 2008[17]; graphic health warnings campaign	Adult smokers	Cessation	Longitudinal (cross-sectional) x 2 waves	High school students; N=2,050 – 2,432; Australia	N/A	Positive	N/A
White et al., 2015[c][11]; all antismoking TV ads	Adult smokers (mostly)	Cessation	Longitudinal (cross-sectional) x 6 waves	High school students; N=82,479; Australia	N/A	Positive	N/A
Wood et al, 2009[16]; "Smarter than Smoking"	Youth (10-15 year olds)	Prevention & Cessation	Longitudinal (cross-sectional) x 10 waves	12-15; N=300 – 3000; Australia	N/A	Positive	N/A
Zawahir et al., 2013[29]; any ads recalled	Mixed	Mixed	Cross-sectional	13-17; N=833 – 839; Malaysia & Thailand	N/A	No effect	No (sex)[b]

Note. Full details for each study are provided in Appendix A. In this table, results are summarized as providing evidence consistent with there being: positive effects of exposure on intentions (i.e., stronger intentions not to smoke) and/or behaviors (i.e., less smoking behavior); negative effects of exposure; or no effects of exposure. "Mixed" campaign target audience and/or campaign goals indicate those studies that measured exposure to any or all antitobacco campaigns over a specified period of time. N/A = outcome not measured in study *or* effects of audience characteristics not examined (or not tested) statistically in study.

[a] Study also included in Table 2 (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

[b] T-test for difference between sub-groups conducted by authors.

[c] Study was published online ahead of print in 2013, during the time period covered by the review.

Optimal duration and intensity of campaign exposure

Campaign success hinges on achieving adequate levels of exposure.[32] It is therefore critical that campaign sponsors carefully consider the frequency with which, and over what period of time, a campaign is to be broadcast. More specifically, campaign sponsors need to know if exposure effects will be short-lived or sustained. They also need to know whether the relationship between exposure and smoking behavior is linear in nature, or alternatively, if there are exposure thresholds below which positive effects will not be observed or above which additional exposure will not produce additional gains.[2, 8] Such questions (RQ2a) are best addressed by studies using behavioral outcomes and objective measures of campaign activity. In the Surgeon General's report,[2] the reviewers considered three studies that explored the relationship between advertising exposure levels and smoking prevalence among youth and young adults.[33-35] These studies provided evidence of a mostly linear relationship between exposure and smoking behavior,[33-35] that appeared to start at a minimum of one antitobacco advertisement every four months[33] and a maximum threshold of around 16 ads per four months.[34] An additional three studies provided evidence that reduced funding for antitobacco campaigns slowed down rates of decline in or even increased the prevalence of youth smoking.[36-38]

In the current review, we identified an additional three studies that examined effects of the duration and intensity of campaign exposure.[10-12] In their evaluation of the national *truth®* campaign, Farrelly and colleagues provided additional evidence of a linear relationship between cumulative exposure (over a period of up to five years) and a decreased risk of initiation.[10] In a more recent study that collected data over 16 years, White and colleagues examined both the

intensity and duration of exposure required for effects.[11] First, by relating survey measures of youth smoking prevalence to objective measures of the amount of antitobacco advertising in the three months and 12 months prior to each survey, they found an exposure threshold below which positive effects were not observed at approximately 5800 cumulative TRPs over 12 months (an average of 480 TRPs/month). They also examined whether advertising effectiveness was influenced by the period of time over which a given intensity of exposure was sustained. For the three months and 12 months prior to each survey, they computed the number of months that each student was exposed to antitobacco advertisements at each of three minimum levels: ≥ 100 TRPs/month; ≥ 400 TRPs/month; or ≥ 800 TRPs/month. Notably, they found no positive effects of advertising at a minimum of ≥ 100 TRPs/month, and the effects of the other two exposure levels depended on the duration of exposure: exposure to ≥ 400 TRPs/month had to occur every month in order to have a positive effect on smoking rates, whereas if exposure levels of ≥ 800 TRPs/month occurred on average only every second month, positive effects were still observed.[11] In their longitudinal study of uptake, reduction, and quitting over two-year periods among 20-30 year olds, Terry-McElrath and colleagues did not find any significant linear effects of 24-month cumulative exposure to antitobacco advertisements. However, in models predicting quitting among all smokers, and quitting or smoking reduction among daily smokers, they observed significant quadratic effects, where positive effects were not observed until an exposure threshold of 10400 GRPs was reached over 24 months.[12] While data suggested a maximum threshold above which additional exposure did not further increase the odds of quitting among all smokers, no such point of diminishing returns was observed in the models predicting reduction or quitting among daily smokers.[12]

Sub-group differences in campaign effectiveness

Only a small number of studies were available to the authors of the Surgeon General's report when they considered the influence of demographic and personality characteristics such as gender, race/ethnicity, socioeconomic status, and sensation seeking on campaign effectiveness.[2] Other than some indications that youth from lower socioeconomic groups were most adversely affected by the withdrawal of campaign funding and mixed results for the impact of sensation seeking, on the whole, the reviewed studies did not show systematic evidence of differences by sub-groups.[2]

Building on this, we examined whether the 21 studies included in this part of the review provided evidence that campaign effectiveness varied among different sub-groups (RQ2b). The strongest evidence for differential effects is provided by analyses that statistically test the interaction between exposure and individual characteristics. Of the 21 studies, only three conducted such tests[18, 21, 25] (Table 1). One study examined whether the effect of seeing a single antitobacco advertisement before a movie differed for youth (10-17 year olds) and adults (18-90 year olds), but found no evidence of moderation.[25] Cowell and colleagues[18] found that the *truth®* campaign had a more positive effect on intentions not to smoke among African-American than among Asian never smokers, while African-Americans vs. Whites and African-Americans vs. Hispanics comparisons were not significant.[18] Similarly, Nasim and colleagues[21] found stronger effects on intentions among African-American never smokers than among all others (Whites and Hispanics combined), and the exposure effects were strongest among African-American experimental smokers and weakest among White experimental smokers.[21]

An additional nine studies reported effects separately by sub-groups, but did not test whether exposure effects were statistically moderated by these audience characteristics.[15, 16, 20, 22-24, 26, 27, 29] Five of these studies[20, 22, 23, 26, 29] provided sufficient data to allow us to test the magnitude of the difference between the sub-groups ourselves (i.e., they reported standard errors/confidence intervals around the estimate for each group, allowing us to conduct a t-test on the difference between the means). These analyses provided further evidence that campaign effects did not differ across sex,[22, 29] age groups,[26], sensation seeking,[20] and smoking status (experimenters vs. triers).[23]

Effectiveness of different message themes, strategies and executional characteristics

Drawing on the findings of previous reviews, and from five newer studies that directly compared advertisements, the authors of the Surgeon General's report[2] concluded that messages that evoked strong negative emotions and were about the tobacco industry or the health effects of smoking and secondhand smoke were most likely to change beliefs and intentions. Building on this, we also examined the extent to which message themes, strategies, and executions were associated with effectiveness. In total, we identified 22 studies that explicitly compared different message themes or characteristics. Appropriately, most of these studies used forced exposure designs, with the exception of two studies that used a longitudinal[12] or cross-sectional[39] design to evaluate real campaigns.

We used this body of studies to address RQ2c and RQ2d. A summary of the findings are presented in Table 2 (Appendix B contains additional details). In reviewing these studies, we examined those that compared message themes and strategies (15 of 22) separately from those

that compared different message formats and executional characteristics (14 of 22; note that six studies examined the effects of both themes and formats).

Message themes and strategies

Of the 15 studies that compared different message themes and strategies, 10 compared the effectiveness of messages about the negative health effects of smoking (NHE) with other themes including: anti-tobacco industry;[39-46] secondhand smoking;[40-42, 47] social norms;[39-42, 46, 47] social consequences;[48] addiction;[44, 49] and short-term effects.[39, 44] Of these 10 studies, two found no difference between themes.[47, 48] Six studies provided descriptive[40] or statistical evidence that NHE messages were the most effective on outcomes such as perceived effectiveness,[41, 42] self-efficacy,[43, 44] and pro-smoking beliefs.[45] One of these studies[43] also found that messages emphasizing the long-term NHE of smoking led to higher self-efficacy to resist smoking than messages about short-term NHE, which still led to higher self-efficacy than anti-tobacco industry messages.[43] Two additional studies found that the effectiveness of NHE messages was conditional on participant characteristics such as smoking status (NHE messages most effective for smokers but not for nonsmokers)[46] and stage-of-change (NHE messages most effective for precontemplators but not for contemplators and preparers).[49] One study produced more mixed findings.[39] It tested six messages that used four different themes and found that NHE messages ranked both highest and lowest on confirmed recall and perceived effectiveness, a finding that helps to demonstrate that campaign effectiveness is influenced by features of the message other than just the broad theme.

For example, two studies considered whether the message referred to the consequences of smoking for the self or others.[50, 51] One found that other-referring messages produced higher perceived susceptibility to harms than self-referring messages,[50] while the other found an interaction with smoking status such that other- and self-referring messages were more effective, respectively, for nonsmokers and smokers.[51] Considering that nonsmokers comprised the majority of the first study's sample, the findings from these two studies consistently suggest that other-referring messages may be more effective for nonsmokers, who are unable to identify with messages that refer to the consequences of smoking for the self.

The remaining three studies examined other strategies including the richness of the argument,[52] the use of competing arguments regarding the attractiveness, prevalence, and social disapproval of smoking,[53] and the sponsor of the message.[12] Details for all of these studies are provided in Table 2, but because each of these strategies was examined in only one study in the sample, we are reluctant to draw conclusions from these findings.

Message formats and executional characteristics

Of the 14 studies that examined different message formats and executional characteristics, six examined the effects of eliciting different types of emotional responses and produced mixed results.[41, 45, 54-57] One study found that messages eliciting high fear were more effective at lowering beliefs about the acceptability of smoking than those eliciting low fear,[45] and another found messages evoking high (compared to low) levels of fear or disgust produced higher levels of attention and recognition.[54] In another study, dramatic messages were more effective than humorous and sarcastic messages.[41] Carter and colleagues found that the more amusing of two

high-disgust messages was no less effective (than the less amusing message) in terms of believability and impact on intentions.[56] Similarly, Adams and colleagues observed no differences in the effectiveness of message combinations intended to evoke fear and relief, or sadness and joy,[57] and Goetz found no difference between messages that evoked only fear or both fear and disgust.[55]

Two studies found little evidence that the use of gain or loss frames matter for message effectiveness,[48, 50] although there was some evidence that gain frames made smokers feel more susceptible to the health effects of smoking.[50]

The remaining six studies examined other message formats and executional characteristics including: actor appeal;[43] message language;[46] presence of an epilogue;[53] message sensation value;[58] explicitness of delivery;[59] and the use of graphic, simulated or testimonial NHE messages.[60] Details for all of these studies are provided in Table 2; however, because each of these message characteristics was examined in only one study, it is difficult to draw definitive conclusions.

