

# Televised State-Sponsored Antitobacco Advertising and Youth Smoking Beliefs and Behavior in the United States, 1999-2000

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**Background:** Recent state budget crises have dramatically reduced funding for state-sponsored antitobacco media campaigns. If campaigns are associated with reduced smoking, such cuts could result in long-term increases in state health care costs.

**Methods:** Commercial ratings data on mean audience exposure to antitobacco advertising that appeared on network and cable television across the largest 75 media markets in the United States for 1999 through 2000 were combined with nationally representative survey data from school-based samples of youth in the contiguous 48 states. Multivariate regression models were used to analyze associations between mean exposure to state antitobacco advertising and youth smoking-related beliefs and behaviors, controlling for individual and environmental factors usually associated with youth smoking and other televised tobacco-related advertising.

**Results:** Mean exposure to at least 1 state-sponsored an-

titobacco advertisement in the past 4 months was associated with lower perceived rates of friends' smoking (odds ratio [OR], 0.72; 95% confidence interval [CI], 0.58-0.88), greater perceived harm of smoking (OR, 1.25; 95% CI, 1.11-1.42), stronger intentions not to smoke in the future (OR, 1.43; 95% CI, 1.17-1.74), and lower odds of being a smoker (OR, 0.74; 95% CI, 0.63-0.88).

**Conclusions:** To our knowledge, this study is the first to explore the potential impact of state-sponsored antitobacco media campaigns while controlling for other tobacco-related advertising and other tobacco control policies. State-sponsored antitobacco advertising is associated with desired outcomes of greater antitobacco sentiment and reduced smoking among youth. Recent cuts in these campaigns may have future negative health and budgetary consequences.

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SINCE THE EARLY 1990S, THE US population has been exposed to a growing number and variety of televised antitobacco advertisements.<sup>1</sup> By 2002, 35 states had launched antitobacco media campaigns. The largest and longest running media campaigns, such as those in California and Massachusetts, were funded by cigarette excise taxes. Many of the campaigns launched since 1998 have relied heavily on funds from the Master Settlement Agreement. In the wake of recent state budget crises and other political forces, many state antitobacco campaigns have been severely cut or, as in Massachusetts, eliminated.<sup>2</sup> If state-sponsored campaigns have been successful in reducing smoking behavior, the short-term savings created by budget cuts could arguably result in long-term costs because

of renewed increases in smoking and consequent smoking-related disease. In an era of scarcity in state budgets, it is important to understand whether state media campaigns influence smoking behavior.

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Although early evidence suggested that state-sponsored antitobacco media campaigns may reduce adult smoking,<sup>3-7</sup> few studies have explored their impact on youth. Such studies have been limited to single-state campaigns and are therefore difficult to generalize.<sup>8-10</sup> They also have been unable to take into account other state-level tobacco control policies that may influence youth smoking.<sup>8-10</sup>

In addition to state-sponsored advertising, other televised advertising related to tobacco use has proliferated in recent years. The tobacco industry and the American Legacy Foundation (Washington, DC) have launched national antitobacco television campaigns. Advertisements for pharmaceutical smoking cessation aids, such as nicotine replacement therapy and Zyban (bupropion hydrochloride; GlaxoSmithKline, Research Triangle Park, NC), also warrant consideration as tobacco-related media. Although pharmaceutical advertisements may be designed to encourage uptake of quitting products among adult smokers, some have hypothesized that such advertisements could actually encourage smoking among adolescents by inadvertently conveying the message that quitting can be easy if such products are used.<sup>11</sup>

Aside from 1 recently published study,<sup>12</sup> relatively little is known about the impact of the various types of national tobacco-related television ads on youth smoking beliefs and behavior. No research has yet explored the potential impact of state-sponsored antitobacco media campaigns in the context of other tobacco-related advertising to which youth may be exposed. This article examines the relationships between American youths' tobacco-related beliefs, attitudes, and behaviors and their exposure to state antitobacco advertising while controlling for tobacco industry-sponsored antitobacco ads and advertisements for pharmaceutical smoking cessation aids. By using a unique archival national media data set that quantifies mean exposure to televised advertisements in different communities in combination with nationally representative surveys of youth, we assessed the impact of state antitobacco advertisements while controlling for other types of antitobacco advertising and individual and environmental factors that influence youth smoking.

