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Estimating the Pathways of an Antitobacco Campaign

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A B S T R A C T

Purpose: This study examined mechanisms through which the truth campaign, a national mass media antismoking campaign, influences smoking-related attitudes, and progression of tobacco use over time in youth and young adults.

Methods: Structural equation modeling tested causal pathways derived from formative research and behavioral theory with a nationally representative longitudinal sample of 15–21-year-olds ($n = 8747$) over 24 months. Data were collected from 2014 to 2016, and analyses were conducted in 2017.

Results: Greater ad awareness predicted strengthening of attitudes targeted by the campaign (i.e., feelings of independence from tobacco, antitobacco industry sentiment, decreasing acceptance of social smoking, and decreasing acceptance of smoking imagery), and attitude changes were significantly associated with greater support for an antitobacco social movement (e.g., agreement to the item “I would be part of a movement to end smoking”). Greater social movement support predicted a slower rate of progression on smoking intensity after two years of the campaign.

Conclusions: Findings suggest that engaging youth and young adults in a cause-based social movement for promoting health can be a powerful strategy to drive positive behavior change. Messages targeting attitudes that resonate with values important to this age group, including independence and connectedness, are particularly effective. Investments in national antitobacco public education campaigns are key policy interventions which continue to help prevent tobacco use among youth and young adults.

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IMPLICATIONS AND CONTRIBUTION

Study findings highlight the importance of using messages based on the values and culture of the target audience. Further, findings suggest that engaging youth and young adults in a cause-based social movement for promoting health can be a powerful strategy to drive positive behavior and prevent tobacco use.

Mass media education campaigns have significantly contributed to the decline in tobacco use over the past two decades by changing social norms, attitudes, and intentions related to tobacco use, which can lead to long-term behavior change [1,2]. In 2016, 6% of U.S. high school students reported past 30-day cigarette smoking, representing a dramatic decrease from the over 20%

reporting use in the 1990s and early 2000s [3]. Additionally, patterns of smoking have changed in recent years, including increases in smoking initiation among young adults, declines in initiation among adolescents, and increases in nondaily and “social smoking” use patterns [4]. This shifting landscape of tobacco use requires innovative campaigns to effectively reach today’s youth and young adults and prevent smoking.

Using a unique message strategy, the truth FinishIt campaign was launched in 2014 with a call-to-action to join a social movement to end tobacco use. The campaign’s focus on an antitobacco social movement was developed based on a variety of formative

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research of the target audience, including quantitative (e.g., surveys of national samples) [5,6] and qualitative (e.g., focus groups and moderated online discussion boards) studies [5,7]. Formative research and psychological theories [8–11] indicate that autonomy, identity formation, and connections with others are valued by truth's target audience. Thus, ads were developed to reflect these values. For example, ads highlight how "social smoking" can trap young people in a cycle of addiction. Ads also showcase how tobacco use can negatively influence dating prospects, financial goals, and pets' health. Messages were crafted to target specific attitudes, including feeling independent from tobacco, having negative views of the tobacco industry and social smoking and perceiving smoking imagery (e.g., pictures of celebrities smoking) as unacceptable or setting a bad example.

The campaign sought to develop an informal social movement by garnering youth support to "be the generation that ends smoking" [9]. While content varied across ads, every ad included the overall campaign message of joining a social movement to end smoking. All ads employed the call for support and engagement in the social movement and provided ways to express that support, such as using hashtags on social media. Employing a generational social movement platform was part of an overall campaign strategy to motivate nonsmokers, both those with and without the intention to try smoking in the future, to reject smoking altogether. This approach leverages the gains made in decreasing smoking rates to focus attention on one key campaign goal: preventing the initiation and progression of tobacco use among nonsmokers by engaging this group in the cause of ending smoking.