Sub-group differences in the effectiveness of different message themes, strategies and executional characteristics

Of the 22 studies that examined the effectiveness of different message themes, strategies, formats and executional characteristics, 13 included some statistical analysis of whether the effectiveness of these message features varied according to audience demographic and personality characteristics (RQ2d). Interactions between message and audience characteristics were not

explicitly considered in the Surgeon General's report;[2] thus, this is the first time this question has been considered systematically.

Gender moderation effects were tested in five studies,[39, 43, 45, 52, 56] four of which observed some differences between males and females. Vogeltanz-Holm and colleagues found differences in which specific NHE messages received the highest perceived effectiveness scores from either 12-17 year old girls or boys,[39] and Samu et al. found some evidence that university-aged females responded more favorably to high-fear messages than males.[45] Flynn and colleagues showed that girls engaged in greater peripheral processing and better liked messages that included only peripheral antitobacco arguments, but that boys and girls did not differ in their processing of argument-rich messages.[52] Carter and colleagues found that males and females rated two disgusting messages similarly on disgust but that males were more likely to find them amusing and funny and less likely to find them revolting.[56]

Age moderation effects were tested, and found to be non-significant, in one study with 11-17 year olds.[43] Other studies compared the responses of younger (<18; 18-29) and older adults[56][60] and did not find that the responses of youth and young adults differed from those of older adults.

Race/ethnicity effects were tested in four studies, two of which found no differences.[39, 43] One study found that European-American youth gave higher message strength ratings to NHE messages than did African-American youth (although for African-Americans, NHE messages were still rated the highest of five themes).[44] In another study, there were mixed findings for

the extent to which Hispanic, African-American and Caucasian youth centrally and peripherally processed messages that were either rich or light in antitobacco arguments.[52]

Six studies tested whether smokers and non-smokers differed in their responses to different message themes and characteristics,[43, 46, 50, 51, 53] with five of these observing some differences in the effectiveness of gain- and loss-frames,[50] self- and other-referring messages,[51] persuasive epilogues in television programs,[53] and different message themes.[46, 53] One study found differences in the fear and disgust ratings given to messages according to whether respondents were light or moderate smokers,[55] and another found that NHE messages were more effective than addiction messages for those in the precontemplation stage-of-change, whereas the reverse was true for those in contemplation and preparation.[49]

All other individual characteristics—including self-regulatory focus,[57] independent vs. interdependent self-construal,[51] academic achievement,[52] and acculturation[46]—were each examined in only one of the studies included in this review, precluding us from drawing substantive conclusions.

Table 2 Studies comparing the effectiveness of different message themes, strategies, and executional characteristics among youth and young adults

Authors	Study Design; Characteristics Compared	Sample Age, Size and Location (Country)	Effect of Themes/ Strategies?	Effect of Executional Characteristics?	Different Effects by Audience Characteristics?
Adams et al., 2011[57]	Between-subjects; emotional tone	18-26; N=226; Belgium	N/A	No effect	Yes (self-regulatory focus)
Bresnahan et al., 2013[50]	Between-subjects; self- vs. other-referring, gain vs. loss frame	University students; N=315; China	Effect on *perceived susceptibility*	No effect	Yes (smoking status)
Carter et al., 2011[56]	Online dissemination + opt-in survey; amusing vs. funny disgusting ads	University students; N=86; Australia	N/A	Effect on *unique website hits* & *ad ratings*	Yes (gender)
Chang, 2009[51]	Between-subjects; self-vs. other-referring	16-17; N=97 – 143; Taiwan	N/A*	N/A	Yes (self-construal, smoking status)
Flynn et al., 2011[52]	Mixed design experiment; argument strategy	7-8th grade; N=1771; US	Effect on *indictors of central processing, indicators of peripheral processing & likeability*	N/A	Yes (gender, race/ethnicity, academic achievement)
Goetz, 2011[55]	Mixed design experiment with follow-up; fear vs. fear+disgust	18-25; N=81/ 73 (follow-up); US	N/A	Effect on *disgust ratings, tonic skin conductance change, blood pressure change*	Yes (smoking level)
Kelly et al., 2010[46]	Mixed design experiment; theme, language	9th-10th grade; N=277; US	N/A*	No effect	Yes (smoking status, acculturation)
Kuang,	Between-subjects; theme	12-14; N=362; China	No effect	N/A	N/A

2008[47]

Langleben et al., 2009[58]	Forced exposure to all ads; message sensation value	18-48; N=18; US	N/A	Effect on *recognition accuracy & esponse time*	N/A
Leshner et al., 2009[54]	Within-subjects; high/low fear vs. disgust	University students; N=58; US	N/A	Effect on *attention & recognition accuracy, recognition sensitivity, & recognition confidence*	N/A
Leshner et al., 2009[48]	Mixed design experiment; theme, frame, outcome extremity	University students; N=72; US	N/A	Effect on *cognitive processing & recognition accuracy*	N/A
Murphy-Hoefer et al., 2008; 2010[41, 42]	Mixed design experiment; theme, humor vs. sarcasm vs. testimonial vs. drama	18-24; N=1020; US	Effect on *beliefs* and *PE*	Effect on *PE*	N/A
Pechmann et al., 2010[53]	Between-subjects; S1: attractiveness/ prevalence/ disapproval (APD) S2: APD, epilogue	14-15; N=1046 (S1), N=1804 (S2); US	Effect on *recall, perceived tone, persuasion knowledge, thoughts, beliefs & intention*	S1: N/A; S2: Effect on *intention* and *persuasion knowledge*	S1 & S2: Yes (smoking status)
Samu et al., 2008[45]	Between-subjects; theme (co-varying fear level)	University students; N=102 – 114	N/A	Effect on *beliefs*	S1: None S2: Yes (gender)
Shadel et al., 2009[43]	Mixed design experiment; theme, actor appeal	11-17; N=110; US	Effect on *self-efficacy*	No effect	None
Shadel et al.,	Mixed design experiment;	11-17; N=110; US	N/A	Effect on *self-efficacy*	N/A

2010[59]	implicit vs. explicit message				
Terry-McElrath et al., 2013[a][12]	Longitudinal cohort; anti-tobacco vs. pharmaceutical vs. tobacco industry	20-30; N=12,931; US	Effect on *quitting behavior*	N/A	N/A
Tharp-Taylor et al., 2012[44]	Mixed design experiment; theme	11-17; N=94; US	Effect on *self-efficacy*	N/A	Yes (race/ethnicity)
Vardavas et al., 2010[40]	Forced exposure to all ads; theme	12-19; N=95; Greece	N/A*	N/A	N/A
Veer et al., 2008[49]	Between-subjects; theme	University students; N=200; UK	N/A*	N/A	Yes (stage-of-change)
Vogeltanz-Holm et al., 2009[39]	Cross-sectional survey; theme	12-17; N=391; US	Effect on *recall & PE*	N/A	Yes (gender)
Wakefield et al., 2013[60]	Forced exposure to all ads; graphic vs. simulated vs. testimonial negative health effects ads	18-34; N=2399; Bangladesh, China, Egypt, India, Indonesia, Mexico, Philippines, Russia, Turkey, Vietnam	N/A	Effect on *message acceptance, PE, discomfort, & likelihood of discussing ad*	None

Note. Full details for each study are provided in Appendix B. PE = perceived effectiveness. N/A = outcome not measured in study; N/A* = main effects not tested statistically OR not reported in study

[a] Study also included in Table 1 (due to additional findings regarding the overall effect of the campaign on intentions/behaviors).

DISCUSSION

The findings from our review of campaign evaluation studies published between July 2008 and August 2013 add weight to the conclusions reached in the 2012 Surgeon General's report[2]: on the whole, there is strong evidence that mass media interventions can positively affect tobacco use intentions and behaviors of youth and young adults. Positive effects reported in earlier reviews have not been lost in more recent time periods. Campaign exposure was associated with positive changes in intentions and behaviors in 14 of 21 studies, and there was no evidence of negative overall effects. Critically, the three studies that used the especially strong approach of relating objective measures of exposure to behavioral changes over time all demonstrated positive effects. Supportive evidence was provided by an additional five longitudinal studies and six cross-sectional studies. One controlled field trial produced no effect, although the authors identified several extraneous factors likely responsible for these null results.

Of note is that many of the positive effect studies evaluated campaigns not necessarily directed at youth and young adults. By using objective (GRPs or TRPs) and self-report measures of exposure to *any or all* antitobacco advertisements aired over a particular time period, these studies likely captured the effects of a mix of adult- and youth-targeted messages. For example, we know that in the Australian study that found an inverse relationship between exposure and youth smoking prevalence, the campaign environment was dominated by adult-targeted messages.[11] It has been suggested that adult-targeted campaigns may affect young people by changing broader social norms about tobacco use,[2, 3] but it is also possible that youth are directly impacted by the information presented about the consequences of tobacco use, in the same way as adults. Irrespective of the mechanism, these findings indicate that scarce campaign

resources may be maximized by prioritizing campaigns targeted at encouraging adults to quit, as these messages seem able to affect the tobacco-related behaviors of youth, young adults and adults.

Insight into the optimal duration and intensity of campaign activity was provided by two studies in particular,[11, 12] both of which suggested exposure thresholds below which positive effects are unlikely to be observed. Despite differences in the setting (Australia, US), age group (secondary school students, young adults), and outcome behavior (smoking prevalence, quitting), these studies provided consistent evidence that campaigns should be aired at an intensity of between 1200-1400 GRPs/TRPs per quarter. In order to achieve this total amount of aggregated activity, campaigns can either be aired consistently every month at lower levels (i.e., 400 TRPs) or every second month at a higher level (i.e., 800 TRPs).[11] By providing critical practical information regarding the precise amount of monthly campaign activity and the duration over which this advertising needs to be on air, these findings help to assure campaign planners that investment in developing and airing these campaigns will be fruitful.

It is evident from the studies included in this review that campaign potential is not always fully realized. Our assessment of the effectiveness of different message themes, strategies and executional characteristics adds some weight to the conclusion of the Surgeon General's report, which determined that the most effective messages were those that used information about the health effects of smoking and secondhand smoke, and about the actions of the tobacco industry, to evoke negative emotional reactions.[2] We identified 10 studies that compared the effectiveness of NHE messages with other themes, and six provided evidence favoring the NHE

message. Evidence that messages are more effective when they elicit a negative emotional response was more limited, although the six studies that addressed this typically found that emotional evocation enhanced message effects. Beyond the broad theme and emotional quality of the messages, other message characteristics—such as gain vs. loss framing, message sensation value, and the use of graphic or testimonial messages—were tested by only one or two of the studies included in this review, precluding us from drawing conclusions about the effectiveness of these approaches. There remains much to learn about the message characteristics that facilitate campaign impact, and the studies reviewed here help to demonstrate the large number of message characteristics available to message designers. Systematic research comparing the impact of different message themes, strategies, and executional characteristics—ideally through head-to-head comparisons—will continue to be welcome.

