

RESEARCH PAPER

The impact of anti-tobacco industry prevention messages in tobacco producing regions: evidence from the US truth[®] campaign

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Background: Adolescents who live in tobacco producing regions may not respond favourably to anti-industry ads.

Objective: To examine whether state level involvement in tobacco production appears to limit the effectiveness of anti-industry ads to prevent tobacco use among adolescents in the USA.

Design: Time trend analyses were done using repeated cross sectional data from six waves of the Legacy Media Tracking Survey, which were collected between 1999 and 2003.

Setting and participants: 28 307 adolescents, ages 12–17 years, were classified as living in: tobacco producing states (TPS) (n = 1929); non-tobacco producing states (non-TPS) with low tobacco control funding comparable to TPS (n = 5323); non-TPS with relatively high funding (n = 15 076); and non-TPS with established anti-industry ad campaigns (n = 5979).

Main outcome measures: Reactions to anti-industry ads; strength of anti-industry attitudes/beliefs; changes in anti-industry attitudes/beliefs over time.

Results: Ad reactions did not differ by state type. Multivariate adjusted time trend analyses indicated significant, comparable increases in anti-industry attitudes/beliefs since the onset of the truth[®] campaign, in both TPS and non-TPS. Mediation analyses indicated that these increases were due, in part, to campaign exposure.

Conclusions: Adolescents who live in tobacco producing regions appear to be as responsive to anti-industry ads as their counterparts in non-tobacco producing regions. This study provides further evidence for the effectiveness of such ads.

Current research suggests that anti-industry advertising, which focuses on the deceitful marketing practices of the tobacco industry, reduces smoking among adolescents.^{1–4} However, in regions where the tobacco industry and tobacco production have played an important economic and social role, adolescents may be less receptive to anti-industry ads. Evaluating this possibility will help determine whether other kinds of messages are needed in regions tied to the tobacco industry.

A number of studies suggest that anti-industry ads increase anti-industry attitudes and, in turn, reduce smoking among youth. Media campaigns with anti-industry components appear to have contributed to declines in youth smoking in California^{5–7} and Massachusetts.⁸ Florida's "truth" campaign provides more direct evidence for the effectiveness of anti-industry ads, since ad exposure was associated with stronger anti-industry attitudes, which, in turn, were associated with lower rates of youth smoking.^{1 4 9–11} Stronger anti-industry attitudes are also associated with exposure to the national truth[®] campaign in the USA.² However, no studies have examined whether youths' responses to anti-industry ads differ if they live in areas involved in tobacco production.

In the USA, the prevalence of tobacco use among adolescents who live in major tobacco producing states (TPS) is generally higher than among youth in other regions.^{12–14} Because youth smoking rates are responsive to cigarette price,¹⁵ these higher rates of tobacco use may be partly due to lower state taxes in TPS (mean tax \$0.08/pack) than in non-TPS (mean tax \$0.78/pack).¹⁶ Given that increases in state level tobacco control reduce tobacco use,¹⁷ the low tobacco control funding in TPS may also contribute to

higher youth smoking rates. Although the tobacco industry has influenced tobacco control policies and spending in TPS, the relationship between the tobacco industry and TPS residents may account for more proximal determinants of youth smoking, as well. Studies within TPS indicate that adolescents have more favourable attitudes toward smoking and are more likely to smoke if they live in areas where tobacco production is high, if they live in a tobacco producing household, or if their parents work for the tobacco industry.^{18–22} Activist youth who live in TPS identify the economic dependence of their state on tobacco as a primary barrier to mobilising other youth to promote tobacco control efforts.²³ Moreover, focus groups with adolescents in TPS indicate that anti-industry ads do not test as well as messages that address the health consequences of smoking.^{24 25} Hence, anti-industry ads may not be effective among youth in TPS.