A recent study provided initial evidence of the causal relationship between awareness of the truth FinishIt campaign and changes in targeted attitudinal constructs. Findings from this study demonstrated a dose-response relationship between awareness of truth messages and significant shifts in targeted antitobacco attitudes, support for an antitobacco social movement to end smoking, and intentions not to smoke among youth and young adults [5]. These findings represent the influence of the campaign on precursors to changes in tobacco use behavior using models that examine campaign effects on each construct independently. However, both theoretical considerations and the campaign design suggest the targeted constructs should relate to one another and that changes in behavior reflect intermediate changes in attitudes [12,13]. A path model enables a specific test of whether the campaign exerted its influence through the attitude changes as designed.

The present study tests the pathways through which campaign awareness influences progression of smoking behavior in youth and young adults. Specifically, we use a longitudinal framework to test the hypothesis that awareness of the campaign among never smokers reduces the progression of smoking behavior over time through a three-step mechanism: (1) ad awareness increases anti-smoking campaign-targeted attitudes: desire for independence from smoking, anti-industry sentiment, antisocial smoking sentiment, and antismoking imagery sentiment; (2) these changes in attitudes increase support for an antitobacco social movement; and in turn, and (3) increasing support for an antitobacco social movement slows smoking progression.

Methods

Sample and procedures

Data are from the Truth Longitudinal Cohort (TLC), a probability-based, nationally representative cohort, ages 15–21 years,

established to assess the impact of the truth campaign at changing smoking behavior over time. Participants who completed two or more online surveys across five waves and who reported at baseline (Wave 1) never having smoked a cigarette were included in the analyses ($n=8747$). Baseline data were collected April to August 2014 (prior to campaign onset) and follow-up data were collected every 6 months, with Wave 5 data collected July to October 2016.

The weighted survey response rate was 38.7% (AAPOR Response Rate 3 [RR3] using quota limits); follow-up response rates ranged from approximately 72% (wave 2) to 65% (wave 5) of the wave 1 sample. Compared to Census estimates, the initial overall sample was represented by a somewhat larger proportion of participants from the Northeast and the Midwest regions. Furthermore, the total initial sample was represented by a slightly larger proportion of whites and slightly fewer African American and Hispanic participants. In order to generalize to the national population of 15–21-year-olds and to ensure that the sample is representative based on Census estimates, analyses used post-stratification longitudinal weights adjusted for selection probabilities, non-response, and attrition [14]. The study protocol was approved by Chesapeake Institutional Review Board (now Advarra). Other details regarding the delivery of the campaign, as well as additional Truth Longitudinal Cohort methods and response rates are available elsewhere [5,15,16].

Measures

Predictor variable: Cumulative truth ad awareness

A cumulative index was formed to reflect awareness of ads during 2 years of the campaign [17]. Using a procedure commonly employed for ad recall [6], at each wave, participants were shown four screenshots for each ad and were asked, "Have you seen this ad in the last 6 months?" Those who answered affirmatively were asked how frequently they had seen the ad (1 = rarely, 2 = sometimes, 3 = often and 4 = very often). Participants who had not seen the ad or who were missing data for that wave were recoded as (0) not aware. Twelve ads total were surveyed across Waves 2–5. The index was calculated as the sum of the frequency scores for all 12 ads (possible range = 0–48).

Pathway variables: Campaign-targeted attitudes

For each attitudinal construct, participants were asked their level of agreement for a series of two to five items (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, and 5 = strongly agree). Scores for each attitude were the average of all items for that construct for each wave; data from Waves 1–5 were used to control for respondent's previous attitudes on each of the campaign attitudes. All scales demonstrated acceptable or good reliability at baseline ($\alpha > .70$). The following are example items used to measure each construct. Independence from Tobacco: "Not smoking helps me feel powerful." Anti-Industry Sentiment: "Tobacco companies make me angry." Anti-Social Smoking Acceptability (reverse coded): "People look cool when they smoke." Anti-Smoking Imagery: "Celebrities who smoke set bad examples." Social Movement Support: "I would be part of a movement to end smoking." The complete list of items and reliability statistics are available in the Appendix A. Confirmatory factor analysis, described elsewhere [5], suggested all items loaded satisfactorily to the corresponding construct.