Fewer than half of the studies that assessed overall campaign effectiveness also tested (or provided data that allowed us to test) whether effectiveness varied according to audience characteristics, making it difficult for us to draw strong conclusions. Yet, the absence of any systematic evidence of differences by sub-groups is consistent with previous reviews of campaign effects among both adults[3, 8, 61] and youth.[2, 3] We also reviewed, for the first time, whether the effectiveness of particular message themes, strategies, formats and executional characteristics was moderated by audience characteristics. Although some of the 13 studies that addressed this issue did find differences according to sex, race/ethnicity, and smoking status, in no instance did more than one study provide evidence of moderation of the effects of a specific message characteristic. These findings contribute to an ongoing debate as to whether antitobacco mass media messages should be targeted to specific audience groups (for example, see [62-69]).

Although targeting may help to increase the relevance of the message,[70] this strategy also requires that multiple messages are developed, thereby increasing the costs associated with developing and airing these messages. By comparison, the weight of current evidence suggests that resources should be directed at increasing the reach of broadly-targeted and unified campaign strategies, rather than to developing different strategies for different segments of the audience. However, it is also apparent that further research is required to more thoroughly examine the role that audience characteristics do (or do not) play in determining campaign success.

Antitobacco mass media interventions are almost always implemented in conjunction with or in the context of other tobacco control interventions. This is appropriate, as gains in tobacco control are most likely to be seen when multi-faceted approaches that combine and create synergies between a range of educational, clinical, economic, and regulatory strategies are adopted.[5, 71-73] However, it can also make it difficult to isolate the effects of the campaign. Nonetheless, most of the reviewed studies were able to relate specific measures of campaign exposure to changes in outcomes, and many employed statistical controls to capture the influence of the broader tobacco control environment. Further increasing our confidence in the conclusions of this review, evidence of campaign effectiveness was provided by studies that used different methodologies, study populations and settings, exposure measures, and outcome behaviors (intentions, initiation, cessation) and that evaluated both single campaigns and the effect of any exposure to any campaigns over a given time period. This heterogeneity, along with the small number of studies which shared any one design, outcome measure, and campaign characteristic, meant that we did not think that a formal meta-analysis was appropriate. Still, in our narrative

synthesis we gave the most weight to studies with the strongest methodological quality. As with all reviews, our search results likely reflect a publication bias that favors those evaluation studies in which the campaign produced the expected results. Further, most studies were conducted with youth (under the age of 18) and in high-income countries, limiting the generalizability of these results. Recent research with adult smokers and non-smokers has indicated that the messages that are most effective in high-income countries like Australia also show the greatest potential for effectiveness in low- and middle-income countries.[60, 74-76] Similar studies with youth and young adults could explore the possibility that existing campaigns could be adapted or recycled for use in new populations, increasing resources available for achieving sufficient exposure.[77]

Conclusion

Investment in antitobacco mass media interventions has continued over recent years: as one notable example, in 2013 the US Food and Drug Administration announced their intention to spend $600 million over five years on campaigns to discourage initiation and encourage smoking cessation,[78] and several phases of this campaign have now been launched.[79] Overall, the findings of this review indicate that this investment is likely to have a positive effect on the tobacco-related intentions and behaviors of youth and young adults, potentially contributing to reductions in population smoking prevalence. Yet, there is a continued need for research that measures the impact of these campaigns, compares the relative effectiveness of different campaigns and campaign messages, and examines the differential responsiveness of population sub-groups.

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APPENDICES

APPENDIX A: Studies Assessing the Effectiveness of Antitobacco Mass Media Interventions among Youth and Young Adults

Authors	Campaign Details	Study Design, Analytic Sample & Location	Exposure Measures	Outcome Measures & Control Variables	Effects	Sub-Group Differences
Cowell et al., 2009[18]	Campaign: national "truth" campaign Target theme: negative health effects, industry manipulation Target audience: youth (12-17 year olds) Medium: TV Duration of exposure: varied according to survey wave (up to 3 years; "truth" launched in 2000) Intensity of exposure: not specified Other components of the campaign: none specified	Design: cross-sectional (combined data from 7 waves between December 1999 & July 2003) Analytic sample: 12-17 year olds (N=22,220 never smokers; N=5,079 non-current ever smokers) (nationally representative sample) Location: US	Analytic measures: confirmed awareness Descriptive measures: confirmed awareness Wave I: 0% Wave II: 75% Wave III: 38% Wave IV: *not reported* Wave V: ~66% Wave VI: ~66% Wave VII: ~66% Wave VIII: 74%	Primary outcome measures: *intention not to smoke* (next 12 months) Control variables: individual characteristics[a]; exposure to Philip Morris' "Think. Don't Smoke" campaign, which aired at the same time	*intention not to smoke* for never smokers, pos. effect; for non-current ever smokers, pos. effect	**Race/Ethnicity (White vs. African American vs. Hispanic vs. Asian)** for never smokers, pos. effect for African-Americans & non-sig. effects for all other groups (but in pos. direction for Whites & Hispanics); African Americans > Asians ; no other sig. pairwise comparisons; for non-current ever smokers, pos. effect for all groups; no sig. differences between groups
Davis et al., 2009[13]	Campaign: national "truth" campaign & Philip Morris' "Think. Don't Smoke" campaign Target theme: "truth": negative health effects, industry manipulation; "Think. Don't Smoke": smoking doesn't lead to social popularity, not smoking is an assertion of independence	Design: longitudinal cohort, with 3 waves between 2000 & 2002 Analytic sample: N=10,919–11,348 baseline non-current smokers who were not open to smoking (intention analyses); N=11,741 baseline non-current smokers (behavior analysis); N=13,195 baseline non-	Analytic measures: prompted recall at waves 2 & 3 (combined into low, medium & high levels of exposure) Descriptive measures: prompted recall: "truth": 15% low; 54% medium; 31% high; "Think. Don't Smoke": 36% low; 57% medium; 7% high	Primary outcome measures: *initiation* at wave 3 (2 measures: to current smoking among baseline non-current smokers; to established smoking among baseline non-established smokers); *intentions to smoke* at wave 3 (5 measures) Control variables:	"truth" *initiation* no effect of medium (vs. low) exposure for either measure; pos. effect of high (vs. low) exposure for both measures *intentions to smoke* pos. effect of medium (vs. low) exposure for 1 of 5 measures; pos. effect of high (vs. low) exposure for 3 of 5	None examined

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Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Target audience: youth (12-17 year olds) **Medium:** TV **Duration of exposure:** varied according to survey wave (up to 2 years; "truth" launched in 2000 & "Think. Don't Smoke" aired 1998-2002) **Intensity of exposure:** 6 of the 7 study communities received low amounts of "truth" advertising prior to baseline; then, in 2 of the 7 communities, advertising levels were increased to 100-120% of the national average (but, GRP increases did not lead to increases in prompted recall) **Other components of the campaign:** none specified	established smokers (behavior analysis); students in grades 6-12 from a total of 83 schools (in 10 school districts) **Location:** US		individual characteristics[a]; community-level characteristics; ad recall at baseline; intentions at baseline; adjusted for clustering within schools	measures; pos. dose-response relationship between recall & intentions to "try a cigarette soon" & intentions to "be smoking cigarettes 5 years from now" "Think. Don't Smoke" *initiation* no effect *intentions to smoke* neg. effect of medium (vs. low) exposure for 1 of 5 measures; neg. effect of high (vs. low) exposure for 1 of 5 measures (intentions to "try a cigarette soon")	
Dietz et al., 2010[15]	**Campaign:** Florida "truth" campaign **Target theme:** industry manipulation **Target audience:** youth (12-17 year olds) **Medium:** TV **Duration of exposure:** varied according to survey wave (up to 3 years) **Intensity of exposure:** not specified **Other components of the campaign:** none specified	**Design:** longitudinal, with 6 cross-sectional waves during the campaign, from 1998-2001, & 2 cross-sectional waves post-campaign in 2004 & 2006 **Analytic sample:** N=1800 12-17 year olds in each survey wave **Location:** US (Florida)	**Analytic measures:** timing: baseline vs. final campaign wave; final campaign wave vs. post-campaign wave 1; post-campaign wave 1 vs. post-campaign wave 2 **Descriptive measures:** confirmed awareness of at least 1 ad: 93% in 1999; 64% in 2004 (post-campaign wave 1); 11% in 2006 (post-campaign wave 2)	**Primary outcome measures:** *prevalence* (smoked in past 30 days) **Control variables:** none specified	*prevalence* declined from baseline to final campaign wave in 2001; declined from final campaign wave until post-campaign wave 1; increased from post-campaign wave 1 to post-campaign wave 2 (but not sig. for total sample, sig. only for ≥ 16 year olds)	**Age** effects reported separately by age, but int. not statistically tested

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

Farrelly et al., 2009[19]	Campaign: national "truth" campaign & Phillip Morris' "Think. Don't Smoke" campaign Target theme: "truth": negative health effects, industry manipulation; "Think. Don't Smoke": smoking doesn't lead to social popularity, not smoking is an assertion of independence Target audience: youth (12-17 year olds) Medium: TV Duration of exposure: varied according to survey wave (up to 3 years; "truth" launched in 2000 & "Think. Don't Smoke" aired 1998-2002) Intensity of exposure: not specified Other components of the campaign: none specified	Design: cross-sectional (combined data from 8 waves between 2000 & 2003) Analytic sample: N=35,074 12-17 year olds (analyses predicting intentions limited to never smokers, but N not specified) (nationally representative sample) Location: US	Analytic measures: 1) confirmed awareness; 2) cumulative GRPs; 3) quadratic term for cumulative GRPs; 4) indicator variable for whether "Think. Don't Smoke" was on or off the air Descriptive measures: confirmed awareness of "truth" ~70% for most waves; awareness of "Think. Don't Smoke" 63-75%	Primary outcome measures: *intention not to smoke* (next 12 months) Control variables: individual characteristics[a]; state-level characteristics; time/year	"truth" *intention not to smoke* pos. effect of confirmed awareness; pos. effect of cumulative GRPs; non-sig. effect of quadratic GRPs (p=.07) "Think. Don't Smoke" *intention not to smoke* non-sig. neg. effect of confirmed awareness (p=.06); no effect of indicator variable	None examined
Farrelly et al., 2009[10]	Campaign: national "truth" campaign Target theme: negative health effects, industry manipulation Target audience: youth (12-17 year olds) Medium: TV Duration of exposure: varied according to survey wave (up to 4 years; "truth" launched in 2000)	Design: longitudinal cohort, with 8 waves between 1997 & 2004 Analytic sample: N=8904 12-17 year olds (at baseline survey in 1997) (nationally representative sample) Location: US	Analytic measures: cumulative GRPs Descriptive measures: see intensity of exposure section	Primary outcome measures: *initiation* Control variables: individual characteristics[a]; media market-level characteristics; state-level characteristics; time/year	*initiation* pos. effect of cumulative GRPs	None examined