There are a number of reasons why most youth who live in TPS may respond no differently to anti-industry ads than their counterparts in non-TPS. The number of people involved in tobacco production in TPS has declined.²⁶ As a result, there are likely to be fewer people who would respond negatively to anti-industry ads because of their ties to the tobacco industry. Even people involved in tobacco cultivation are beginning to have ambiguous feelings about the tobacco industry because, increasingly, the industry buys cheaper tobacco from developing countries.^{27 28} In support of the diminished status of the tobacco industry in TPS, a recent poll found that most North Carolinians do not view tobacco as having a special place in the state's economy and culture.²⁹

Abbreviations: LMTS, Legacy Media Tracking Surveys; TPS, tobacco producing states

Nevertheless, state legislators claim that supporting tobacco control policy, including anti-industry ads, would be political suicide.^{29–30} Such claims should be met with data to help resolve the otherwise contradictory evidence around the receptivity of TPS youth to anti-industry ads.

Given the conflicting evidence cited above, we tested a series of non-directional hypotheses around potential differences in the effectiveness of anti-industry ads in TPS and non-TPS. First, we predicted that adolescents living in TPS and in other states would differ neither in their reactions to anti-industry ads nor in the strength of their anti-industry attitudes and beliefs. Second, we predicted no differences in time trends for anti-industry attitudes and beliefs across TPS and non-TPS. Third, we predicted that time trends in anti-industry attitudes and beliefs across TPS and non-TPS would be mediated, in part, by recent exposure to anti-industry ads.

METHODS

Data source and analytic sample

The data for this study come from the Legacy Media Tracking Surveys (LMTS), a telephone based, nationally representative sample of 12–24 year old US youth.² The analytic sample for this study consists of 28 307 adolescents, ages 12–17 years, who participated in the first six waves of the LMTS, which were collected between December 1999 and January 2003. No respondent provided more than one observation. Based on a standard calculation,³¹ the response rates ranged from 48–60% across waves.

Measures

State level tobacco production

Data on state level tobacco production were drawn from Department of Agriculture figures for 1997.³² Observations from Georgia, North Carolina, South Carolina, Tennessee, Virginia, and Kentucky (GA, NC, SC, TN, VA, KY) were classified as from TPS because these six states comprise the vast majority of earnings from agricultural involvement in US tobacco production (94%).

State level tobacco control funding

State level per capita funding for tobacco control was estimated for federal, state, and non-governmental sources for each year from 1999 until 2002. Details on the specific methods used to create this measure are described elsewhere.^{14 33 34} State specific means for per capita annual tobacco control funding were determined for 1999–2002. Next, observations from California, Florida, and Massachusetts were grouped together (CA/FL/MA) because these states had already initiated well funded anti-industry ad campaigns before the truth[®] campaign's launch.^{5 6 8 9 11} Remaining observations were classified into one of three groups: TPS; non-TPS with low tobacco control funding; and non-TPS with relatively high tobacco control funding. Given the low mean level of per capita tobacco control funding for TPS (mean US\$0.84; range \$0.26–1.81), a non-TPS group with comparable per capita tobacco control funding was created (mean \$0.94; range \$0.32–1.79). Remaining observations from non-TPS were classified into the "high" tobacco control funding group (table 1).

Anti-industry attitude/beliefs scale

Items measuring anti-tobacco industry attitudes and beliefs have good psychometric properties,³⁵ had moderate inter-item reliability in our sample ($\alpha = 0.68$), and were averaged into scale scores.

Confirmed awareness of truth[®] ads

Participants' awareness of specific truth[®] advertisements aired in the six week period before the interview was

measured using methods to reduce bias (see Farrelly *et al*²). Participants were asked about 4–18 ads, depending on the number recently aired. Participants with confirmed awareness of any truth[®] ad were given a value of 1. This dichotomous proxy for exposure was used because of the large range of ads across different interview time points; the absence of questions on the frequency of exposure for estimating multiple exposure to a single ad; and the highly skewed nature of the variable. None of the participants who responded to the baseline survey were asked about ads, and all were assigned a value of 0 for this variable.

Time trend variable

Given that the truth[®] campaign uses mass media, is national in scope, and confirmed awareness of truth[®] does not reflect exposure more than six weeks before the interview, a time trend variable was constructed to evaluate population level changes in anti-industry attitudes and beliefs over time. Because data collection for particular survey waves lasted up to five months, each participant was assigned a value that corresponded to the number of months that had elapsed from the onset of the campaign to the date of the interview. Observations from the pre-campaign baseline survey were given a value of 0.

