Exposure to the Above the Influence Antidrug Advertisements and Adolescent Marijuana Use in the United States, 2006–2008

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Objectives. We examined the relationship between exposure to the Above the Influence antidrug campaign in 210 US media markets and adolescent marijuana and alcohol use from 2006 to 2008.

Methods. We analyzed monthly advertising exposure (targeted rating points) data from the Office of National Drug Control Policy and drug use data from the Monitoring the Future study. We estimated multivariate logistic regression models of marijuana use for students in grades 8, 10, and 12, with controls for individual, family, and media market characteristics and year and regional fixed effects.

Results. For eighth-grade adolescent girls, greater exposure to antidrug advertisements was associated with lower rates of past-month marijuana use (adjusted odds ratio [AOR]=0.67; 95% confidence interval [CI]=0.52, 0.87) and lower rates of lifetime marijuana use (AOR=0.76; 95% CI=0.62, 0.93), but not alcohol use (AOR=1.00; 95% CI=0.84, 1.19). Associations were not significant for adolescent boys or for students in grades 10 and 12.

Conclusions. Antidrug advertising may be an effective way to dissuade eighth-grade adolescent girls from initiating marijuana use. (*Am J Public Health.* 2011; 101:948–954. doi:10.2105/AJPH.2010.300040)

The Office of National Drug Control Policy's National Youth Anti-Drug Media Campaign is the largest public health advertising campaign in history.[1,2] The campaign began in 1998 and continues today, with federal expenditures that exceed $1.5 billion and another $1.2 billion in required media matches to date; the matches are for public service announcement time for the campaign and are required by law. The main goal is to prevent youth drug abuse, especially marijuana use. The Partnership for a Drug-Free America arranges for advertising agencies to develop the creative executions pro bono, and the campaign produces them. A separate advertising agency handles the campaign branding, media buys, and research.

Phase 1 of the campaign began in 1999; used the brand My Anti-Drug, developed by Ogilvy & Mather; and spent approximately $180 million annually.[1,3] This phase initially targeted youths aged 11 to 13 years, focused on marijuana (but included other drugs), and ran different advertisements for parents. Phase 2 began in September 2005 and is ongoing, spending approximately $85 million annually. This phase uses the brand Above the Influence, developed by Draftfcb, primarily targets adolescents aged 12 to 17 years, and focuses on marijuana (no other specific drug) and on living life above negative influences.[2] Both campaigns featured a variety of advertisements to appeal to different youths.

Palmgreen et al. developed and tested a precursor antimarijuana campaign.[4] They created several televised advertisements highlighting immediate negative consequences of marijuana use on self and others that were high in sensation value (e.g., drama). They tested the campaign in 2 matched communities (treatment and control) with interrupted time-series methods. The study focused on youths in grades 7 to 10 at baseline and revealed that the campaign significantly lowered 30-day marijuana use among high-sensation–seeking youths. That campaign provided insights for the national campaign. Palmgreen et al. also tested phase 1 of the national campaign from April 1999 (prior to full rollout) to mid-2003.[3] This interrupted time-series study tracked youths in grades 4 to 8 and found that high-sensation–seeking youths' marijuana use gradually rose over time as they aged, until mid-2002, when their use significantly declined. This drop was attributed to new advertisements featuring strong negative consequences. These advertisements targeted adolescents aged 14 to 16 years and concentrated on marijuana rather than other drugs.

Hornik et al. formally evaluated phase 1 of the national youth antidrug media campaign from late 1999 to mid-2004.[5] Children and youths aged 9 to 18 years were surveyed at their homes annually 4 consecutive times; they were shown the advertisements and answered questions to assess advertising exposure, effects, and confounders (covariates). This was a novel evaluation method; typically baseline measures or control groups are used to assess advertising effects.[4,6–8] The researchers found that beliefs about marijuana's negative consequences strengthened among nonusers (defined as never users) from 2000 to 2004, but they observed no other significant trends. Youths who reported more advertising exposure did not report lower drug use. In fact, nonusers reporting 12 or more specific advertising exposures per month (vs fewer exposures) sometimes reported more pro-marijuana norms, intent, and initiation a year later. Previous research revealed that advertising effects manifested within a few weeks or months and then gradually dissipated[9]; in fact, this is how advertising effects are modeled.[10] After Hornik et al. reported a possible boomerang effect,[5] campaign funding was substantially reduced, and changes were made to improve the campaign.