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Intensity of exposure: varied according to media market (210 in the US) & over time; cumulative exposure values ranged between 3096 & 32,137 GRPs Other components of the campaign: none specified					
Flynn et al., 2010[24]	Campaign: created for study Target theme: social norms, self-efficacy, positive & negative outcome expectancies Target audience: youth (3 different target age groups: grades 4-6; 7-8; 9-12) Medium: TV & radio Duration of exposure: up to 4 years Intensity of exposure: TV: 380 GRPS/week in January-May & August-September of each year Radio: 215 GRPs/week in June-July of each year Other components of the campaign: none specified	Design: controlled field trial: matched pairs of media markets in 4 states randomized to treatment (4-year TV/radio campaign) or control conditions (no campaign); pre-campaign baseline data collected in 2001 & follow-up data collected in 2005 Analytic sample: N=19,966 7-12th grade students in 2001; N=23,246 7-12th grade students in 2005 (recruited from school districts serving lower-income & lower-education populations) Location: US (Florida, South Carolina, Texas & Wisconsin)	Analytic measures: pre- vs. post-intervention Descriptive measures: semi-prompted recall (scale of 1-4): TV-intervention: 3.05 (baseline) → 3.03 (follow-up); TV-control: 3.07 (baseline) → 2.94 (follow-up) Radio-intervention: 2.61 (baseline) → 2.61 (follow-up); Radio-control: 2.59 (baseline) → 2.44 (follow-up)	Primary outcome measures: *prevalence* (2 measures: smoked in past 30 days; smoked in past 7 days); *intentions to smoke* (3 measures: 30 days, next 12 months, 5 years) Control variables: individual characteristics[a]; adjusted for clustering by state, time & condition	*prevalence* no effect of condition, time, and no int. (both measures) *intentions to smoke* non-sig. effect of condition, time, and no int. (3 measures) *except* pos. effect of time on intention to smoke in next 5 years, with reduced intentions over time in both conditions	**Age, Gender & Race/Ethnicity** some effects reported separately by age and race/ethnicity, but int. not statistically tested
Hanewinkel et al., 2010[25]	Campaign: "Factual Romance" (single ad) Target theme: negative health effects Target audience: general audience Medium: PSAs shown in	Design: quasi-experimental field trial: treatment (PSA shown before movie in the cinema) & control (no PSA shown) conditions Analytic sample: N=1148 10-17 year old cinema audience	Analytic measures: treatment vs. control condition Descriptive measures: semi-prompted recall: 57% in treatment condition; 3% in control condition	Primary outcome measures: *intention to smoke* (next 12 months) Control variables: individual characteristics[a]	*intention to smoke* no effect (for 10-17 year olds)	**Age** non-sig. int. between age group (10-17 vs. 18-90) & condition

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	cinemas Duration of exposure: N/A Intensity of exposure: single exposure prior to movie (in treatment condition) Other components of the campaign: none specified	members (N=4,005 total, ages 10-90) Location: Germany				
Kandra et al., 2013[20]	Campaign: "Tobacco. Reality. Unfiltered." (TRU) Target theme: negative health effects Target audience: youth (11-17 year olds) Medium: TV Duration of exposure: < 6 months for 2004 sample & up to 5 years for 2009 sample Intensity of exposure: campaign expenditure: $2.7 million 2004-2005; $1.7 million 2005-2006; $4.5 million 2006-2007; $5 million 2007-2008; $5 million 2008-2009 Other components of the campaign: tobacco-free colleges program; teen coalitions (education, awareness, & policy activities) as part of the Teen Tobacco Use Prevention & Cessation Initiative	Design: cross-sectional with 2 waves, 2004 & 2009 Analytic sample: N=604 11-17 year olds in 2004 (mean age=14); N=1,154 11-17 year olds in 2009 (mean age=14; recruited from a random probability sample of North Carolina households; weighted) Location: US (North Carolina)	Analytic measures: confirmed awareness Descriptive measures: 1) confirmed awareness: 45% in 2004 & 77% in 2009; 2) semi-prompted recall of the TRU brand: 40% in 2004 & 63% in 2009	Primary outcome measures: *prevalence* (2 measures: smoked in past 30 days; ever puffed) Control variables: individual characteristics[a]	*prevalence* (effects only reported separately by sensation seeking (SS)) no effect for low SS but pos. effect for high SS (both measures)	**Sensation Seeking** effects reported separately by sensation seeking, but int. not statistically tested
Nasim et al., 2009[21]	Campaign: any recalled ads about the dangers of cigarette smoking, September 2007-April 2008	Design: cross-sectional Analytic sample: N=1,338 never smokers & N=353 experimental	Analytic measures: semi-prompted recall (past 30 days) Descriptive measures:	Primary outcome measures: *intention to smoke* (next 12 months) Control variables:	*intention to smoke* (effects only reported separately by smoking status) for never smokers, pos. effect; for	**Race/Ethnicity** for never smokers, sig. int. with African-American race/ethnicity, such that exposure

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Target theme: negative health effects Target audience: N/A Medium: TV, radio & the Internet Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	smokers, recruited from 39 middle schools & 30 high schools (weighted) Location: US (Virginia)	semi-prompted recall: never smokers: 60%; experimental smokers: 64%	individual characteristics[a]	experimental smokers no effect	effects were stronger among African-Americans than among all others; non-sig. int. with Latino & White race/ethnicities (vs. all others); for experimental smokers, sig. int. with African-American race/ethnicity, such that exposure effects were stronger among African-Americans than among all others; sig. int. with White race/ethnicity, such that exposure effects were weaker among Whites than among all others; non-sig. int. with Latino race/ethnicity
Paek, 2008[23]	Campaign: any antismoking messages recalled Target theme: N/A Target audience: N/A Medium: TV, radio, internet, billboards or outdoor signs & magazines Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	Design: cross-sectional Analytic sample: middle school & high school students who were either triers (smoked $\leq$ 1 cigarette) or experimenters (smoked $\leq$ 99 cigarettes): N=1,316 middle school triers; N=987 middle school experimenters; N=1,708 high school triers; N=2,176 high school experimenters (nationally representative sample) Location: US	Analytic measures: semi-prompted recall (past 30 days) Descriptive measures: none specified	Primary outcome measures: *intention to smoke* Control variables: individual characteristics[a]; smoking-related beliefs & attitudes; 8 2-way int. between exposure & social influence variables	*intention to smoke* (effects only reported separately by school grade/smoking status) for middle school triers, no main effect & no sig. int. for middle school experimenters, no main effect but sig. int. between exposure & family smoking, such that higher exposure increased intentions for those who lived with family members who smoked for high school triers, no main effect but sig. int. between exposure & parental monitoring, such that higher	**School Grade & Smoking Status** effects reported separately by grade & smoking status, but int. not statistically tested

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Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

					exposure reduced intentions for those with parental monitoring, & between exposure & school prevention programs, such that higher exposure reduced intentions for those with high exposure to school prevention programs for high school experimenters, no main effect & no sig. int.	
Paek et al, 2011[14]	Campaign: any antismoking ads recalled Target theme: N/A Target audience: N/A Medium: TV, radio, internet, magazines & billboards Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	Design: longitudinal cohort, with 2 waves, spring & fall 2003 Analytic sample: N=654 6th & 8th grade students Location: US (Wisconsin)	Analytic measures: semi-prompted recall (past 30 days) (1 = none; 5 = more than once a day) Descriptive measures: none specified	Primary outcome measures: smoking susceptibility Mediator variables: perceived media influence on peers Control variables: individual characteristics[a]; perceived risk from smoking	smoking susceptibility neg. direct effect at Time 1 (cross-sectional) but pos. indirect effect through perceived media influence on peers at Time 1 (cross-sectional); non-sig. indirect effects at Time 2 (longitudinal)	None examined
Richardson et al., 2010[28]	Campaign: national "truth" campaign Target theme: negative health effects, industry manipulation Target audience: youth (12-17 year olds) Medium: TV Duration of exposure: varied according to survey wave (up to 4 years) ("truth" launched in 2000)	Design: cross-sectional (combined data from 8 waves between 1999 & 2004) Analytic Sample: N=19,701 18-24 year olds (37% never smokers; 32% former smokers; 31% current smokers) Location: US	Analytic measures: confirmed awareness Descriptive measures: confirmed awareness: wave 1 (baseline): 0% wave 2: 68% wave 3: 42% wave 4: not available wave 5: 65% wave 6: 64% wave 7: 60% wave 8: 60% wave 9: 49%	Primary outcome measures: intention not to smoke (next 12 months; for never smokers & former smokers); intention to quit (for current smokers) Mediator variables: anti-smoking attitudes & beliefs (9 measures) Control variables: individual	intention not to smoke no effect (attributed to a ceiling effect since 93% held intention at baseline) intention to quit no effect (but in pos. direction, p=.06) **Path Analysis:** confirmed awareness pos. associated with 5 of 9 attitudes & beliefs; 1 of these 5 was pos.	None examined

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Intensity of exposure: not specified Other components of the campaign: none specified			characteristics[a]; state-level characteristics; time/year	associated with intention not to smoke & 2 of these 5 were marginally associated (p=.06); of these 5 attitudes & beliefs, all were pos. associated with intention to quit	
Richardson et al., 2011[26]	Campaign: EX Target theme: encouragement to quit Target audience: adult smokers (25-49 year olds) Medium: TV Duration of exposure: 6 months Intensity of exposure: not specified Other components of the campaign: none specified	Design: longitudinal cohort, with a pre-campaign wave & 6 month follow-up Analytic sample: N=552 18-24 year old current smokers from 8 media markets (+ N=1,380 25-39 year olds & N=1,639 40-49 year olds) Location: US	Analytic measures: confirmed awareness Descriptive measures: confirmed awareness: 47% in total sample; not specified for 18-24 year olds	Primary outcome measures: *quit attempts* Mediator variables: campaign-targeted cognitions Control variables: individual characteristics[a]; campaign-targeted cognitions at baseline; quit attempts at baseline	*quit attempts* among 18-24 year olds, no effect **Path Analysis:** among 18-24 year olds, no effect of confirmed awareness on campaign-targeted cognitions; and no evidence that the effect of awareness on quit attempts was mediated through campaign-targeted cognitions	**Age** effects reported separately by age but int. not statistically tested **Sex & Race/Ethnicity & Education** effects reported separately (although not within 18-24 year old age group), but int. not statistically tested
Schmidt et al., 2009[27]	Campaign: "Changing Social Norms: A Mass Media Campaign for Youth Ages 12 to 18 Years" Target theme: negative health effects, social norms, youth empowerment Target audience: youth (12-18 year olds) Medium: TV, radio, posters & print Duration of exposure: 6 weeks Intensity of exposure: not specified	Design: longitudinal cohort, with a pre-campaign wave & during-campaign wave Sample: N=149 12-18 year olds Location: Canada (Calgary)	Analytic measures: 1) time (pre- / during-campaign) 2) prompted recall (high/low) Descriptive measures: prompted recall of campaign slogan: 60%; prompted recall of ad: 52%	Primary outcome measures: *intention to: tell other experimenters not to smoke* (8 measures); *support smokers to quit tobacco use* (8 measures); *listen to people who talk about the benefits of being abstinent from tobacco* (8 measures) Control variables: none specified	*intention to tell other experimenters not to smoke* no effects of time; no effects of prompted recall *intention to support smokers to quit tobacco use* no effects of time; no effects of prompted recall *intention to listen to people who talk about the benefits of being abstinent from tobacco* no effects of time; no effects of prompted	**Smoking Status & Age** effects reported separately by smoking status & age, but int. not statistically tested