Reactions to truth[®] ads

Participants with confirmed awareness of a truth[®] ad were asked for their reactions to the ad, specifically whether the ad was convincing (five point Likert scale), grabbed their attention (yes/don't know/no), and whether it gave them good reasons not to smoke (yes/don't know/no). Each variable was scaled from 0 to 1, and, if a participant was exposed to more than one ad, the values were averaged across the number of ads seen. Inter-item reliability for these items was adequate ($\alpha = 0.68$), so item scores were summed to form a scale.

Smoking

Data on current smoking (smoked in last 30 days) and established smoking (smoked > 100 cigarettes in lifetime and smoked on 20 days or more of last 30 days) were gathered with validated items that have been used to measure smoking in other studies of adolescent populations.^{36–39}

Control variables

Control variables included sociodemographics (that is, age, sex, race/ethnicity), familial influences on smoking (that is, presence of both parents at home, presence of a smoker at home, existence of rules about smoking at home), other social risk factors for smoking (that is, church attendance, employment, weekly earnings), and media use (that is, the number of hours of TV watched a week).

Analysis

All analyses were done using STATA, version 8.0. Confirmatory factor analysis and Cronbach's α were used to determine the dimensionality and reliability of scale items. All other results were adjusted for sampling weights and accounted for the survey design. Tests of the mean differences across groups were done using analysis of variance (ANOVA) and the differences in proportions were tested using Pearson's χ^2 . To adjust for inflated error rates associated with multiple tests, pairwise comparisons across groups used the Bonferroni procedure.⁴⁰ Linear regression was used to estimate the bivariate and adjusted multivariate associations between the anti-industry attitudes/beliefs scale and months since the onset of the campaign. Next, confirmed exposure to truth[®] was entered into the multivariate linear

Table 1 State groupings and selected tobacco related characteristics*

Demographic and tobacco related characteristics	Tobacco producing states† (n = 1929)	Non-tobacco producing states			All states (n = 28307)
		Low funding‡ (n = 5323)	High funding§ (n = 15076)	CA/FL/MA¶ (n = 5979)	
Age	14.36 (0.07)	14.50 (0.04)	14.48 (0.04)	14.45 (0.05)	14.46 (0.02)
Male	53% (2.1%)	53% (1.2%)	49% (1.3%)	51% (1.4%)	51% (0.7%)
Race/ethnicity					
White‡‡ ¶¶ ***	67% (2.0%)	67% (1.2%)	71% (1.1%)	52% (1.4%)	65% (0.7%)
Black** †† ‡‡ §§ ¶¶	26% (1.9%)	14% (1.0%)	10% (0.7%)	10% (0.8%)	13% (0.5%)
Hispanic** †† ‡‡ §§ ¶¶ ***	2% (0.4%)	14% (0.7%)	10% (0.9%)	27% (1.3%)	14% (0.5%)
Other†† ‡‡ §§ ¶¶	4% (0.6%)	5% (0.6%)	8% (0.7%)	11% (0.9%)	7% (0.4%)
Lives with both parents**	66% (2.1%)	73% (1.1%)	72% (1.2%)	71% (1.3%)	71% (0.7%)
Attends church often** †† ‡‡ ¶¶ ***	59% (2.0%)	48% (1.3%)	45% (1.2%)	39% (1.4%)	46% (0.7%)
Employed¶¶	24% (1.9%)	26% (1.2%)	28% (1.1%)	20% (1.2%)	25% (0.7%)
Weekly earnings	\$80.27 (\$10.84)	\$81.87 (\$6.69)	\$69.95 (\$4.39)	\$77.63 (\$7.72)	\$76.55 (\$3.35)
Hours of TV/day†† §§	3.45 (0.13)	3.36 (0.08)	3.06 (0.06)	3.20 (0.08)	3.23 (0.04)
Smoker in household‡‡ ¶¶ ***	36% (2.0%)	38% (1.3%)	34% (1.2%)	28% (1.3%)	34% (0.7%)
Rules about smoking at home‡‡ §§ ¶¶	70% (1.9%)	71% (1.2%)	75% (1.1%)	79% (1.1%)	74% (0.6%)
Current smoker§§ ¶¶ (smoked on ≥ 1 day in last month)	11% (1.3%)	13% (1.1%)	10% (0.7%)	8% (0.8%)	11% (0.5%)
Established smoker (smoked cigs ≥ 20 days in last month and > 100 lifetime cigs)	5% (1.0%)	4% (0.6%)	4% (0.4%)	3% (0.5%)	4% (0.3%)
Mean state level tobacco control funding, per capita, 1999–2002 (range)	\$0.31 (\$0.26–\$1.81)	\$0.35 (\$0.32–\$1.79)	\$2.24 (\$1.82–\$8.62)	\$7.21 (\$2.43–\$9.50)	\$1.82 (\$0.26–\$9.50)