Outcome variable: Smoking intensity

The Smoking Intensity measure was based on prior work examining progression of youth and young adult smoking (ages in these studies ranged from 12-to-26-year-olds) [13,18,19]. The measure included five levels of smoking progression: (1) Closed to smoking; (2) Open to smoking; (3) Low intensity non-daily smoking; (4) High intensity non-daily smoking; and (5) Daily smoking. The first two levels classified those who reported no past 30-day cigarette use. Classification was based on whether they were open to smoking using responses to two questions: “Do you think you will smoke a cigarette (even 1 or 2 puffs) in the next year?” and “Think about the future, if one of your best friends offered you a cigarette (even 1 or 2 puffs) in the coming year, would you smoke it?”. Level 1, closed to smoking, consisted of those reporting “definitely not” to both intention-to-smoke questions. Level 2, open to smoking, consisted of those reporting “probably not”, “probably yes”, or “definitely yes” to one or both intention-to-smoke questions.

The remaining three levels classified participants who reported past 30-day smoking. In line with the youth progression literature [4,19], classification was based on a combination of number of days smoked and the number of cigarettes per smoking day (CPD) using responses to two questions: “During the past 30 days, on how many days did you smoke cigarettes (even 1 or 2 puffs)?”, with responses ranging from 1 to 30 days, and “During the past 30 days, on the days that you smoked cigarettes, how many cigarettes did you smoke per day?”, with response categories, “<1”, “1”, “2–5”, “6–10”, “11–20”, and “>20”. Level 3, low intensity nondaily smoking, consisted of (a) participants who smoked on 1 of the past 30 days, regardless of CPD and (b) those who smoked on 2–5 days if they smoked fewer than two CPD. Level 4, high intensity nondaily smoking, consisted of (a) participants who smoked on 6–24 of the past 30 days, regardless of CPD and (b) those who smoked on 2–5 days if they reported at least two CPD. Level 5, daily smoking, consisted of participants who smoked on at least 25 of the past 30 days, regardless of CPD. Because the specific population of interest was never smokers, all participants were at Level 1 or 2 on the Smoking Intensity measure at baseline. Participants’ Smoking Intensity scores from all waves were used in the model to estimate growth, or progression, in smoking intensity over the two years following baseline.

Control variables

Two sets of control variables were included, all measured at baseline (Table 1). Demographic variables included respondent age, parental education level, gender, financial situation, race/ethnicity, and truth brand awareness prior to the campaign. Measures of the respondents’ immediate, personal environment included parental smoking, perceived peer smoking, and awareness of FDA and CDC antismoking ads running concurrently with the truth campaign. Additionally, tobacco-related policy variables included media-market smoking prevalence and the following state tobacco policy factors as covariates: (1) total tax per cigarette pack (state and federal) [20], (2) state-level per capita tobacco control expenditures rounded to the nearest cent [21], and (3) level of clean indoor air legislation as measured in percentage of state population covered as of 2012 across all U.S. states and the District of Columbia [22]. We also included state smoking prevalence as another indicator of the effectiveness of all tobacco control efforts [23]. All state policy variables were treated as continuous.

Table 1
Sample descriptive information (n = 8,747)