Ours was the first study to evaluate the behavioral effects of Above the Influence, the National Youth Anti-Drug Media Campaign's ongoing phase 2, on adolescent marijuana use. We used the campaign's targeted ratings points (TRPs; a measure of exposure potential) by

media market to examine adolescent exposure, independent survey data from the Monitoring the Future (MTF) study[11] to examine youth outcomes, and empirical methods used in other evaluations of antismoking media campaigns.[9,12] Because previous research suggested that media campaign effects might be contingent on grade[9] or gender,[13] we also explored differences between these subgroups.

METHODS

MTF is a cross-sectional, school-based survey of drug, alcohol, and tobacco-related outcomes for adolescents in the United States. It is administered annually between January and June. We obtained a restricted-access version of data from the 2006 to 2008 MTF surveys (n=130 245) that included information on the month and year of survey administration and the location (zip code) of each school. We used school zip codes to match each respondent to a media market. Our primary outcome measure in MTF was an indicator equal to 1 if the adolescent reported using marijuana in the past month. We also examined lifetime marijuana use to assess whether antidrug advertising was associated with delayed initiation, and we examined past-month alcohol use as an outcome that was presumably not directly affected by antidrug advertising. MTF also measures standard demographic and family characteristics for each respondent, including race and parental education, which we included as controls in our multivariate models.

Drug Outcomes

To identify the relationship between exposure to antidrug advertisements and adolescent drug-related outcomes, we estimated standard multivariate logistic regression models for the numerous dichotomous outcomes created from MTF (e.g., whether the respondent used marijuana in the past month). We estimated all models separately by gender and grade.

These models followed previous work on antismoking advertisements and youths[9,12] and took the form

$$(1)\quad Y_{imrt} = \alpha + \beta_1 X_{imrt} + \beta_2 Z_m + \beta_3 (\text{Depreciated TRP})_{mt} + R_r + T_t + \xi_{imrt}$$

where Y_{imrt} represented our various outcomes of interest for youth i in media market m in region r in year t. X_{imrt} was a vector of individual demographic characteristics: age in months at time of survey, race/ethnicity dummies, and parental education dummies. Z_m was a vector of market-level characteristics measured from the 2006 American Community Survey: population size, median household income, percentage of the population with at least a bachelor's degree, median age, and percentage of the population in rental housing.[14] These market-level characteristics were intended to reduce bias from omitted factors that vary at the same level as advertising exposure and that may independently be associated with youth marijuana use (e.g., average educational attainment, average age). Failure to control for these factors could have led us to find a significant protective association between advertising exposure and youth drug use that might be more properly attributable to variation in demographic characteristics across markets. R_r was a set of 4 regional fixed effects, and T_t was a set of survey year dummies.

We clustered standard errors at the school level to account for the complex multistage sampling design of MTF, in which schools are selected within geographic areas that are determined by the sampling section of the University of Michigan Survey Research Center.[9,11] All analyses were performed using Stata version 11.0 (StataCorp LP, College Station, TX).

Ad Exposure

Our data on exposure to antidrug advertisements came from the Office of National Drug Control Policy (personal correspondence). We used monthly TRPs (targeting youths aged 12–17 years) across all media for each of 210 media markets for 2006 to 2008, after the introduction of the Above the Influence campaign. TRPs measure the delivery of a media campaign to a target audience and therefore the audience's potential (i.e., likely or estimated) exposure to the campaign. TRPs are calculated by multiplying the percentage of the target audience that is reached by the frequency of exposure, according to media penetrations and media buys. We divided each month's TRPs by 1000 for scaling (100% reach×10 frequency or a reasonable per ad dose=1000 TRPs). Research indicates that our measure of exposure to antidrug advertisements is highly correlated with advertising recall.[15]

Most of the media buys, that is, purchases of antidrug advertisements, were national (e.g., network radio, print, and Internet), but some buys were local (e.g., spot radio). Also, variation across media markets in network television stations (e.g., Fox, UPN) and especially cable television stations (e.g., MTV2) generated variation across adolescents in exposure to the antidrug television advertisements (Figure 1). We operationalized the TRP variable by creating a depreciated TRP exposure measure according to the method of Emery et al.[12] To construct this variable for each adolescent in MTF, we used the monthly TRPs (across all media) for the month immediately preceding the interview date plus the depreciated average viewings for the 3 previous months. Specifically, we calculated

$$(2)\quad \text{Depreciated TRP}_{mt} = \text{TRP}_{mt} + \lambda \text{TRP}_{mt-1} + \lambda^2 \text{TRP}_{mt-2} + \lambda^3 \text{TRP}_{mt-3},$$

where λ was the depreciation factor and equaled 0.3. This assumed that the advertising effect weakened steadily and was negligible after 4 months.[10]