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Other components of the campaign: promotional items, interactive community website, media launch event				recall	
Seo et al., 2009[30]	Campaign: any antismoking messages about the dangers of smoking recalled Target theme: negative health effects Target audience: N/A Medium: TV, outdoor signs & "any media" Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	Design: cross-sectional with 2 waves, 2000 & 2004 Analytic sample: N=1,516 middle school & N=1,416 high school students in 2000; N=1,990 middle school & N=3,433 high school students in 2004 (recruited from public schools using a 2-stage cluster sampling method; weighted) Location: US (Indiana)	Analytic measures: semi-prompted recall (past 30 days), categorized into low, medium, or high exposure Descriptive measures: semi-prompted recall: low exposure: 26% in 2000 & 34% in 2004; moderate exposure: 67% in 2000 & 51% in 2004; high exposure: 7% in 2000 & 15% in 2004	Primary outcome measures: *prevalence* (2 measures: current smoking – smoked 1 of the past 30 days; established smoking – smoked on 20 or more of past 30 days & more than 100 cigs in lifetime) Control variables: individual characteristics[a]	*prevalence* no effect in 2000 or 2004 (both measures)	None examined
Shah et al., 2008[22]	Campaign: any antismoking media messages recalled Target theme: N/A Target audience: N/A Medium: TV, radio, billboards, posters, newspapers, magazines, movies & drama Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	Design: cross-sectional Analytic sample: N=34,119 male & N=24,757 female 13-15 year old (13% smoked in past 30 days; 22% past smokers; 65% never tobacco users) (recruited from schools using a 2-stage cluster sample design) Location: India	Analytic measures: semi-prompted recall (past 30 days) Descriptive measures: none specified	Primary outcome measures: *smoking status* (current smokers vs. never smokers, & past smokers vs. never smokers) Control variables: individual characteristics[a]; state-level characteristics	*smoking status* (effects only reported separately by gender) for both males & females, pos. effect such that exposure reduced the likelihood of being a current smoker; for both males & females, pos. effect such that exposure reduced the likelihood of being a past smoker	**Gender** effects reported separately by gender, but int. not statistically tested
Terry-McElrath et al., 2013[b][12]	Campaign: antitobacco ads (state tobacco control programs, American Legacy	Design: longitudinal cohort, with surveys conducted every 2 years	Analytic measures: measures of GRPs assigned to participants	Primary outcome measures: 5 measures of 2-year	*uptake* no effect of linear or quadratic GRPs for all 3	None examined

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Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Foundation), pharmaceutical ads (including NRTs, bupropion), & tobacco industry ads (corporate image advertising & youth smoking prevention targeted at parents & youth) that ran during 2001-2008 Target theme: N/A Target audience: N/A Medium: TV Duration of exposure: 2 years Intensity of exposure: mean 2-year exposure to antitobacco ads was 13,900 GRPs, mean exposure to pharmaceutical ads was 22,100 GRPs & mean exposure to tobacco industry ads was 15,500 GRPs Other components of the campaign: N/A	between 2001 & 2008 Analytic sample: N=26,315 observations from N=12,931 20-30 year olds, recruited as high school seniors. Eligible participants provided baseline data while at high school, at least 1 round of follow-up data to be eligible, & reported residing in the same state for the 24 month period prior to the current survey Location: US	based on the media market they lived in & the date of the follow-up survey: (1) cumulative GRPs over the 24 months prior to survey for the 3 type of ads; (2) a quadratic term for cumulative GRPs; (3) categorical version of cumulative GRPs (52 ad exposure [5200 GRPs] increments) Descriptive measures: none specified	smoking behavior change: *uptake; daily smoking uptake; quitting among all smokers; quitting among daily smokers; reduction or quitting among daily smokers* Control variables: individual characteristics[a]; state-level characteristics; time/year	types of ads *daily smoking uptake* no effect of linear or quadratic GRPs for all 3 types of ads *quitting among all smokers* no effect of linear GRPs for all 3 types of ads; pos. effect of quadratic & categorical GRPs for anti-tobacco ads *only*, such that exposure to 10,400-15,500 GRPs over 24-months was associated with more quitting than exposure to <5,200 GRPs *quitting among daily smokers* no effect of linear or quadratic GRPs for all 3 types of ads; pos. effect of categorical GRPs for antitobacco ads *only* (similar effect to example above) *reduction or quitting among daily smokers* no effect of linear GRPs for all 3 types of ads; pos. effect of quadratic & categorical GRPs for antitobacco ads *only* (similar effect to example above)	
White et al., 2008[17]	Campaign: 1 ad featuring "mouth cancer" warning label from cigarette packs & 1 ad featuring "peripheral vascular disease" warning label from cigarette packs	Design: longitudinal, with 2 waves of cross-sectional data collected pre-intervention (year prior) & post-intervention (6 months	Analytic measures: time (pre- / post-intervention) Descriptive measures: prompted recall: 65% for	Primary outcome measures: *cigarette consumption* per week (among those who smoked during past week); *smoking*	*cigarette consumption* pos. effect of time (but unclear whether due to TV ads or pack warning labels)	None examined

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	Target theme: negative health effects Target audience: adult smokers Medium: TV Duration of exposure: < 6 months Intensity of exposure: not specified Other components of the campaign: graphic warning labels on cigarette packs	following implementation of cigarette pack warnings) Sample: N=2,432 high school students in 2005; N=2,050 high school students in 2006 Location: Australia (Victoria)	ad about mouth cancer warning & 65% for ad about peripheral vascular disease warning	*susceptibility*; *intention to smoke* (next 12 months) Control variables: individual characteristics[a]; adjusted for clustering within schools	*smoking susceptibility* pos. effect of time, such that increase in proportion who "never smoked, not susceptible" (but unclear whether due to TV ads or pack warning labels) *intention to smoke* pos. effect of time (but unclear whether due to TV ads or pack warning labels)	
White et al., 2015[11]	Campaign: all antismoking TV ads, 1993-2008 Target theme: negative health effects (mostly) Target audience: adult smokers (mostly) Medium: TV Duration of exposure: variable (analytic measure of exposure) Intensity of exposure: variable (analytic measure of exposure) Other components of the campaign: N/A	Design: longitudinal, with 6 waves of cross-sectional data collected every 3 years between 1993 & 2008 Analytic sample: N=82,479 high school students (ranging from N=12,314-N=16,611 depending on year) (recruited from schools using a stratified 2-stage probability sample, with schools selected at the 1st stage & students at the 2nd stage; the number of students surveyed from each state was proportional to the population size of that state) Location: Australia	Analytic measures: (1) cumulative TRPs over the 3 months prior to survey & over the 12 months prior to the survey, & a quadratic term for cumulative TRPs (2) number of months at which TRPs/month reached each of three levels: ≥100; ≥400; & ≥800 Descriptive measures: none specified	Primary outcome measures: *prevalence* (smoked in past 30 days) Control variables: individual characteristics[a]; state-level characteristics; adjusted for clustering within schools	*prevalence* (1) 3-month cumulative TRPs inversely associated with prevalence; 12-month cumulative TRPs associated with prevalence only when the quadratic term was entered, indicating that very low levels of cumulative TRPs were associated with higher prevalence, but higher levels of cumulative TRPs were associated with lower prevalence (threshold = ~5,800 TRPs per year) (2) Over 3-months: no effect of duration of advertising at ≥ 100 TRPs/month on prevalence; pos. effect of advertising at ≥400 TRPs/month only if sustained for all 3	None examined

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Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

					months; pos. effect of advertising at $\geq$800 TRPs/month if sustained for at least 2 of 3 months Over 12 months: no effect (or neg. effect for 1 month) of duration of advertising at $\geq$100 TRPs/month on prevalence; pos. effect of advertising at $\geq$400 TRPs/month only if sustained for all 12 months; pos. effect of advertising at $\geq$800 TRPs/month only if sustained for 8-10 months	
Wood et al, 2009[16]	Campaign: "Smarter than Smoking" Target theme: industry manipulation, cosmetic effects, smoking is expensive, effect on fitness & social acceptability of smoking Target audience: youth (10-15 year olds) Medium: TV, radio, cinema, mobile phone SMS, internet promotions & youth-related press Duration of exposure: up to 10 years Intensity of exposure: at least 2 media campaigns aired annually for an average of 5.4 weeks per campaign (ranging from 2-10+ weeks). Between 1995-2005, expenditure per person in the target audience	Design: longitudinal, with 10 waves of cross-sectional data collected annually between 1996 & 2005 Analytic sample: school-based surveys (in 1996, 1997, 1998, 2001, 2004) surveyed between N=1,500 & N=3,000 12-15 year olds per year (majority nonsmokers); face-to-face street intercept surveys (in 1999, 2000, 2002, 2003, 2005) surveyed between N=300 & N=400 14-15 year olds per year Location: Australia (Western Australia)	Analytic measures: time (pre- /post-campaign) Descriptive measures: awareness: at least 87% for all campaigns over the 10 years (with the exception of 1 adapted from overseas)	Primary outcome measures: *smoking status* (never smoker vs. smoker) Control variables: none specified	*smoking status* pos. effect of time, such that the proportion of never smokers increased from 40% in 1996 to 61% in 2005, and the proportion of 14 year old smokers reduced 28% to 7% & the proportion of 15 year old smokers reduced from 43% to 14%	**Age** effects reported separately by age, but int. not statistically tested

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Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

	was an average of $2.34 (AUD $2.59) Other components of the campaign: school-based education programs, small grants & resources for schools, & smoking cessation resources at schools; Smarter than Smoking sponsorship of sports & arts events & activities involving youth; Smarter than Smoking involvement in youth-oriented publications, merchandise & websites as well as advocacy involvement to reduce tobacco promotion, availability & affordability					
Zawahir et al., 2013[29]	Campaign: any antismoking media messages recalled Target theme: N/A Target audience: N/A Medium: TV, radio, billboards, posters, newspapers, magazines, advertisements before/after movies & at discos/karaoke/lounges Duration of exposure: N/A Intensity of exposure: not specified Other components of the campaign: N/A	Design: cross-sectional Analytic sample: N=839 13-17 year old never smokers in Malaysia & N=833 13-17 year old never smokers in Thailand (recruited using a stratified multistage cluster sampling design at the household level; weighted) Location: Malaysia & Thailand	Analytic measures: semi-prompted recall (past 30 days & past 6 months; summed into exposure index, 0=none to 9=a lot) Descriptive measures: categorical version of exposure index: none or low (5.5% in Malaysia; 7.6% in Thailand); average (19.2% in Malaysia; 22.0% in Thailand); high (75.4% in Malaysia; 70.4% in Thailand)	Primary outcome measures: *smoking susceptibility* Control variables: individual characteristics[a]; knowledge of health effects of smoking & perceived health risk of smoking	*smoking susceptibility* (effects only reported separately by country and gender) in Malaysia, for both males and females, no effect; in Thailand, for both males and females, no effect	**Country** effects reported separately by country, but it's not clear if int. effects were tested for media exposure variable **Gender** effects reported separately by gender, but it's not clear if int. effects were tested for media exposure variable

Note. Many studies measured other outcomes that were not considered relevant to the current review. These included knowledge of the health effects of tobacco use, tobacco-related beliefs and attitudes, and perceived effectiveness of the advertisements. pos. = positive effects (i.e., less smoking behavior; stronger intentions not to smoke); neg. = negative effect (i.e., more smoking behavior; weaker intentions not to smoke); sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Individual characteristics control variables include demographic characteristics and smoking behaviors, and other factors known to influence smoking such as parental and friend smoking, exposure to pro-tobacco marketing. The type and actual number of control variables varied in each study.
[b] Study also included in Appendix B (due to additional findings that compared the effectiveness of different campaign themes or message execution characteristics).