## METHODS

### SAMPLE SELECTION AND DATA COLLECTION

Commercial ratings data purchased from Nielsen Media Research (New York, NY) provided information on mean audience exposure to all antitobacco advertising that appeared on any of the Nielsen Monitor-Plus monitored network and cable television distributors nationally and for local spot, clearance, and syndication television across the largest 75 media markets (called *designated market areas*) in the United States for the years 1999 through 2000. These 75 markets accounted for 78% of American viewing households.<sup>13</sup> Ratings for each commercial occurrence were aggregated by market, month, year, and sponsor. We identified the following campaigns: state tobacco control, American Legacy Foundation, tobacco parent (sponsored by Philip Morris, Richmond, Va), tobacco youth (sponsored by Philip Morris and Lorillard, Greensboro, NC), pharmaceutical (including advertising for nicotine replacement therapy and Zyban products), and "other" antitobacco advertisements. We were unable to include data for the American Legacy Foundation advertisements in analyses presented in this article because the campaign was launched in February 2000, resulting in insufficient months of data available for linkage to the youth smoking survey data. Details of the methodology used for obtaining and aggregating the Nielsen data are reported elsewhere.<sup>14</sup>

Nielsen data are based on individual ratings of television programs obtained by monitoring household audiences across media markets. Ratings provide an estimate of the percentage of households with televisions watching a program or advertisement in a media market over a specified time interval. To assess the ratings of an advertisement among the US teen audience, this study used targeted ratings points (TRPs), which estimate the reach and frequency of advertising to 12- through 17-year-olds. For example, an ad with 80 TRPs per month is estimated to have been seen an average of 1 time by 80% of the 12- through 17-year-olds in that media market over a 1-month period. Because these are media market averages, any individual teens may have higher or lower exposure based on their own television viewing behavior.

### INDIVIDUAL STUDENT DATA

Data on individual student characteristics, smoking-related attitudes and beliefs, and self-reported tobacco use from 1999 and 2000 were obtained from the Monitoring the Future (MTF) study (Ann Arbor, Mich). Details on sampling procedures and response rates are available elsewhere.<sup>15</sup> Data were collected from February to June each year from separate and nonoverlapping school samples of 8th, 10th, and 12th grade classes, drawn to be representative of all students in the specified grade for the 48 contiguous states. All surveys were self-completed in group-administered school settings.

### STATE TOBACCO CONTROL POLICY DATA

Data on the average real price per pack of cigarettes by state and year were calculated using data from *The Tax Burden on Tobacco*<sup>16</sup> and the US Bureau of Labor Statistics (Washington, DC) Consumer Price Index. A smoke-free air (SFA) index that measures the strictness of state SFA laws was constructed with data from tobacco control researchers at the Roswell Park Cancer Institute (Buffalo, NY) and the MayaTech Corporation (Silver Spring, Md). The SFA index included scores for the strength of protection for the following locations: schools (public and private), recreational facilities, cultural facilities, shopping malls, private work sites, public transit, restaurants, and health care facilities; points were subtracted for state SFA preemption laws. The SFA index values ranged between -22.5 and 51.0, depending on the number, type, and level of protection for smoke-free locations and whether the state had the authority to preempt local SFA regulations.<sup>17</sup>

### MEASURES AND ANALYSIS

The Nielsen ratings data and state tobacco control policy data were merged with the 1999 and 2000 MTF student-level data by year, using state and county Federal Information Processing Standards codes.<sup>18</sup> The resulting file contained 65 891 cases (25 800 eighth graders, 20 164 tenth graders, and 19 927 twelfth graders) with measures of TRPs for each student for each year and month, based on the media market in which that student lived, and tobacco control policy variables for each student based on the state of residence.

### DEPENDENT VARIABLES

Separate models were analyzed for each of the following student self-reported dependent variables:

1. Recall: 1 meant the respondent had been seeing antitobacco commercials on television or hearing them on the radio at least once a week in recent months.

2. Perceived smoking prevalence among friends: 1 meant that most or all of the respondent's friends smoked.

3. Perceived school-level smoking prevalence: 1 indicated that more than 70% of students in the respondent's school smoked regularly.

4. Perceived harm of smoking: 1 indicated that the respondent believed people risk "great harm" to themselves by smoking 1 or more packs of cigarettes per day.

5. Perceived risk of addiction: 1 was assigned if the respondent felt neutral or some level of agreement with the statement, "I will never get addicted to cigarettes."