*Table lists survey adjusted means, percentages, and standard errors using data collapsed across all waves. Threshold for significance uses the Bonferroni correction.

†Tobacco producing states: GA, KY, NC, SC, TN, VA.

‡Low funding: AL, CT, DC, ID, IN, KS, LA, MI, MO, NV, OH, OK, PA, TX.

§High funding: AK, AR, AZ, CO, DE, HI, IL, IA, MD, ME, MN, MS, MT, ND, NE, NH, NJ, NM, NY, OR, RI, SD, UT, VT, WA, WI, WV, WY.

¶CA, FL, MA in separate group because they had anti-industry campaigns before the onset of truth®

**TPS v non-TPS, low different at p<(0.05)/6=0.008.

††TPS v non-TPS, high different at p<0.008.

‡‡TPS v CA/FL/MA different at p<0.008.

§§Non-TPS, low v non-TPS, high different at p<0.008.

¶¶Non-TPS, low v CA/FL/MA different at p<0.008.

***Non-TPS, high v CA/FL/MA different at p<0.008.

regression models in order to assess both its direct influence on anti-industry attitudes/beliefs and the extent to which it appeared to mediate the relationship between the time variable and the scale. To test differences in time trend coefficients across groups, the Chow test technique was used.^{41 42} This technique enables simultaneous estimation of separate models for each group being compared. Mathematically, the Chow test is equivalent to testing interactions, with two distinct advantages: (1) it avoids colinearity issues that apply when interacting multiple terms with the same variable; and (2) coefficients for adjustment variables, as well as for the independent variables of interest, are freely estimated for each group; hence, one does not need to assume, as in tests of interaction, that the coefficients are the same across the adjustment variables for all comparison groups.

RESULTS

Sociodemographics, smoking risk factors, anti-tobacco industry attitudes and beliefs, truth® exposure, and reactions to truth®

Table 1 shows the sociodemographic characteristics of participants in each of the four state groups, with data collapsed across all waves. There were no significant differences between TPS youth and others with regard to age, sex, weekly earnings, employment, and smoking behaviour. However, there were significant differences across the groups by race/ethnic composition, living with both parents, church attendance, and daily hours of television watching.

Table 2 shows the means for the anti-industry attitudes/beliefs scale in the TPS and non-TPS groups, both before and after the launch of the campaign. For both time periods, mean scores for the TPS group were not significantly different from the means scores for the non-TPS group with

comparably low levels of tobacco control funding. After the start of the campaign, these two groups had significantly weaker anti-industry attitudes/beliefs than both the high funded TPS group and the CA/FL/MA group. Confirmed awareness of at least one truth® ad was significantly lower in TPS than in CA/FL/MA, but no other group differences were found. Finally, reactions to truth® ads did not differ across TPS and non-TPS groups.

Time trends in industry attitude/beliefs across groups

Table 3 shows the results from a series of models used to determine the relation between truth® exposure and changes in scores on the anti-industry attitude/beliefs scale. First, for each group, we determined the bivariate correlations between the anti-industry scale and the number of months from baseline until the date of data collection for the interview. Positive, significant correlations were found within all groups except in the CA/FL/MA group. Second, to test for the possibility of diminishing campaign effects on anti-industry attitudes and beliefs over time (that is, non-linearity), we ran simple regression models for each group that included both months and months² as independent variables. The months² variable was not significant, either in any subgroup or in the entire sample. Third, multivariate models (that is, table 3, model 1) were run for each group while controlling for potential confounding variables. The relation between scores on the anti-industry scale and months remained significant in all groups but CA/FL/MA, indicating the independence of this positive time trend for anti-industry attitudes/beliefs. For each of these models, we generated predicted values for the time trend regression line (fig 1). We also used the Chow method to test differences in the time trend coefficients across groups. A marginal significant difference was found when comparing the stronger coefficient for the low funded tobacco control states with the coefficient for CA/FL/MA