APPENDIX B: Studies Comparing the Effectiveness of Different Message Themes, Strategies, and Executional Characteristics among Youth and Young Adults

Authors	Message Details	Study Design, Message Exposure, Analytic Sample & Location	Outcome Measures	Effects of Different Message Themes/Strategies (for each outcome: main effect of message theme/strategy &/OR moderated effect?)	Effects of Different Executional Characteristics (for each outcome: main effect of executional characteristic &/OR moderated effect?)	Sub-Group Differences (for each individual characteristic x each outcome: significant moderation?)
Adams et al., 2011[57]	Themes/strategies compared: none Executional characteristics compared: fear-relief emotional tone (n=1); sadness-joy emotional tone (n=1) Medium: print	Design: forced exposure, with a between-subjects experimental design: 2 (fear-relief vs. sadness-joy) x 2 (prevention self-regulatory focus vs. promotion self-regulatory focus) Intensity of exposure: single exposure to 1 msg. (although, each msg. was actually comprised of 2 separate messages: a threat (fear or sadness) msg. & an action msg. (relief or joy)) Analytic sample: N=226 18-26 year olds (current smokers) Location: Belgium	*attitude towards the ad; intention to quit; intention to think about negative effects of smoking; intention to think about quitting; intention to find out more about methods to quit; ad involvement*	N/A	*all outcomes*: no main effects (+ sig. int.)	**Self-Regulatory Focus** *all outcomes*: sig. int., such that fear-relief > sadness-joy msg. for those with prevention focus, and sadness-joy > fear-relief msg. for those with promotion focus; effects significantly mediated by ad involvement
Bresnahan et al., 2013[50]	Themes/strategies compared: self-referring; other-referring (friends) Executional characteristics compared: gain-frame; loss-frame Medium: text (online)	Design: forced exposure, with a between-subjects experimental design: 2 (gain-frame vs. loss-frame) x 2 (self-referring vs. other-referring), with a no msg. control condition	*perceived susceptibility to smoking harms; perceived severity of smoking harms; smoking enjoyment; resistance efficacy; intention to smoke*	*perceived susceptibility*: other-referring > self-referring (int. not tested) *all other outcomes*: no main effects (int. not tested)	*perceived susceptibility*: no main effect (+ sig. int.) *all other outcomes*: no main effects (+ no sig. int.)	**Smoking Status** *perceived susceptibility*: sig. int. such that gain-frame > loss-frame for smokers only

Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Study also included in Appendix A (due to findings assessing the overall effect of the campaign/s).

| | | Intensity of exposure: single exposure to 1 msg.

Analytic sample: N=315 university students (mean age = 22; 14% smokers)

Location: China | | | | |
|---|---|---|---|---|---|---|
| Carter et al. 2011[56] | Themes/strategies compared: none

Executional characteristics compared: high-disgust ads rated as more ("Toilet"; n=1) vs. less ("Rubbish"; n=1) amusing & funny

Medium: TV, but distributed online | Design: dissemination of ads (via email) tracked via website hits; opt-in survey after ad viewing

Intensity of exposure: unknown

Analytic sample: N=200 university students (median age = 26) initially received the msg.; N=86 completed survey

Location: Australia (initial sample) | *unique website hits* (ad dissemination); *ad ratings* (disgusting; revolting; interesting; amusing; anxiety; clever; truthful; funny; misses the point; try hard; dumb; weak; pathetic); *believability*; *smoking intentions* | N/A | *unique website hits*: over 4-months, "Toilet" ad received 487 hits & "Rubbish" ad received 339 hits; "Toilet" > "Rubbish" (int. not able to be tested)

ad ratings: no difference between ads, except on *amused* ("Toilet" > "Rubbish") & *funny* ("Toilet" > "Rubbish") (+ sig. int.)

believability: no difference between ads (+ non-sig. int.)

smoking intentions: no difference between ads (+ non-sig. int.) | **Gender**
ad ratings: sig. int. such that for both "Toilet" and "Rubbish", men were more likely to find the ads *amusing* and *funny* and less likely to find them *revolting* (no differences on any other ratings)

Age
no sig. int. for any outcomes |
| Chang, 2009[51] | Themes/strategies compared: self-referring (n=1); other-referring (n=1)

Executional characteristics compared: none

Medium: print (magazine segment, each containing articles, 1 antismoking ad & 2 commercial (filler) ads)

Intensity of exposure: | Design: 2 forced exposure studies, with between-subjects experimental designs. S1: 2 (self-referring vs. other referring ad) x 2 (independent self-construal vs. interdependent self-construal). S2: 2 (self-referring vs. other referring ad) x 2 (smoker vs. non-smoker)

Intensity of exposure: | *attitude towards smoking* | *attitude towards smoking*: main effects not tested/reported (+ sig. int.) | N/A | **Self-Construal**
attitude towards smoking: S1: sig. int. such that self-referring > other-referring ad for independent participants (although non-sig.) and other-referring > self-referring ad for interdependent participants (although non-sig.)

Smoking Status
attitude towards smoking: S2: sig. int. such that self- |

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Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Study also included in Appendix A (due to findings assessing the overall effect of the campaign/s).

		single exposure to 1 ad Analytic sample: S1: N=97 16-17 year old high school students. S2: N=143 16-17 year old high school students Location: Taiwan				referring > other-referring ad for smokers (although non-sig. simple effect) and other-referring > self-referring ad for non-smokers (although non-sig. simple effect)
Flynn et al., 2011[52]	Themes/strategies compared: argument rich (AR; contained explicit factual arguments against smoking; n=3); argument light (AL; no explicit factual arguments but focus on social norms and cigarette refusal; n=6); AR & AL blended (n=3) Executional characteristics compared: none Medium: TV	Design: forced exposure, with a mixed experimental design: 2 strategies (within: all exposed to all ads) *x* various individual characteristics Intensity of exposure: single exposure to 12 ads Analytic sample: N=1771 7th-8th grade students (non-smokers) Location: US	*indicators of central processing* ('has good facts'; 'makes me think'); *indicators of peripheral processing* ('looks cool'; 'fun to watch'); likeability	*indicators of central processing*: both measures: AR > blended > AL (+ sig. int.) *indicators of peripheral processing*: looks cool: blended > AR > AL (+ sig. int.) fun to watch: blended > AR, AL (+ sig. int.) *likeability*: AR, blended > AL (+ sig. int.)	N/A	**Gender** *indicators of central processing*: sig. int. for 'has good facts', such that females > males for blended ads, but equivalent for AR & AL ads; non-sig. int. for 'makes me think' *indicators of peripheral processing*: sig. int. such that females > males for AL ads, but equivalent for AR & blended ads (on both measures) *likeability*: sig. int. such that females > males for AL ads, but equivalent for AR & blended ads **Race/Ethnicity (Hispanic vs. African-American vs. Caucasian)** *indicators of central processing*: sig. int. for 'has good facts', such that H & AA > C for blended ads, & H > C for AL ads, but all equivalent for AR ads; non-sig. int. for 'makes me think'

Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.
[a] Study also included in Appendix A (due to findings assessing the overall effect of the campaign/s).

						indicators of peripheral processing: sig. int. for 'looks cool', such that H > AA & C for AR ads, but all equivalent for blended & AL ads; sig. int. for 'fun to watch', such that H > C for AR ads, but all equivalent for blended & AL ads *likeability*: non-sig. int. **Academic Achievement (A vs. B vs. C/D grades)** *indicators of central processing*: sig. int. for 'has good facts', such that A & B > C/D for AR ads, B & C/D > A for blended ads, & C/D > A for AL ads; sig. int. for 'makes me think', such that A & B > C/D for AR ads, B > C/D for blended ads, all equivalent for AL ads *indicators of peripheral processing*: sig. int. for 'looks cool', such that A > C/D for AR ads, B > C/D for blended ads, A & B > C/D for AL ads; non-sig. int. for 'fun to watch' *likeability*: non-sig. int.
Goetz, 2011[55]	Themes/strategies compared: none Executional characteristics compared: fear only (n=5); fear + disgust (n=5) (all about negative health effects)	Design: forced exposure, with a mixed experimental design: 2 (between: fear only vs. fear + disgust) x 5 (within: 5 ads) x 3 (within: baseline; 1st exposure; 2nd exposure), and a 2-week follow-up	*fear ratings; disgust ratings; heart rate; tonic skin conductance change; skin conductance response; blood pressure change; recall at follow-up; thinking about ads at follow-up; discussing ads at follow-up; readiness to*	N/A	*fear ratings*: no main effect (+ sig. int.) *disgust ratings*: fear + disgust > fear only (+ sig. int.) *heart rate*: no main effect (+ no sig. int.)	**Smoking Level (low vs. moderate)** *fear ratings*: sig. int. such that fear only > fear + disgust ads for moderate smokers only; moderate smokers > low smokers on fear ratings after fear only ads

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Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

[a] Study also included in Appendix A (due to findings assessing the overall effect of the campaign/s).

	Medium: TV	Intensity of exposure: 2 exposures to 5 ads Analytic sample: 18-25 year old university students (current smokers). N=81, except N=61 for physiological data & N=73 at follow-up Location: US	*quit; quit attempts at follow-up*		*tonic skin conductance change*: fear only > fear + disgust (+ no sig. int.) *skin conductance response*: no main effect (+ no sig. int.) *blood pressure change*: fear only > fear + disgust for diastolic blood pressure; no main effect for systolic blood pressure (+ no sig. int.) *recall/thinking about ads/discussing the ads at follow-up*: no main effects (+ no sig. int.) *readiness to quit*: no main effect (+ no sig. int.) *quit attempts at follow-up*: no main effect (+ no sig. int.)	*disgust ratings*: sig. int. such that fear + disgust > fear only ads for low smokers only; moderate smokers > low smokers on disgust ratings after fear only ads
Kelly et al., 2010[46]	Themes/strategies compared: health effects (NHE; n=2); social norms (SN; n=2); anti-tobacco industry (ATI; n=2) Executional characteristics compared: English; Spanish; Spanglish language Medium: print	Design: forced exposure, with a mixed experimental design: 3 themes (within: all exposed to all 6 messages) x 3 (between: English vs. Spanish vs. Spanglish) Intensity of exposure: single exposure to 6 ads Analytic sample: N=277 bilingual Mexican-American 9th & 10th students (35% ever smokers)	*ad appeal; believability; ad-attributable smoking deterrence; readability*	*ad appeal*: main effects not tested/reported (+ sig. int.) *believability*: main effects not tested/reported (+ sig. int.) *smoking deterrence*: main effects not tested/reported (+ sig. int.) *readability*: main effects not tested/reported (+ int. not tested)	*ad appeal*: no main effect (int. not tested) *believability*: no main effect (int. not tested) *smoking deterrence*: no main effect (int. not tested) *readability*: no main effect (+ sig. int.)	**Smoking Status** *ad appeal*: sig. int. such that for non-smokers, ATI ads most appealing; for smokers, NHE ads most appealing & appeal of ATI & SN ads decreased with heavier smoking *believability*: sig. int. such that for non-smokers, NHE ads most believable & SN ads least believable; for smokers, NHE ads most believable & ATI ads least believable

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Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

[a] Study also included in Appendix A (due to findings assessing the overall effect of the campaign/s).