6. Five-year smoking intentions: 1 indicated that the respondent definitely would not be smoking cigarettes in 5 years.

7. Current smoking: 1 indicated any cigarette smoking in the past 30 days.

8. Consumption among current smokers, measured by a 6-point scale: 0.5 (<1 cigarette/d), 3.0 (1-5 cigarettes/d), 10 (about one-half pack/d), 20 (about 1 pack/d), 30 (about 1½ packs/d), and 40 (>2 packs/d). The natural log of this scale was used in all models.

## INDEPENDENT VARIABLES

Monthly totals of TRPs were aggregated to form 4-month depreciated-sum measures for each ad sponsor based on the date of survey participation for each student. The depreciated sum accounts for the cumulative impact of repeated exposure to advertising over a 4-month period and gives greater weight to more recent exposures relative to previous exposures.<sup>19-21</sup> We calculated the respondents' mean exposure to tobacco-related advertising in the month they were surveyed for the MTF study as a function of the mean viewings for that month plus the sum of depreciated mean viewings from the 3 previous months using a Koyck transformation of the standard sales model.<sup>21</sup> Based on the work of Pollay and colleagues,<sup>1</sup> we specified a depreciation value of 0.3, as noted in the following equation:

$$Adstock_t = Ad_t + \lambda Ad_{(t-1)} + \lambda^2 Ad_{(t-2)} + \lambda^3 Ad_{(t-3)}$$

where  $Adstock_t$  is the total effective advertising,  $\lambda$  is set at the specified value of 0.3, and  $Ad$  indicates ad sponsor TRPs for the time periods  $t$ ,  $t-1$ ,  $t-2$ , and  $t-3$ . The depreciated sum was then divided by 100. The resulting value represents the mean number of times advertising from a particular sponsor was seen by 100% of the 12- through 17-year-olds in each designated market area over the 4 months preceding each specific school's date of MTF survey participation.

Our measures of mean exposure to pharmaceutical, tobacco parent, and tobacco youth advertisements had essentially normal distributions; however, the state TRP exposure measure had a significant positive skew in distribution. To assess how to accurately model the relationship between mean exposure to state antitobacco advertisements and our various outcomes, we first ran models using the continuous form of TRPs, noting where results (either odds ratios or coefficients) were significant. Then, based on the data distributions, we created categorical variables for each TRP measure, allowing us to examine whether the monotonic relationship suggested by significant results obtained from models using the continuous TRP measures could be confirmed. These analyses suggested that the relationship between the odds of recalling antismoking ads and our measure of state TRPs was approximately linear: each additional mean exposure to a state-sponsored advertisement was associated with a proportional increase in the odds of recalling antitobacco advertising. Analyses also suggested monotonic relationships for 5-year smoking intentions

and perceived harm. However, for the other 5 behavioral and attitudinal outcomes, our analyses suggested a nonlinear relationship with state-sponsored TRPs in the pattern of a threshold effect, where there were significant differences between 0 TRPs, less than 1 TRP, and 1 or more TRPs for state antitobacco ads. For ease of data presentation and discussion, for all outcomes other than recall, we present only models using the trichotomized version of state TRPs. Therefore, in each of our models of smoking-related beliefs and behaviors, we defined 2 dummy variables (reference group=0 TRPs): greater than 0 but less than 1 mean exposure, and 1 or more cumulative, depreciated mean exposures. For each of the other types of tobacco-related advertising sponsors, our initial analyses suggested a variety of possible relationships, including some non-ordinal relationships, between our measures of mean exposure and our set of 8 dependent variables. Because there was no robust pattern to the relationships between the other sponsors' TRPs and the dependent variables, and because the significance of odds ratios related to the state TRPs was not affected by manipulation of the other TRP measures (holding them continuous, using dummy variables, or using dichotomous or polytomous forms), we report the results of the state TRPs, simultaneously controlling for the other TRP measures in continuous form.