RESULTS

Table 1 shows the descriptive characteristics for the key study variables separately by gender and grade. Drug use rates differed substantially by gender and grade, with more marijuana use reported by adolescent boys and by students in higher grades. These differences were quite large in magnitude: adolescent boys were 26%, 24%, and 34% more likely than were adolescent girls to report past-month marijuana use in grades 8, 10, and 12, respectively. Similarly, past-month marijuana use among adolescents in grade 12 was 325% higher than was the past-month marijuana use among adolescents in grade 8. These patterns suggested that different mechanisms contributed to drug use decisions by gender and grade and supported our strategy of estimating separate models for each gender–grade combination.

Table 1 also shows that adolescents on average were exposed to approximately 1360

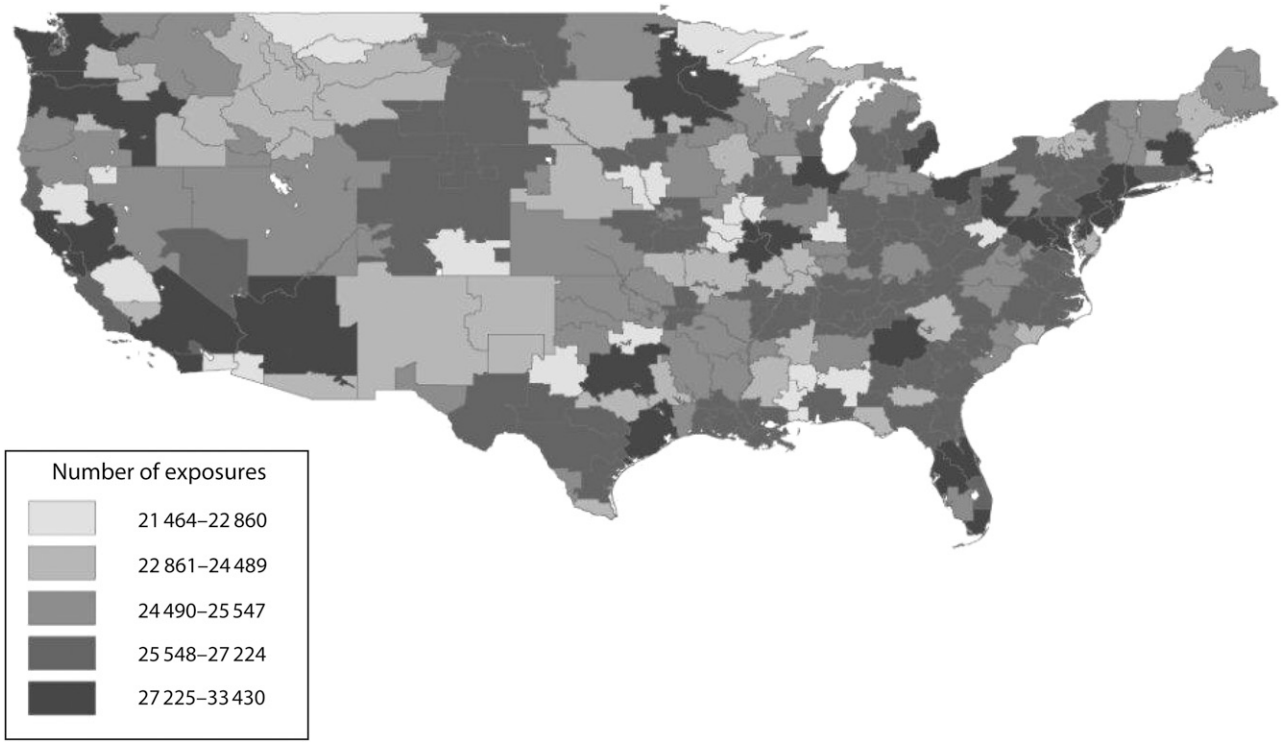

FIGURE 1—US media market exposures to the Above the Influence antidrug advertising campaign, 2006–2008.

total antidrug advertising TRPs over the 2006 to 2008 period (e.g., roughly 100% reach and 13.6 frequency/mo). This was largely similar across the grade and gender groups, which was expected, because the TRP measures were the same for all adolescents in a market. A majority of adolescents in the MTF sample were White, and most had parents with at least a high school education. The market-level demographic characteristics were also similar across the gender and grade groups, as expected.