Table 2 Baseline and post-baseline anti-industry attitudes & beliefs, confirmed awareness of truth[®] ads, and truth[®] ad reactions across tobacco producing states (TPS) and non-tobacco producing states (non-TPS)

State groups	Baseline*	Post-baseline*		
	Anti-industry attitudes/ beliefs (1–5 point range) Mean (SE)§ ††	Anti-industry attitudes/ beliefs (1–5 point range) Mean (SE)‡ § ¶ ††	Confirmed awareness of truth [®] ads % (SE)§	Reactions to truth [®] ads** (1–3 point range) Mean (SE)
TPS (n ₁ = 381; n ₂ = 1 548)	3.86 (0.06)	3.98 (0.04)	57.8% (2.4%)	2.60 (0.05)
Non-TPS, low (n ₁ = 589; n ₂ = 4,734)	3.89 (0.05)	4.06 (0.02)	61.3% (1.4%)	2.63 (0.03)
Non-TPS, high (n ₁ = 1,792; n ₂ = 13,284)	4.02 (0.03)	4.16 (0.02)	63.4% (1.4%)	2.58 (0.03)
CA, FL, MA (n ₁ = 676; n ₂ = 5306)	4.14 (0.04)	4.22 (0.02)	66.4% (1.4%)	2.62 (0.02)
All states (n ₁ = 3438; n ₂ = 24869)	3.99 (0.02)	4.12 (0.01)	62.6% (0.8%)	2.61 (0.01)

n₁, baseline sample size; n₂, post-baseline sample size.

*Baseline results use the pre-campaign survey; post-baseline results collapse data from the five subsequent waves after campaign launch.

**Data on reactions to truth[®] ads are from the subpopulation with confirmed awareness of at least one truth[®] ad.

Threshold for significance uses Bonferroni correction.

†TPS v non-TPS, low different at $p < (0.05)/6 = 0.008$.

‡TPS v non-TPS, high different at $p < 0.008$.

§TPS v CA/FL/MA different at $p < 0.008$.

¶Non-TPS, low v non-TPS, high different at $p < 0.008$.

††Non-TPS, low v CA/FL/MA different at $p < 0.008$.

‡‡non-TPS, high v CA/FL/MA different at $p < 0.008$.

($p = 0.03$). Finally, we ran a series of multivariate models (table 3, model 2) that included the months variable, potential confounding variables, and the variable measuring confirmed exposure to truth[®]. In models for each group, the point estimates for the association between months and the anti-industry scale decreased, indicating at least partial mediation of the time trend by confirmed truth[®] exposure. This point estimate became non-significant in the TPS group ($p = 0.351$). The relation between confirmed exposure to truth[®] and the anti-industry scale was significant within both low and high funded non-TPS ($p = 0.001$ and 0.010 , respectively), and this relation was marginally significant in the model for TPS ($p = 0.05$).

DISCUSSION

This study suggests that adolescents who live in tobacco producing regions respond to anti-industry ads in ways that are comparable to their counterparts in other regions. Anti-industry attitudes and beliefs were not significantly lower in TPS than in other states with comparable tobacco control funding, either at baseline or after the launch of the campaign. Moreover, youths' reactions to truth[®] ads did not differ across the state groups and increases in anti-industry attitudes and beliefs over time were relatively consistent across TPS and non-TPS. In all states but California, Florida, and Massachusetts (CA/FL/MA), the strength of the time trend coefficient diminished after controlling for confirmed truth[®] exposure, thereby suggesting that at least some of this trend is due to anti-industry ads. These findings do not imply, however, that states and localities should rely only on national media campaigns in lieu of funding tobacco control programs. Indeed, almost all states funded tobacco control at levels that were well below the \$5.98–\$15.85 per capita recommended by the Centers for Disease Control.¹⁴