## CONTROL VARIABLES

All reported models included the following control variables known to predict individual youth smoking behavior: sex and race/ethnicity (using a dummy variable for white)<sup>21,22</sup>; grade (8th vs 10th/12th)<sup>15,23</sup>; average parental education as a proxy for socioeconomic status<sup>24</sup>; a dichotomous variable indicating whether the student lived with both parents<sup>25</sup>; grade point average<sup>26</sup>; a dichotomous variable indicating whether the student went out 3 or more evenings per week for fun and recreation<sup>27</sup>; a dichotomous variable indicating whether the student had skipped or cut school in the past month<sup>27</sup>; a dummy variable for the year 2000 to account for potential secular trends (including American Legacy Foundation advertising, which we were unable to model); dummy variables indicating region of the country (Northeast, Midwest, and West; South was the reference category); real student earned income adjusted for the 1982-1984 Consumer Price Index; the state average real price per pack of cigarettes (generics excluded) for the first 6 months of each year; and an index measuring the strictness of SFA laws in the state.<sup>28</sup> Because there are 8 separate models, we do not report the covariate relationships for each separate model. Interested readers are invited to contact the corresponding author for further information on control variable results.

## ANALYSES

Logistic regression models were run for all dichotomous outcomes, and ordinary least squares regression models were used for the models of cigarette consumption (using the natural log of the consumption scale). All analyses used Stata version 8 (Stata Corporation, College Station, Tex), adjusting for clustering by school and including weights to account for the unequal probability of sampling. Our analyses used survey commands in Stata for descriptive population estimates and multivariate regression models (SVYLOGISTIC for dichotomous outcomes; SVYREG for the models of cigarette consumption using the natural log of the consumption scale). We accounted for the complex multistage sample design by using sampling weights to adjust for differential selection probabilities and by using Taylor linearization-based variance estimators to adjust for clustering by school and to compute robust standard errors.

**Table 1. Descriptive Statistics\***

Variables (Range for Continuous Variables)	Proportion ± SE	Mean ± SE
Independent control variables (n = 51 085)†		
Middle school, grade 8	0.37 ± 0.023	
High school, grades 10 and 12	0.63 ± 0.023	
Male infants	0.47 ± 0.004	
White	0.67 ± 0.013	
Lives with both parents	0.75 ± 0.005	
Regularly out ≥3 nights per week	0.44 ± 0.005	
Skipped or cut school in the past month	0.20 ± 0.006	
Earned income, median \$/wk		1-15
Parental education (range, 1-6)‡		3.99 ± 0.006
Grade point average (range, 1-9)§		6.18 ± 0.034
Average real price/pack of cigarettes, \$ (range, 1.32-2.27)		1.79 ± 0.001
Surveyed in 1999	0.49 ± 0.024	
Surveyed in 2000	0.51 ± 0.024	
Northeast	0.22 ± 0.019	
Midwest	0.27 ± 0.022	
West	0.19 ± 0.019	
South	0.31 ± 0.022	
Independent variables: antismoking advertising TRPs (n = 51 085)		
State campaign TRPs (range, 0.00-11.42)		0.90 ± 0.085
State campaign TRP dummy value = 0.00	0.14 ± 0.016	
State campaign TRP dummy value >0, <1.00	0.65 ± 0.022	
State campaign TRP dummy value ≥1.00	0.21 ± 0.019	
Pharmaceutical TRPs (range, 2.09-10.55)		5.32 ± 0.067
Tobacco parent TRPs (range, 0.00-2.53)		0.79 ± 0.040
Tobacco youth TRPs (range, 1.61-14.51)		7.16 ± 0.112
Dependent variables¶		
Recall of antitobacco advertising, (1 = weekly or more; n = 14 180)	0.58 ± 0.006	
Perceived smoking prevalence among friends (1 = most or all; n = 35 153)	0.20 ± 0.006	
Perceived smoking prevalence in school (1 = 70% or greater; n = 13 435)	0.25 ± 0.007	
Risk of addiction (1 = neutral or do not believe will be addicted to cigarettes; n = 14 339)	0.63 ± 0.005	
Perceived harm in smoking (1 = great risk; n = 47 541)	0.69 ± 0.004	
Five-year smoking intentions (1 = definitely will not be smoking; n = 16 783)	0.59 ± 0.006	
Current smoking (1 = any smoking in past 30 days; n = 50 347)	0.23 ± 0.006	
Consumption frequency among current smokers (0.5, 3, 10, 20, 30, or 40 cigarettes per day; n = 11 614)		5.61 ± 0.128

Abbreviations: TRPs, targeted ratings points.

\*The average 1999-2000 student response rate was 85.5%.

†The total number of respondents is 51 085 because we retained only cases with valid data for all independent control variables, as well as at least 1 dependent variable. Not all items were asked of all students.