		Location: US				*smoking deterrence*: sig. int. such that for non-smokers, ATI ads most deterrent; for smokers, NHE ads most deterrent *readability*: int. with smoking status not tested/reported **Acculturation** *ad appeal:* sig. int. such that as acculturation increased, appeal of ATI increased relative to other ads *believability:* non-sig. int. *smoking deterrence*: non-sig. int. *readability:* non-sig. int. for msg. theme; sig. int. for language condition such that as acculturation increased, readability decreased for the Spanish condition
Kuang, 2009 [47]	Themes/strategies compared: health effects (NHE; n=2); secondhand smoke consequences (SHS; n=2); social disapproval risk (SN; n=2) Executional characteristics compared: none Medium: print (advertising booklet, each containing 2 antismoking	Design: forced exposure, with a between-subjects experimental design: 3 msg.(NHE vs. SHS vs. SN) & 1 control condition (exposed only to filler ads only) Intensity of exposure: single exposure to 2 ads (in treatment conditions) Analytic sample: N=362 12-14 year old 7th grade students (non-smokers)	*intention to smoke; campaign-targeted beliefs and attitudes towards smoking*	*all outcomes*: no main effects (+ int. not tested, although effect of self-construal [interdependent vs. independent] examined within condition)	N/A	None examined

Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

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	Themes/strategies compared; Executional characteristics compared; Medium	Design; Intensity of exposure; Analytic sample; Location	Outcomes measured		Findings	
		Location: China				
Langleben et al., 2009[58]	Themes/strategies compared: none Executional characteristics compared: high msg. sensation value (MSV) anti-tobacco ads (n=4); low MSV anti-tobacco ads (n=4); neutral videos (n=8) Medium: TV	Design: forced exposure (all exposed to all ads) Intensity of exposure: single exposure to 16 ads Analytic sample: N=18 18-48 year olds (mean age = 23 years; regular smokers) Location: US	*recognition accuracy; recognition response time* (recognition of frames from ads)	N/A	*recognition accuracy:* low MSV > high MSV; anti-tobacco > neutral *recognition response time:* low MSV > high MSV; no difference between anti-tobacco & neutral	None examined
Leshner et al2., 2009[54]	Themes/strategies compared: none Executional characteristics compared: low fear/low disgust (n=6); low fear/high disgust (n=6); high fear/high disgust (n=6); high fear/low disgust (n=6) Medium: TV	Design: forced exposure, with a within-subjects experimental design: 2 (fear: low/high) x 2 (disgust: low/high) Intensity of exposure: single exposure to 24 ads Analytic sample: N=58 university students (>18 years old; non-smokers) (N=54 for attention analyses & N=55 for recognition analyses, due to missing data) Location: US	*attention* (measured by decelerating heart rate); *recognition accuracy; recognition sensitivity; recognition confidence*	N/A	*attention:* high fear > low fear; high disgust > low disgust; sig. int. such that high disgust increased attention in low fear ads but reduced attention in high fear ads *recognition accuracy:* high fear > low fear; high disgust > low disgust; no sig. int. between emotion conditions *recognition sensitivity:* high fear > low fear; high disgust > low disgust; no sig. int. between emotion conditions *recognition confidence:* no main effect for fear; high disgust > low disgust; no sig. int. between emotion conditions	None examined
Leshner et al., 2009[48]	Themes/strategies compared: health effects (NHE); social consequences (SC)	Design: forced exposure, with a mixed experimental design: 2 (within: gain vs. loss frame) x 2 (within: NHE	*cognitive processing* (secondary-task reaction time); *recognition accuracy*	See next column	*cognitive processing:* sig. int. between frame x outcome extremity, such that extreme loss-framed messages required most	None examined

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	Executional characteristics compared: gain frame; loss frame high outcome extremity; low outcome extremity Medium: TV	vs. SC theme) x 2 (between: extreme outcome vs. not extreme outcome); 2-3 ads per condition Intensity of exposure: single exposure to 8 ads Analytic sample: N=72 university students (mean age = 21; n=65 non-smokers) Location: US			processing; no other main effects or sig. int. *recognition accuracy*: sig. int. between frame x outcome extremity, such that extreme loss-framed messages were best recognized; main effect of outcome extremity, extreme > not extreme; no other main effects or sig. int.	
Murphy-Hoefer et al., 2008; 2010 [41, 42]	Themes/strategies compared: health effects (NHE; n=4); social norms (SN; n=4); anti-tobacco industry (ATI; n=4) Executional characteristics compared: humor; sarcasm; testimonial; drama (n=1 of each for each theme) Medium: TV	Design: forced exposure, with a mixed experimental design: 3 x (between: NHE vs. SN vs. ATI) x 4 (within: humor vs. sarcasm vs. testimonial vs. drama) Intensity of exposure: 2 exposures to 4 ads Analytic sample: N=1020 18-24 year old university students (36% current smokers) Location: US	*health effects beliefs; social norms beliefs; anti-tobacco industry beliefs; perceived effectiveness; intention to quit* (change in those with no intention at pre-exposure)	*health effects beliefs*: NHE & ATI ads > SN ads *social norms beliefs*: statistical comparisons between themes not reported *anti-tobacco industry beliefs*: statistical comparisons between themes not reported *perceived effectiveness*: NHE > ATI > SN *intention to quit*: no main effect of theme (in restricted sample)	*health effects beliefs*: main effects not tested/reported *social norms beliefs*: main effects not tested/reported *anti-tobacco industry beliefs*: main effects not tested/reported *perceived effectiveness*: drama > testimonial > humor > sarcasm *intention to quit*: main effects not tested/reported	None examined
Pechmann et al., 2010[53]	STUDY 1 Themes/strategies compared: attractiveness & prevalence & disapproval of smoking (A-P-D; n=1); attractiveness & prevalence of smoking (A-P; n=1)	Design: forced exposure, with between-subjects experimental design: 3 (A-P-D vs. A-P vs. control (C; no smoking content)) x 2 (nonsmoker vs. smoker) Intensity of exposure:	*recall of smoking content; perceived anti-smoking tone; disapproval thoughts; disapproval beliefs; attractiveness belief; prevalence belief*	*recall of smoking content*: A-P-D > A-P > C (+ sig. int.) *perceived anti-smoking tone*: A-P-D > C > A-P (+ no sig. int.)	N/A	**Smoking Status** *recall of smoking content*: sig. int. such that A-P-D > A-P for nonsmokers but not for smokers *disapproval thoughts*: sig. int. such that A-P-D > A-P > C effect stronger for

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Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

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	Executional characteristics compared: none Medium: edited TV program segment	single exposure to 11-minute TV program segment Analytic sample: N=1046 14-15 year old 9th grade students Location: US		*disapproval thoughts*: A-P-D > A-P > C (+ sig. int.) *disapproval belief*: A-P-D > A-P, C (+ no sig. int.) *attractiveness belief*: A-P > A-P-D, C (+ no sig. int.) *prevalence belief*: no effect (+ no sig. int.)		nonsmokers than smokers
	STUDY 2 Themes/strategies compared: attractiveness, prevalence & disapproval of smoking (A-P-D; n=1); attractiveness, prevalence, disapproval & approval of smoking (A-P-D-A; n=1) Executional characteristics compared: epilogue; no epilogue Medium: edited TV program segment	Design: forced exposure, with between-subjects experimental design: 3 (A-P-D vs. A-P-D-A vs. C) x 2 (epilogue vs. no epilogue) x 2 (nonsmoker vs. smoker) Intensity of exposure: single exposure to 11-minute TV program segment Analytic sample: N=1804 14-15 year old 9th grade students Location: US	*recall of smoking content; perceived anti-smoking tone; disapproval thoughts; disapproval beliefs; persuasion knowledge; intention to smoke*	*recall of smoking content*: A-P-D > A-P-D-A > C (+ no sig. int.) *perceived anti-smoking tone*: A-P-D > A-P-D-A > C (+ sig. int.) *disapproval thoughts*: A-P-D-A > A-P-D > C (+ no sig. int.) *disapproval belief*: A-P-D > A-P-D-A, C (+ no sig. int.) *persuasion knowledge*: A-P-D, A-P-D-A > C (+ no sig. int.) *intention to smoke*: sig. main effect, but not reported (+ sig. int.)	*recall of smoking content*: no main effect (+ no sig. int.) *perceived anti-smoking tone*: no main effect (+ no sig. int.) *disapproval thoughts*: no main effect (+ sig. int.) *disapproval belief*: no main effect (+ sig. int.) *persuasion knowledge*: epilogue > no epilogue (+ no sig. int.) *intention to smoke*: sig. main effect, but not reported (+ sig. int.)	**Smoking Status** *perceived anti-smoking tone*: sig. int. with strategy, such that A-P-D > A-P-D-A > C effect stronger for nonsmokers than smokers *disapproval thoughts*: sig. int. with epilogue, such that epilogue < no epilogue for smokers, but no difference for nonsmokers *disapproval belief*: sig. int. with epilogue, such that epilogue < no epilogue for smokers, but no difference for nonsmokers *intention to smoke*: sig. int. with theme, such that A-P-D < A-P-D-A, C for smokers, but no effect for nonsmokers; sig. int. with epilogue, such that epilogue > no epilogue

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Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