Results from CA/FL/MA are consistent with previous findings.³ Although the time trend coefficient for this group

was significantly different only from the low funded non-TPS group, other results indicated that CA/FL/MA was the only group with no significant increase in anti-industry attitudes and beliefs over time. These states initiated anti-industry ad campaigns before our baseline data were collected, and youth from CA/FL/MA generally had stronger anti-industry

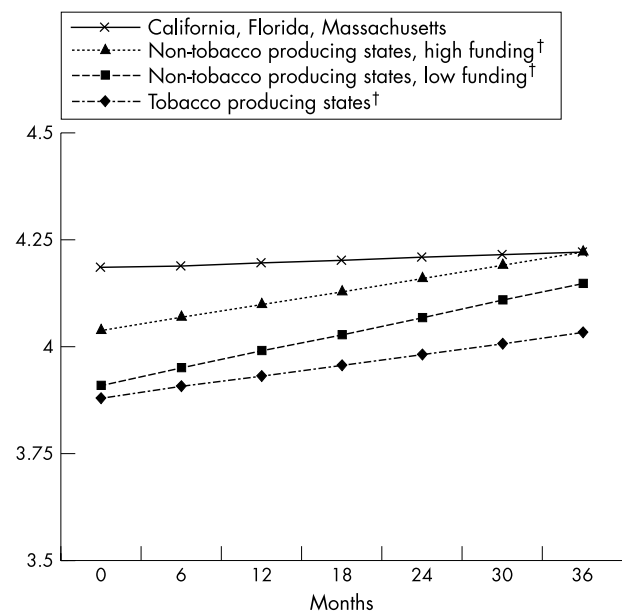


Figure 1 Predicted values for time trends in anti-industry attitudes, adjusting for age, sex, presence of both parents at home, presence of smoker at home, existence of smoking rules at home, number of hours of TV watched a week, church attendance, employment, and weekly earnings. †Time trend significant (TPS $p = 0.044$; non-TPS low $p < 0.000$; non-TPS high $p < 0.000$).

Table 3 Bivariate and adjusted coefficients for the relationship between time since campaign onset and anti-industry attitudes/beliefs across tobacco producing states (TPS) and non-tobacco producing states (non-TPS)

State groups	Coefficients of association between anti-industry attitudes/beliefs and months from baseline to interview			
	Bivariate <i>r</i> (SE)	Model 1*	Model 2†	Confirmed awareness of truth® ad <i>b</i> _{adj} (SE)
		Months <i>b</i> _{adj} (SE)	Months <i>b</i> _{adj} (SE)	
TPS	0.005 (0.002)	0.004 (0.002)	0.002 (0.002)	0.128 (0.067)
p Value	0.020	0.044	0.351	0.054
Non-TPS, low fund	0.007 (0.001)	0.007 (0.001)	0.005 (0.002)	0.112 (0.038)
p Value	0.000	0.000	0.001	0.003
Non-TPS, high fund	0.004 (0.001)	0.005 (0.001)	0.003 (0.001)	0.119 (0.032)
p Value	0.001	0.000	0.010	0.000
CA/FL/MA	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.037 (0.029)
p Value	0.378	0.480	0.769	0.208
Total sample	0.005 (0.001)	0.005 (0.001)	0.003 (0.001)	0.104 (0.020)
p Value	0.000	0.000	0.000	0.000

*Model 1 adjusts for age, sex, presence of both parents at home, presence of smoker at home, existence of smoking rules at home, number of hours of TV watched a week, church attendance, employment, and weekly earnings. Chow tests of the difference in time trends across groups indicated a marginally significant difference between the CA/FL/MA group and the non-TPS, low funding group ($p=0.03$)

†Model 2 includes confirmed awareness of a truth® ad, as well as the time trend variable (that is, months) and the above control variables.

attitudes than other groups. These results suggest that anti-industry ad campaigns may have diminishing returns over time. Even though our tests indicated no non-linearity in the time variable, there may be a need to trace out campaign effects for longer than the time period under consideration here. If the strong anti-industry attitudes among CA/FL/MA youth at baseline indicate little room for further anti-industry ad effects, then other prevention strategies may be needed to assure the continued decline in youth smoking. On the other hand, the national truth® campaign in CA/FL/MA may have had larger effects on smoking behaviour than on anti-industry attitudes because earlier, state sponsored campaigns had already shifted norms and primed youth for engaging in non-smoking behaviour. Future studies on data from CA/FL/MA should determine the longer term, downstream effects of truth® on smoking behaviour.