‡Parental education is a scaled value ranging from 1 to 6 and is a combined average of the mother's and father's highest levels of education, where 1 indicates grade school or less, 2, some high school; 3, high school completion; 4, some college; 5, college completion; and 6, graduate school.

§Grade point average is a 9-item scale where a mean of 6 indicates a B (1 = D or below, 2 = C-, 3 = C, 4 = C+, 5 = B-, 6 = B, 7 = B+, 8 = A-, and 9 = A).

¶We report TRP data at the student level and not at the designated-market-area level because students within the same designated market area may have different mean exposures based on their Monitoring the Future survey date.

||Possible numbers for dependent variables vary because not all items were asked of all students.

## RESULTS

### SAMPLE CHARACTERISTICS

After retaining only cases with no missing data on control variables and valid responses for at least 1 outcome, a total of 51 085 students remained in the analytical sample: 19 043 eighth graders, 16 131 tenth graders, and 15 911 twelfth graders. **Table 1** summarizes the characteristics of these students.

Our measures of mean exposure clearly indicate that pharmaceutical and tobacco industry advertising dominated televised antitobacco messages (see Table 1). Across the 2 years of data in our sample, the national average of 4-month cumulative, depreciated viewings of advertise-

ments was 5.32 for pharmaceutical cessation aids; 7.16 for tobacco company youth ads; and 0.79 for tobacco company parent-targeted advertisements—compared with 0.90 for state-sponsored antitobacco advertisements. Among the respondents to the MTF surveys, 14% had no (0) cumulative depreciated mean exposures to state-sponsored antitobacco advertisements in the 4 months prior to the survey; 65% of the students had a mean exposure to state-sponsored advertisements that was greater than 0 but less than 1; 21% had a mean exposure of 1 or more state antitobacco advertisements during this period.

The range of mean exposures for each advertisement sponsor, as shown in Table 1, reveals considerable variation across designated market areas. Further investigation of the data showed that in some media markets, state-

**Table 2. Relationships Between State Antismoking Targeted Ratings Points and Youth Smoking-Related Attitudes, Beliefs, and Behaviors\*†**

Attitudes, Beliefs, and Behaviors	State-Sponsored Antismoking Advertising Exposures					
	TRP = 0‡		TRP < 1		TRP = 1 or More	
	%	Odds Ratio	%	Odds Ratio (95% Confidence Interval)	%	Odds Ratio (95% Confidence Interval)
Most or all friends smoke (n = 35 153)	24.1	Ref	21.4	1.04 (0.86-1.25)	14.8	0.72 (0.58-0.88)§
>70% of Students smoke in school (n = 13 435)	30.0	Ref	25.4	0.91 (0.74-1.11)	21.3	0.80 (0.63-1.03)
Perceive no risk of addiction (n = 14 339)	62.1	Ref	63.4	0.95 (0.84-1.09)	60.3	0.86 (0.74-0.99)¶
Perceive great harm from smoking (n = 47 541)	65.1	Ref	68.7	1.11 (1.00-1.22)¶	72.1	1.25 (1.11-1.42)#
Definitely won't be smoking in 5 y (n = 16 783)	55.3	Ref	58.3	1.13 (0.98-1.31)	64.0	1.43 (1.17-1.74)#
Current smoking, past 30 d (n = 50 347)	26.7	Ref	23.7	1.01 (0.88-1.15)	18.6	0.74 (0.63-0.88)§
Cigarettes smoked among smokers, No. (n = 11 614)**	Mean	Coefficient	Mean	Coefficient ± SE	Mean	Coefficient ± SE
	6.2	Ref	5.6	-0.03 ± 0.05	5.1	-0.13 ± 0.07

Abbreviations: Ref, reference; TRP, targeted ratings point.

\*All models included the following control variables: pharmaceutical, tobacco parent, and tobacco youth TRP types entered as continuous variables; grade (8 vs 10/12); year 2000 dummy variable; sex; ethnicity (white vs other); earned income; average parental education; presence of both parents in household; grade point average; nights out per week ( $\geq 3$ ); any skipping of school; state smoke-free air index; and state cigarette price.

†Alternative values for  $\lambda$  were tested (0, 0.3, 0.7, 1), but no significant changes in results occurred. Thus, the  $\lambda$  value of 0.3 was retained to be consistent with the literature. When we used  $\lambda = 0.3$ , the advertising more than 4 months prior to the date of survey administration added only negligibly to depreciated advertising exposure.