	Weighted %
Age (missing n = 134)	
15–17	52.6
18–22	47.4
Gender (missing n = 0)	
Male	50.8
Female	49.2
Race ethnicity (missing n = 27)	
Non-Hispanic, white	56.6
Non-Hispanic, black	14.1
Hispanic	20.0
Non-Hispanic, other	9.3
Financial situation (missing n = 52)	
Live comfortably	41.6
Meets needs	36.8
Just meets basic expenses	17.5
Does not meet basic expenses	4.1
Parent education (missing n = 62)	
Less than high school educated	3.4
High school grad/GED	14.6
Some college/Associate’s degree	23.6
College graduate/Advanced degree	58.4
Truth brand awareness ^a (missing n = 0)	
Yes	29.5
No	70.5
Parental smoking ^b (missing n = 492)	
Yes	7.1
No	92.9
Cigarette smoking intensity at Wave 1 (missing n = 0)	
Nonsmoker, closed to smoking	77.91
Nonsmoker, open to smoking	22.09
Cigarette smoking intensity at Wave 5 (missing n = 1,985)	
Nonsmoker, closed to smoking	77.3
Nonsmoker, open to smoking	17.7
Low intensity, nondaily user	2.2
High intensity, nondaily user	1.3
Daily user	1.4
	Weighted mean (SE)/Median
Perceived peer smoking ^c (missing n = 48)	3.3 (.01)/0
Cumulative truth ad awareness ^d (missing n = 0)	3.91 (.09)/1.33
Campaign-targeted attitudes (baseline means) ^e (missing n = 0)	
Anti-Industry Sentiment	3.78 (.01)/3.66
Independence from Tobacco	3.60 (.01)/3.33
Anti-Social Smoking Acceptability	4.17 (.01)/4.15
Anti-Smoking Imagery	3.73 (.01)/3.62
Social Movement Support	3.64 (.01)/3.56

Note: Awareness of CDC’s Tips from Former Smokers and FDA’s Real Cost campaigns was also included as covariates. To assess awareness, participants were shown 4 screenshots from 2 randomly selected CDC and 2 randomly selected FDA ads that aired in the 6 months prior to data collection, and were asked, “Have you seen this ad in the last 6 months?” with response options yes/no. Participants were considered aware of the campaign if they responded “yes” to either ad from each campaign.

^a To measure truth brand awareness, participants were shown an image of the truth logo and asked, “Do you recognize this logo?” Those who answered affirmatively were asked, “What do you think of when you see this logo?” Those who answered “anti-tobacco” were defined as being brand aware.

^b One or more of their parents smoke or both parents do not smoke.

^c Perceived peer smoking was measured with the item: “How many of you 4 closest friends smoke cigarettes/large cigars, little cigars, or cigarillos?”

^d Cumulative truth ad awareness scores: possible range 0–48, actual range 0–42.

^e Campaign-targeted attitudes scores ranged from 1 to 5.

Statistical analysis

Structural equation models (SEM) were fit using Mplus 7.4 [24]. Latent growth SEM was used to estimate Smoking Intensity at

Table 2
Standardized path estimate paths

Indirect paths testing the hypothesized three-step mechanism		Estimate (SE)	p
Total effects	Slope model	-.014 (.024)	.55
Total indirect effects	Slope model	-.050 (.007)	<.0001
Specific indirect effects	Ad → <u>Anti-industry</u> → Social move → Slope	-.017 (.003)	<.0001
	Ad → <u>Independence</u> → Social move → Slope	-.028 (.004)	<.0001
	Ad → <u>Social smoking</u> → Social move → Slope	-.003 (.001)	.05
	Ad → <u>Social imagery</u> → Social move → Slope	-.001 (.001)	.07

Note: Boldface indicates statistical significance ($p < .05$). Model fit was satisfactory ($\chi^2(966) = 3948.55, p < .001$; CFI = .94; TLI = .93; RMSEA = .019 [.018–.019, $P_{close} = 1.00$]). A sensitivity analysis was performed using a version of this model with categorical ad awareness variable (No Awareness, Low Awareness, and High Awareness). Findings were similar to the current model.

Ad = Cumulative truth Ad Awareness, Independence = Independence from Tobacco, Anti-Industry = Anti-Industry Sentiment, Social Smoking = Anti-Social Smoking Acceptability, Social Imagery = Anti-Smoking Imagery, Social Move = Social Movement Support; estimates are STDYX standardized. The correlation between slope and intercept was .87.