This study provides indirect evidence supporting use of anti-industry ads in tobacco prevention campaigns; however, there is a need to determine whether these ads are stronger than ads that address other beliefs and values related to smoking. There may be other cognitive domains that are more strongly associated with smoking behaviour, and these messages may be more politically viable to support. Future studies should compare the magnitude of association between smoking behaviour and ads that contain a range of content. As indicated above, research should explore whether anti-industry ads produce continued reductions in youth smoking, or whether message content and strategies must be changed to meet the needs of adolescents. Finally, it is critical to determine which, if any, factors related to message content and delivery differ by country, social group, or cultural group. Such studies will help tobacco control professionals share prevention materials and, hence, reduce campaign costs.⁴³

When these results are considered with other studies showing the effectiveness of anti-industry ads in preventing tobacco use among US youth, as well as evidence supporting the broad appeal of these ads across racial, ethnic, and sex groups,⁴⁴ results from this study suggest that other countries should consider using and evaluating anti-industry ads in their tobacco control campaigns. Anti-industry ads may be particularly powerful when they call attention to the tobacco

industry's increased focus on markets in low and middle income countries. The current study suggests that countries with ties to the tobacco industry should not be too quick to dismiss the efficacy of this kind of ad. Indeed, ambivalent or negative feelings about the tobacco industry may abound in tobacco producing regions outside the USA, perhaps augmenting receptivity to anti-industry ads.

The results reported here have some limitations. First, the repeated cross sectional design of the survey precludes determination of causality. Because of this study design, we focused on potential differences in the time trends for truth® targeted industry attitudes and beliefs rather than emphasizing the relation between campaign exposure and these changes. This strategy was undertaken partly because the measure of exposure was self reported and may have been susceptible to response bias despite precautions taken to avoid this problem. Perhaps more importantly, this measure did not account for exposure more than six weeks before the interview, and earlier exposures may have accounted for changes in industry attitudes and beliefs. Moreover, the national scope of this mass media campaign may indirectly influence youth, as their cohort is exposed to campaign messages, thereby shifting social norms and the salience of beliefs about the tobacco industry. Given these possibilities, our focus on time trends provides an upper bound on campaign effects. At the same time, we recognise the possibility that anti-industry attitudes and beliefs may be influenced by secular trends, perhaps spurred by negative coverage of the tobacco industry in the national media.

Another potential study limitation concerns the number of observations in our analytic sample and whether this sample is overpowered for determining meaningful differences across population subgroups. For example, the increases in anti-industry attitudes/beliefs over time appear relatively small. However, these are nationally representative data on population level changes for a relatively strong risk factor for smoking. Following Rose,⁴⁵⁻⁴⁶ we suggest that relatively small population level changes in risk factors can translate into large payoffs in terms of reducing morbidity and mortality.

Finally, the present study does not assess the impact of truth® on behavioural outcomes. Teasing out the relative influence of exposure and secular trends on smoking behaviour deserves a fuller treatment than we could achieve

What this paper ads

Adolescent tobacco prevention campaigns in the USA have increasingly used anti-industry ads that focus on the deceitful practices of the tobacco industry. Existing evidence suggests that adolescents who live in regions historically tied to tobacco cultivation and production may not be receptive to this kind of tobacco prevention message.

Our results suggest that adolescents who live in tobacco producing regions are as responsive to anti-industry ads as their counterparts in non-tobacco producing regions.

here. Although evidence from laboratory studies and focus groups have drawn mixed conclusions about the effectiveness of anti-industry ads, these studies measure only short term behavioural outcomes and immediate ad reactions rather than longer term changes in attitudes and behaviour.⁷⁻⁴⁷ Evidence from the Florida "truth" campaign suggests that anti-industry ad campaigns reduce youth smoking behaviour by influencing industry attitudes.⁴ In addition, preliminary evidence suggests that truth[®] has contributed to nationwide reductions in youth smoking rates.⁴⁸

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