‡State TRPs entered as dummies, with "0" as referent category.

§ $P < .01$ .

|| $P < .10$ .

¶ $P < .05$ .

# $P < .001$ .

\*\*Natural log of number of cigarettes smoked used in multivariate regression analyses.

sponsored antitobacco advertising outweighed all advertising from other antitobacco sponsors.

### MULTIVARIATE MODELS

After controlling for other types of antitobacco advertising as well as individual characteristics and the real price of cigarettes by state, strong associations were found between levels of mean exposure to state-sponsored antitobacco advertising and recall of antitobacco advertising generally, antismoking attitudes and beliefs, and actual smoking behaviors.

### RECALL

Higher levels of state-sponsored TRPs were strongly associated with greater odds of recalled exposure to antitobacco ads. This relationship appeared to be approximately linear (odds ratio [OR], 1.11; 95% confidence interval, 1.08-1.14), indicating that each additional cumulative, depreciated mean viewing for state-sponsored antitobacco advertisements was associated with an 11%  $\pm$  3% increase in the odds of a student reporting having seen an antitobacco ad (data not shown).

### ATTITUDES AND BELIEFS

Higher levels of state-sponsored TRPs were associated with significantly greater odds of holding antismoking attitudes and beliefs. Specifically, **Table 2** shows that

compared with students in markets with no mean exposure to state-sponsored antitobacco advertisements, those with at least 1 cumulative, depreciated mean viewing for state-sponsored antitobacco advertisements were significantly less likely to report most or all of their friends were smokers: 24.1% of students reported believing most or all their friends smoked in areas with no mean exposure to state TRPs, and only 14.8% reported similarly in areas with 1 or more state TRPs (OR, 0.72). Students in areas with 1 or more state TRPs were also marginally less likely to report that more than 70% of the students in their school smoked: 21.3% vs 30.0% in areas with no state TRPs (OR, 0.80). Students with 1 or more state TRPs were slightly less likely to say that they would never get addicted to cigarettes than those with no state TRPs (60.3% vs 62.1%; OR, 0.86) and were clearly more likely to perceive great harm from smoking 1 or more packs of cigarettes per day (72.1% vs 65.1%; OR, 1.25). Also, compared to those with 0 state TRPs, students with a state TRP measure greater than 0 but less than 1 were more likely to perceive great harm from smoking (68.7% vs 65.1%; OR, 1.11). Importantly, students living in areas with a mean exposure measure of at least 1 state-sponsored antitobacco advertisement were more likely to report that they believed they would definitely not be smoking in 5 years' time (64.0% vs 55.3%; OR, 1.43), and those living in areas with a TRP measure greater than 0 but less than 1 were marginally more likely to report they would definitely not be smoking in 5 years (58.3% vs 55.3%; OR, 1.13).

## SMOKING BEHAVIORS

Table 2 indicates that students with a state TRP measure of 1 or higher were significantly less likely to have smoked in the past 30 days compared with those in markets with no exposure to state-sponsored antitobacco advertisements: 18.6% vs 26.7% (OR, 0.74). Smokers with a state TRP measure of 1 or higher also smoked marginally fewer cigarettes per day compared with smokers with 0 state TRPs: 5.1 vs 6.2 cigarettes per day (coefficient of  $-0.13$ ).

### COMMENT

Our analyses suggest that state-sponsored antitobacco media campaigns were associated with more favorable antismoking attitudes and beliefs among youth and reduced youth smoking. Each state media campaign promotes a strong antismoking message, but the various campaigns differ substantially in the number and frequency of the advertisements aired, the target audience (youth vs adult), and advertisement themes.<sup>29</sup> It is therefore particularly noteworthy that our models consistently produced significant associations between mean exposure to state-sponsored antitobacco advertisements and youths' smoking-related attitudes, beliefs, and behaviors. Even more notably, our data provide evidence of a threshold for mean exposure to state-sponsored antitobacco advertisements. The strong associations between antismoking attitudes and beliefs, as well as reduced smoking, among students with a state TRP measure of at least 1 suggest that it is important to maintain a minimal mean exposure level of at least 1 cumulative state-sponsored antitobacco ad per 4-month period for the general teen viewing audience.