Wave 5 and the rate of participants' progression along the Smoking Intensity measure over time. This model takes advantage of the rich longitudinal dataset to estimate growth as a function of time-varying and time-invariant predictors. The Smoking Intensity intercept was set to Wave 5 to allow for easy interpretation of Smoking Intensity after two years of the campaign. Analyses used Mplus' full-information maximum likelihood (FIML) algorithm to calculate standard errors based on the level of missing data for each model [25]. Categorical variables were dummy coded, with reference levels excluded (Table 2). First, a base model was fit with only a direct path between Ad Awareness and the latent Smoking Intensity factors. Second, the full model tested the indirect effect of Ad Awareness on Smoking Intensity through the three-step pathway.

Base model

The Smoking Intensity slope was predicted directly by Ad Awareness. The demographic control variables were added as

predictors of Ad Awareness. The tobacco-related environmental variables were entered as predictors of the Smoking Intensity intercept and slope, ensuring that any effect of Ad Awareness on Smoking Intensity would be over and above effects of other environmental factors. Importantly, this model tests for effects of the truth campaign while controlling for awareness of FDA and CDC antitobacco campaigns that were running concurrently and have been demonstrated to be effective [26,27].

Full model specification

For the full model, pathway variables were added to the base model (Waves 1–5; Figure 1). Ad Awareness had direct paths to the latent Smoking Intensity slope, and to four of the latent mediator variables (Anti-Industry Sentiment, Independence from Tobacco, Anti-Smoking Imagery, and Anti-Social Smoking Acceptability). These four attitudes each had a direct path to Social