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						among smokers, but no effect for nonsmokers; effects mediated by disapproval belief
Samu et al., 2008[45]	Themes/strategies compared: See below Executional characteristics compared: high fear health effects ads (n=2); low fear anti-tobacco industry (n=2) ads Medium: online print ads	Design: 2 forced exposure studies, with between-subjects experimental designs. S1: 2 (high vs. low fear) x 2 (male vs. female). S2: 2 (high vs. low fear) x 2 (male vs. female) x 2 (imagined discussion about ad with friend vs. imagined discussion about ad with stranger) Intensity of exposure: single exposure to 2 ads Analytic sample: S1: N=102 university students (92% <25 years old; 73% non-smokers). S2: N=114 university students (72% nonsmokers) Location: not reported	*propensity to smoke; attitude towards smoking; belief about acceptability of smoking; susceptibility to antismoking ads*	See next column	*propensity to smoke*: S1 & S2: no main effects (+ sig. int. in S2) *attitude towards smoking*: S1 & S2: no main effects (+ no sig. int.) *belief about acceptability of smoking*: S1: high fear < low fear (+ no sig. int.); S2: no main effects (+ sig. int.) *susceptibility to antismoking ads*: S1 & S2: no main effects (+ sig. int. in S2) (+ sig. int. with discussion partner in S2, such that higher susceptibility when imagined discussing the ad with friends than with strangers in high fear condition, but no difference in low fear condition)	**Gender** S1: no sig. int. S2: *propensity to smoke, belief about acceptability of smoking & susceptibility to antismoking ads*: sig. int. such that more favorable responses among females than males in high fear condition, but no difference in low fear condition
Shadel et al., 2009[43]	Themes/strategies compared: short-term health effects (STHE); long-term health effects (LTHE); anti-tobacco industry (ATI) Executional characteristics compared: low actor appeal; high actor appeal Medium: TV	Design: forced exposure, with a mixed experimental design: 2 (within: low actor appeal vs. high actor appeal) x 3 (within: STHE vs. LTHE vs. ATI) x 2 (between: low smoking risk vs. high smoking risk), with 2-5 ads per condition Intensity of exposure: single exposure to 21 ads	*self-efficacy to resist smoking*	*self-efficacy*: LTHE > STHE > ATI; sig. 2-way int. between theme & actor appeal, such that LTHE ads were more effective with more appealing actors, but STHE & ATI ads were more effective with less appealing actors; non-sig. 3-way int.	*self-efficacy*: no main effect	**Gender, Age, Race/Ethnicity, Experience with Smoking** *no sig. int.*

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		Analytic sample: N=110 11-17 year olds (non-smokers) Location: US				
Shadel et al., 2010[59]	Themes/strategies compared: none Executional characteristics compared: implicit (n=8) vs. explicit (n=3) delivery of anti-tobacco industry msg. Medium: TV	Design: forced exposure, with a mixed experimental design: 2 (within: implicit msg. vs. explicit msg.) x 2 (between: younger vs. older) Intensity of exposure: single exposure to 3 or 8 ads (depending on condition) Analytic sample: N=110 11-17 year olds (non-smokers) Location: US	*self-efficacy* to resist smoking	N/A	*self-efficacy*: explicit messages > implicit messages (+ no sig. int. with age)	None examined
Terry-McElrath et al., 2013[a][12]	Themes/strategies compared: anti-tobacco ads; pharmaceutical ads; tobacco industry ads (all ads that aired 2001-2008) Executional characteristics compared: none Medium: TV	Design: longitudinal design using Monitoring the Future 2 year follow-up data (2001-2008); measures of GRPs assigned to participants based on the media market they lived in & the date of the follow-up survey: (1) cumulative GRPs over the 24 months prior to survey for the 3 type of ads; (2) a quadratic term for cumulative GRPs; (3) categorical version of cumulative GRPs (52 ad exposure [5200 GRPs] increments) Intensity of exposure: mean 2-year exposure to	5 measures of 2-year smoking behavior change: *uptake; daily smoking uptake; quitting among all smokers; quitting among daily smokers; reduction or quitting among daily smokers*	*uptake*: no effect of linear or quadratic GRPs for all 3 types of ads *daily smoking uptake*: no effect of linear or quadratic GRPs for all 3 types of ads *quitting among all smokers*: no effect of linear GRPs for all 3 types of ads; effect of quadratic GRPs among daily smokers and effect of quadratic & categorical GRPs among all smokers for anti-tobacco ads *only*, such that exposure to 10,400-15,500 GRPs over 24-months was associated with more quitting than	N/A	None examined

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		anti-tobacco ads in the population was 13,900 GRPs, mean exposure to pharmaceutical ads was 22,100 GRPs, & mean exposure to tobacco industry ads was 15,500 GRPs

Analytic sample: N=26,315 observations from 12,931 20-30 year olds, recruited as high school seniors. Eligible participants provided baseline data while at high school, & follow-up data at 2-yearly intervals (at least 1 round of follow-up data to be eligible), & reported residing in the same state for the 24-month period prior to the current survey

Location: US | | exposure to <5,200 GRPs*

reduction or quitting: no effect of linear GRPs for all 3 types of ads; effect of quadratic & categorical GRPs among daily smokers for anti-tobacco ads *only* (similar effect to example above) | | |
| Tharp-Taylor et al., 2012[44] | Themes/strategies compared: negative health effects (NHE; n=2 text & n=6 TV); short-term effects (STE; n=1 text & n=4 TV); secondhand smoke (SHS; n=1 text & n=3 TV); addiction (A; n=1 text & n=4 TV); anti-tobacco industry (ATI; n=1 text & n=11 TV)

Executional characteristics compared: none

Medium: TV PSAs and decontextualized print | Design: forced exposure, with data collected at 2 time points (2 weeks apart). At Time 1, exposure to decontextualized print messages, mixed experimental design: 5 (within: NHE vs. STE vs. SHS vs. A vs. ATI) x 2 (between: European-American vs. African-American). At Time 2, exposure to TV PSAs, mixed experimental design: 5 (within: NHE vs. STE vs. SHS vs. A vs. ATI) x 2 (between: European-American vs. | *perceived msg. strength* (after each print msg.); *self-efficacy* to resist smoking (after each TV PSA) | *perceived msg. strength*: main effects not reported (+ sig. int.)

self-efficacy: NHE > all others; ATI < all others (+ no sig. int.) | N/A | **Race/Ethnicity** *perceived msg. strength*: sig. int. such that NHE messages were rated as more persuasive by European-Americans than African-Americans, but no difference in ratings of other messages. For European-Americans, NHE > SHS > STE, A, ATI. For African-Americans, NHE > A & ATI; & SHS > ATI |

Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at *p*<.05); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

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	messages	African-American) Intensity of exposure: single exposure to 28 TV PSAs & 5 print messages Analytic sample: N=94 11-17 year olds (non-smokers) Location: US				
Vardavas et al., 2010[40]	Themes/strategies compared: negative health effects (NHE; n=3); secondhand smoke (SHS; n=2); social norms (SN; n=1); anti-tobacco industry (ATI; n=1) Executional characteristics compared: none Medium: TV	Design: forced exposure (all exposed to all ads) Intensity of exposure: 2 exposures to 7 ads Analytic sample: N=95 12-19 year olds (33% current smokers) Location: Greece	*perceived effectiveness*; *ad ratings* (clarity; importance; unbelievable; stop and think; curious; taught something new; talked down to me); *emotional ratings* (sad; angry; happy; scared; funny; boring; emotional)	*all outcomes*: descriptive results indicate that NHE ads rated highest on most outcomes (except: talked down to me; happy; funny; boring; emotional), however no statistical analyses comparing ads or ad types were conducted	N/A	None examined
Veer et al., 2008[49]	Themes/strategies compared: negative health effects (NHE; n=1); addiction (A; n=1) Executional characteristics compared: none Medium: TV	Design: forced exposure, with a between-subjects experimental design: 2 (NHE vs. A) x 3 (stage-of-change: precontemplation (PC) vs. contemplation (C) vs. preparation (PP)) Intensity of exposure: single exposure to 1 ad Analytic sample: N=200 university students (mean age = 22; current smokers) Location: UK	*attitude towards quitting*	*attitude towards quitting*: main effects not reported (+ sig. int.)	N/A	**Stage-of-Change** sig.int. such that NHE > A for PC, but A > NHE for C & PP
Vogeltanz-Holm et al., 2009[39]	Themes/strategies compared: negative health effects (NHE; n=3	Design: cross-sectional survey	*confirmed recall*; *perceived effectiveness* (for ads recalled)	*confirmed recall*: TV ads: "Artery" (NHE) > "Bucking Bronco"	N/A	**Gender** *perceived effectiveness*:

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	TV & n=3 radio); social norms (SN; n=1 TV); anti-tobacco industry (ATI; n=1 TV & n=1 radio); cosmetic effects (CE; n=1 radio) Executional characteristics compared: none Medium: TV & radio	Intensity of exposure: 12,690 TRPs for all TV ads, over 13 weeks (= ~2540 TRPs per ad). 3730 total airings for all radio ads, over 13 weeks (=~746 total airings per ad). Confirmed recall ranged between 8% - 42% for TV ads & 3% - 35% for radio ads Analytic sample: N=391 White or American Indian 12-17 year olds (23% ever smokers) Location: US		(SN) > "Still Can't Quit" (NHE) > "Cold Blooded" (ATI) > "Fires" (NHE) (+ no sig. int.) Radio ads: "ABC" (NHE) > "Napkin" (NHE) > "Thank You" (ATI), "Wanna Come Over" (CE) > "Joe DoBoer" (NHE) (+ no sig. int.) *perceived effectiveness*: TV ads: "Artery" (NHE) > "Bucking Bronco" (SN) > "Still Can't Quit" (NHE), "Cold Blooded" (ATI), "Fires" (NHE) (+ no sig. int.) Radio ads: main effect not reported (+ sig. int.)		Radio ads: sig. int. such that "Joe DoBoer" (NHE) rated higher than all others by girls; "ABC" & "Napkin" (both NHE) rated higher than all others by boys **Race/Ethnicity** int. not sig. for confirmed recall and not tested for perceived effectiveness due to small Ns
Wakefield et al., 2013[60]	Themes/strategies compared: none Executional characteristics compared: graphic negative health effects (G-NHE; n=3); simulated NHE (S-NHE; n=1); testimonial NHE (T-NHE; n=1) Medium: TV	Design: forced exposure (all exposed to all ads), replicated in 10 countries Intensity of exposure: 2 exposures to 5 ads Analytic sample: N=1195 18-24 year olds & N=1204 25-34 year olds (age groups combined for analysis; daily smokers) Location: Bangladesh, China, Egypt, India, Indonesia, Mexico, Philippines, Russia, Turkey, Vietnam	*msg. acceptance; perceived effectiveness; feeling of discomfort; likelihood of discussing ad*	N/A	*msg. acceptance*: Combined Sample: G-NHE ads all > T-NHE; no difference between S-NHE & T-NHE; By Country: G-NHE ads > S-NHE ad in 6 of 10 & > T-NHE ad in 6 of 10 countries *perceived effectiveness*: Combined Sample: G-NHE ads & S-NHE all > T-NHE; By Country: G-NHE ads > S-NHE ad in 7 of 10 & > T-NHE ad in 7 of 10 countries *discomfort*: Combined Sample: G-NHE ads all > T-NHE; no difference between S-NHE & T-	**Age** moderation by age group not statistically tested, but note that age (18-24 vs. 25-34) was not a sig. predictor of any outcome

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| | | | | | NHE;
By Country: G-NHE ads
> S-NHE ad in 8 of 10 &
> T-NHE ad in 7 of 10
countries

discuss: Combined
Sample: G-NHE ads & S-
NHE all > T-NHE;
By Country: G-NHE ads
> S-NHE ad in 7 of 10 &
> T-NHE ad in 8 of 10
countries | |

Note. msg. = message/s; > = significantly greater than; < = significantly less than; sig. = significant/significantly (typically at $p<.05$); int. = interaction/s; TRPs = targeted rating points and GRPs = gross rating points (measures are used by the advertising industry to estimate the number of people who were potentially exposed to an advertisement, capturing both the reach and frequency of campaign exposure); N/A = category not applicable to that study/campaign.

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