There are limitations to our analyses and their interpretation. Our use of cross-sectional data leaves us unable to make direct causal inferences about whether mean exposure to antitobacco advertisements resulted in changes in youths' smoking-related attitudes, beliefs, or behaviors. Also as a result of the cross-sectional design, we are unable to categorically reject the hypothesis that the relationships observed in our models may be better explained by an unmeasured factor related to both smoking behavior and amount of exposure to antismoking advertisements. However, by including important control variables such as other tobacco control policies and regional and year dummy variables in our models, we believe that it is unlikely that we are misrepresenting the relationship between exposure to antismoking advertisements and smoking-related attitudes, beliefs, and behavior among youth in the United States. In addition, our results reflect the relationships between the mean exposure to antitobacco advertisements for each media market and individual youths' smoking-related attitudes, beliefs, and behaviors. Individual youths may have seen many more or fewer such ads. Relatively few student respondents to the MTF surveys lived in media markets with very high levels of state-sponsored TRPs; had there been a larger number of students in such areas, further exploration of the relation-

ship between intensive exposure to state-sponsored antitobacco advertisements and smoking-related beliefs and behaviors might have been possible. Further research is needed to better understand and model the relationships between pharmaceutical and tobacco-industry antitobacco ad exposure and youth smoking-related beliefs and behaviors. Finally, our analyses included only 2 years of observations, 1999 and 2000, which precluded analysis of the effects of the American Legacy Foundation's national media campaign.

Despite the limitations, our use of the Nielsen ratings data provided a unique opportunity to explore whether state-sponsored antitobacco advertising affects youth in the context of their mean exposure to other tobacco-related television advertising, controlling for other individual characteristics and tobacco control policies. Our findings suggest that state-sponsored antismoking advertisements may have played a critical role in the recent reductions in youth smoking observed across the United States. In light of these results, past decisions and future considerations to cut tobacco control media campaigns appear shortsighted.

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### REFERENCES

1. Farrelly MC, Niederdeppe J, Yarsevich J. Youth tobacco prevention mass media campaigns: Past, present, and future directions. *Tob Control*. 2003(suppl 1): i35-i47.
2. Gianatasio D. Anti-smoking ads are history as funding dries up: suspension of Mass. effort due to budget cuts part of growing trend. *Adweek Eastern Edition*. 2002;43:5.
3. Pierce JP, Macaskill P, Hill D. Long-term effectiveness of mass media led anti-smoking campaigns in Australia. *Am J Public Health*. 1990;80:565-569.
4. McVey D, Stapleton J. Can anti-smoking television advertising affect smoking behaviour? Controlled trial of the Health Education Authority for England's anti-smoking TV campaign. *Tob Control*. 2000;9:273-282.
5. Hu T-W, Sung H-Y, Keeler TE. Reducing cigarette consumption in California: tobacco taxes vs an anti-smoking media campaign. *Am J Public Health*. 1995; 85:1218-1222.
6. Hu T-W, Sung H-Y, Keeler TE. The state antismoking campaign and the industry response: the effects of advertising on cigarette consumption in California. *AEA Papers and Proceedings*. 1995;85:58-90.
7. Kozlowski LT, Yost B, Stine MM, Celebucki C. Massachusetts' advertising against light cigarettes appears to change beliefs and behavior. *Am J Prev Med*. 2000; 18:339-342.
8. Siegel M, Biener L. The impact of an antismoking media campaign on the progression to established smoking: results of a longitudinal youth study. *Am J Public Health*. 2000;90:380-386.
9. Sly DF, Heald GR, Ray S. The Florida "truth" anti-tobacco media evaluation: design, first year results, and implications for planning future state media evaluations. *Tob Control*. 2001;10:9-15.
10. Wakefield M, Flay B, Nichter M, Giovino G. Effects of anti-smoking advertising on youth smoking: a review. *J Health Commun*. 2003;8:229-247.
11. Bolton LE, Cohen JB, Bloom PN. The marketing of "get out of jail free cards": how remedies encourage risky consumption. Department of Marketing, Univer-