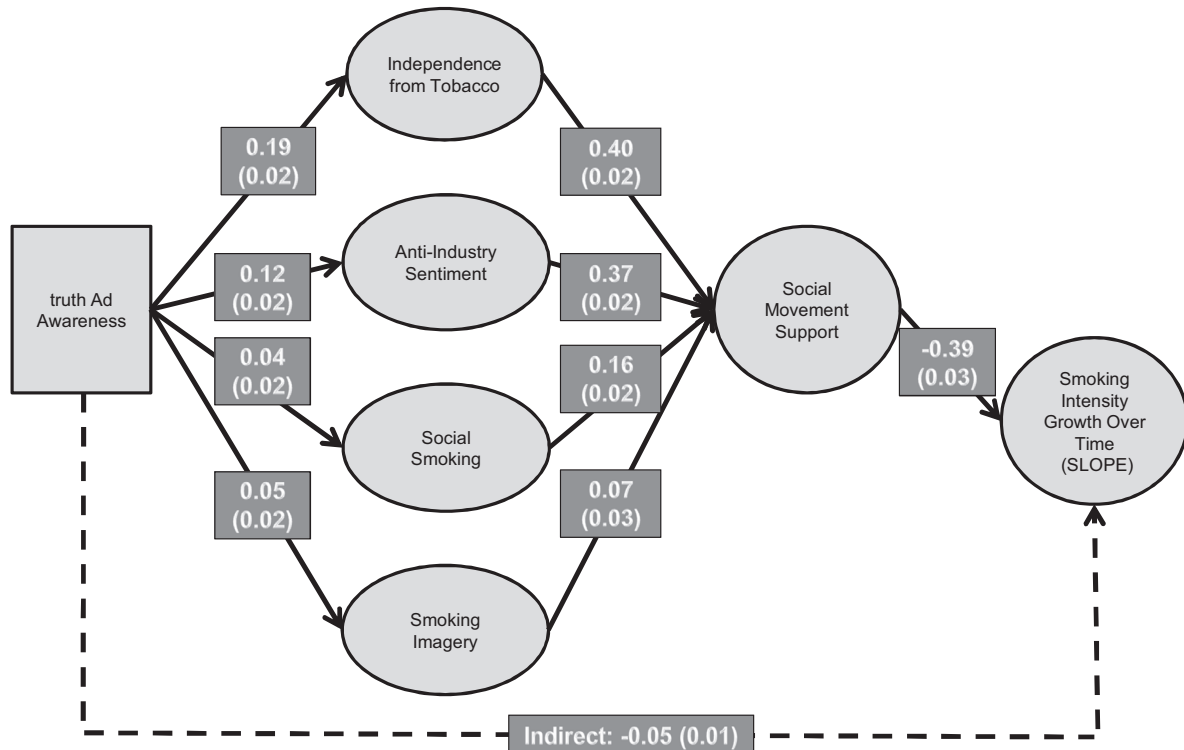


Figure 1. Path model with standardized path coefficients (SE)

Movement Support, which in turn, had direct paths to the slope of Smoking Intensity.

Results

The baseline demographic profile of the analytic sample is presented in Table 1. At the last wave of data collection, 77% of the sample was at level 1 of the smoking progression measure and 18% of the sample was at level 2, indicating that the majority of participants did not progress to frequent smoking.

Base Model

The base growth model fit the data moderately well ($\chi^2(105) = 367.76, p < .0001$; CFI = .93; TLI = .92; RMSEA = .017 [.015–.019, $P_{close} = 1.00$]). The direct effect of Ad Awareness was not significant for growth in Smoking Intensity (slope).

Full Model

Model fit. The full model fit the data well ($\chi^2(966) = 3948.6, p < .0001$; CFI = .94; TLI = .93; RMSEA = .019 [.018–.019, $P_{close} = 1.00$]). Comparison of goodness-of-fit statistics indicated the full model was a significantly better fit to the data than the baseline model ($\chi^2_{diff}(1085) = 49644.9, p < .0001$). See Appendix Table A1 for estimates of control variable paths.

Tests of the three-step mechanism. The model that tests the three-step mechanism is presented in Figure 1 along with the direct effects and standard errors; indirect effects are presented in Table 2. The model illustrates how Ad Awareness works indirectly through Independence, Anti-Industry Sentiment, Anti-Social Smoking, and Anti-Smoking Imagery to impact Social Movement Support, which then impacts growth in Smoking Intensity over time. The paths through Independence and Anti-Industry Sentiment were stronger than the paths through Anti-Social Smoking and Anti-Smoking Imagery.

Direct effects. Ad Awareness was directly and positively associated with each campaign-targeted attitude: Independence ($B = .19, p < .0001$); Anti-Industry Sentiment ($B = .12, p < .0001$); Anti-Social Smoking ($B = .04, p = .03$); Anti-Smoking Imagery ($B = .05, p = .02$). In turn, each of the campaign-targeted attitudes was positively associated with Social Movement Support: Independence ($B = .40, p < .0001$); Anti-Industry Sentiment ($B = .37, p < .0001$); Anti-Social Smoking ($B = .16, p = .01$); Anti-Smoking Imagery ($B = .07, p < .0001$). Social Movement Support was directly associated with less growth in Smoking Intensity over time ($B = -.39, p < .0001$). Ad Awareness did not have a significant direct effect on growth in Smoking Intensity over time ($B = .04, p = .13$).

Indirect effects. The total indirect pathway from Ad Awareness to the growth in Smoking Intensity over time is significant ($B = -.05, p < .0001$) (Table 2). The pathways from Ad Awareness to Smoking Intensity through Independence and Anti-Industry Sentiment were significant (Figure 1). The pathway through Anti-Smoking Imagery was marginal in significance ($p < .10$), while the pathway through Anti-Social Smoking was not significant.

Discussion

Drawing from a large, nationally representative longitudinal cohort, this study provides evidence for how mass media campaigns can impact smoking progression among youth and young adults. Findings support the proposed three-step mechanism: (1) Greater truth ad awareness predicted stronger antismoking, campaign-targeted attitudes; (2) these increased attitudes were significantly associated with greater support for an antitobacco social movement; and (3) greater social movement support predicted a slower progression of smoking intensity over 24 months from the campaign launch.

One explanation for the observed pattern of effects may include the alignment of campaign-targeted attitudes with the basic needs of autonomy, relatedness (or connectedness with others), and identity formation that are significant parts of development in adolescence and young adulthood [8]. Additionally, truth messages motivate youth to live up to present values rather than asking them to change their behavior for a healthier distant future. This approach is consistent with behavior change theory that suggests young people are more motivated by immediate rewards than long-term consequences. The focus on supporting a social movement capitalized on trends in the broader culture orienting today's youth towards social action [28]. While other campaigns have utilized cause-based ideas to encourage behavior change among adolescents [29,30], the FinishIt campaign is unique in its purposive integration of youth culture. Importantly, we found significant, independent effects of the truth campaign over and above any effects of other national antitobacco campaigns.

Findings indicated smaller effects for attitudes related to perceptions of social smoking and smoking imagery as compared to those related to independence and anti-industry. This variation in effect size likely reflects both the structure of the campaign messages and the nature of the constructs. Campaign messages are more tightly organized around exposing the tobacco industry's manipulative actions to promote their products, as compared to perceptions of smoking and smoking norms. Attitudes related to the perceptions of smoking and smoking imagery are also less closely related to the basic psychological needs of young people (i.e., autonomy and relatedness), and may not serve as strong motivators for attitude or behavior change.

The campaign's primary goal is smoking prevention, with ads that aim to deter smoking initiation rather than ads that encourage quitting among regular users. While the smoking intensity measure was intended to capture the full range of smoking intentions and behavior, the focus of the campaign means that it is likely that the largest part of the campaign effect is on the lower levels of the progression measure, with a stronger influence on nonuser's intentions to smoke than on tobacco users' smoking frequency.

The current findings are particularly relevant for prevention campaigns targeting older adolescents and young adults. Prior research has demonstrated that younger adolescents (ages 9–15) are influenced by mass media campaigns through different mechanisms than older adolescents and young adults [13,31,32]. Among younger adolescents, ad awareness and comprehension of campaign messages alone may effectively influence behavior. In the present analysis, we did not find a significant direct effect from ad awareness to behavior change, suggesting ad awareness alone was not sufficient to slow smoking progression. Rather, the relationship between ad awareness and smoking progression was mediated through increases in antitobacco attitudes. This pathway is consistent with behavior theories, which posit that changes in

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behavior are preceded by changes in attitudes and intentions regarding that behavior [12].

This study has several strengths. The use of a large, longitudinal, and probability-based sample of youth and young adults allows for high generalizability of the findings. Data collection was conducted every 6 months over 2 years, allowing for more precise assessments of change over time than is possible with less frequent national surveys. The latent growth structural equation modeling framework allowed us to test a specific hypothesis based on the implementation of the campaign and behavior change theories which serves to increase the legitimacy of the causal inference.

There are several limitations to the current work. The study relied on self-report for both campaign awareness and tobacco use, which could be subject to recall bias. However, the use of visual aids to assist in ad recall, as done in this study, is a method known to increase the accuracy of reporting [33]. Despite our best efforts to include meaningful covariates in the model, the lack of subject randomization means we cannot rule out differences between those who are and are not aware of truth advertisements that may be related to the study outcome. Finally, since most participants did not initiate smoking during the 2-year study period, smoking progression was limited, which likely constrained effect sizes. Further research is necessary to determine whether the three-step pathway of campaign effectiveness tested here applies equally to different subgroups within the population of 15–21-year-olds.

This study adds to the existing literature demonstrating the pathways through which a mass media campaign can prevent tobacco use. Findings suggest that engaging this generation in a cause-based social movement for promoting health can be a powerful strategy to drive positive behavior change and prevent future morbidity and mortality. Evidence also underscores the need for campaigns to employ message themes that are relevant to the target audience. Such attention to the values and culture of a target audience is a key to harness their influence to make tobacco a thing of the past.

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Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2018.04.008>.

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