- sity of Pennsylvania, 2004. Available at: <http://www-marketing.wharton.upenn.edu/people/faculty/bolton.html>. Accessed June 8, 2004.
12. Farrelly MC, Heaton CG, Davis KC, Messeri P, Hersey JC, Haviland ML. Getting to the truth: evaluating national tobacco countermarketing campaigns [erratum in: *Am J Public Health*. 2003;93:703]. *Am J Public Health*. 2002;92:901-907.
  13. Nielsen Media Research. *DMA Market and Demographic Rank: September 2001*. New York, NY: Nielsen Media Research; 2002.
  14. Szczyпка G, Emery S, Wakefield M, Chaloupka F. The adaptation and use of Nielsen Media Research commercial ratings data to measure potential exposure to televised smoking-related advertisements. *ImpactTeen Research Paper Series*, No. 29. Chicago, IL: University of Illinois at Chicago; 2003. Available at: [http://www.impactteen.org/ab\\_RPNo29\\_2003.htm](http://www.impactteen.org/ab_RPNo29_2003.htm). Accessed June 8, 2004.
  15. Johnston LD, O'Malley PM, Bachman JG. Monitoring the Future: National Survey Results on Drug Use, 1975-2002. Volume I: Secondary School Students. NIH Publication No. 03-5375. Bethesda, Md: National Institute on Drug Abuse; 2003.
  16. Orzechowski W, Walker R. *The Tax Burden on Tobacco*. Washington, DC: Orzechowski & Walker; 2001.
  17. Giovino GA, Tworek C, Chaloupka F, et al. Smoke-Free Air Policies and Adolescent Smoking: United States, 1991-2001. Presentation at: 12th World Conference on Tobacco or Health; August 5, 2003; Helsinki, Finland.
  18. Information Technology Laboratory of the National Institute of Standards and Technology. Federal Information Processing Standards publications (FIPS PUBS), 2003. Available at: <http://www.itl.nist.gov/fipspubs/>. Accessed June 8, 2004.
  19. Pollay RW, Siddarth S, Siegel M, et al. The last straw? cigarette advertising and realized market shares among youths and adults, 1979-1993. *J Mark*. 1996; 60:1-16.
  20. Kooyck LM. *Distributed Lags and Investment Analysis*. Amsterdam, the Netherlands: North Holland Publishers; 1959.
  21. Berndt E. *The Practice of Econometrics: Classic and Contemporary*. Reading, Mass: Addison-Wesley Publishing Co; 1991.
  22. Chaloupka FJ, Pacula RL. Sex and race differences in young people's responsiveness to price and tobacco control policies. *Tob Control*. 1999;8:373-377.
  23. Wallace JM Jr, Bachman JG, O'Malley PM, Schulenberg J, Cooper SM, Johnston LD. Gender and ethnic differences in smoking, drinking, and illicit drug use among American 8th, 10th and 12th grade students, 1976-2000. *Addiction*. 2003; 98:225-234.
  24. Sorensen G, Barbeau E, Hunt MK, Emmons K. Reducing social disparities in tobacco use: a social-contextual model for reducing tobacco use among blue-collar workers. *Am J Public Health*. 2004;94:230-239.
  25. Bachman JG. Family relationships and self-esteem. In Rosenberg M, Kaplan HB, eds. *Social Psychology of the Self-Concept*. Arlington Heights, Ill: Harlan Davidson, Inc; 1982:356-364.
  26. Schulenberg J, Bachman JG, O'Malley PM, Johnston LD. High school educational success and subsequent substance use: a panel analysis following adolescents in young adulthood. *J Health Soc Behav*. 1994;35:45-62.
  27. An LC, O'Malley PM, Schulenberg J, Bachman JG, Johnston LD. Change at the high end of risk in cigarette smoking among U.S. high school seniors, 1976-1995. *Am J Public Health*. 1999;89:699-705.
  28. Chaloupka FJ. Macro-social influences: the effects of prices and tobacco control policies on the demand for tobacco products. *Nicotine Tob Res*. 1999; 1(suppl 1):S105-S109.
  29. Terry-McElrath Y, Wakefield M, Ruel E, et al. The effect of anti-smoking advertisement executional characteristics on youth appraisal and engagement. *J Health Commun*. In press.

### Correction

Numerical Error. In "This Month in *Archives of Pediatrics & Adolescent Medicine*" published in the June issue of ARCHIVES (2005;159:511), an error occurred in the summary written about the article by Paz-Bailey et al. In the last summary on page 511, the second sentence should have read: "In this study from the Centers for Disease Control and Prevention, the effect of condom use on decreasing the prevalence of chlamydia and gonorrhea was examined among more than 500 adolescent girls."