Our main results are shown in Table 2, separately by gender and grade. Each cell shows the adjusted odds ratio (AOR) for depreciated TRPs from a multivariate logistic regression model of equation 1. All models included the individual- and market-level covariates and region and year fixed effects (data not shown). We observed patterns in the estimates for the control variables: older adolescents were significantly more likely to report marijuana use (even within grade), White adolescents were significantly more likely to report marijuana use, and Asian adolescents were significantly less likely to report marijuana use.

Lifetime and Past-Month Marijuana Use

Our results for lifetime marijuana use indicated that greater exposure to antidrug advertisements was significantly related to lower odds of having ever used marijuana among eighth-grade girls (AOR=0.76; 95% confidence interval [CI]=0.62, 0.93; $P<.01$; Table 2). This result is consistent with the possibility that greater antidrug spending may delay initiation of marijuana use among eighth-grade adolescent girls. The AOR for adolescent boys in grade 8 and for students of both genders in grades 10 and 12 were closer to 1 and not statistically significant, suggesting that no substantive relationship existed between antidrug advertising and lifetime marijuana use for these adolescents. For past-month marijuana use, the patterns were largely similar: eighth-grade adolescent girls were significantly less likely to report past-month marijuana use when they were exposed to more antidrug advertisements (AOR=0.67; 95% CI=0.52, 0.87; $P<.01$). Again, however, we found no significant relationships between antidrug advertising exposure and past-month marijuana use for any of the other gender or grade groups.

The relationship between antidrug advertising and marijuana use for eighth-grade adolescent girls was unique to marijuana use: we did not find any substantive or statistically significant relationship between antidrug advertising and past-month alcohol use for these students (AOR=1.00; 95% CI=0.84, 1.19; Table 2) or for any other gender–grade combination. This null result is important because the Above the Influence campaign contained only antidrug content, not anti-alcohol content, and because this finding suggests that the significant protective associations between antidrug advertisements and marijuana use among eighth-grade adolescent girls were unlikely to be attributable to other market-level media campaigns against other risk behaviors more generally. That is, the patterns shown in Table 2 indicate that the antidrug

TABLE 1—Descriptive Characteristics of US Adolescents: American Community Survey, 2006, and Monitoring the Future Study, 2006–2008

	Grade 8		Grade 10		Grade 12	
	Adolescent Girls	Adolescent Boys	Adolescent Girls	Adolescent Boys	Adolescent Girls	Adolescent Boys
Drug use outcomes						
Lifetime marijuana use, mean	0.126	0.158	0.288	0.323	0.397	0.443
Past-mo marijuana use, mean	0.050	0.063	0.123	0.153	0.159	0.213
Past-mo alcohol consumption, mean	0.164	0.155	0.318	0.317	0.417	0.466
Annual antidrug advertising exposure, depreciated TRPs,[a] mean	1360	1350	1360	1360	1370	1360
Individual characteristics						
Race/ethnicity, mean						
White	0.642	0.640	0.690	0.694	0.668	0.692
Black	0.158	0.144	0.140	0.129	0.153	0.123
Asian	0.047	0.054	0.050	0.050	0.045	0.053
Father's education, mean						
≤High school	0.131	0.111	0.134	0.112	0.146	0.119
High school degree	0.226	0.221	0.254	0.249	0.269	0.257
Some college	0.122	0.128	0.141	0.147	0.170	0.170
College degree	0.342	0.372	0.359	0.387	0.334	0.373
Missing	0.168	0.154	0.107	0.098	0.075	0.069
Mother's education, mean						
≤High school	0.119	0.087	0.115	0.088	0.120	0.092
High school degree	0.212	0.207	0.231	0.225	0.249	0.248
Some college	0.165	0.156	0.196	0.181	0.222	0.200
College degree	0.395	0.420	0.400	0.433	0.370	0.404
Missing	0.099	0.117	0.054	0.067	0.032	0.043
Total respondents, no.	22 995	22 145	23 448	21 981	20 750	18 926
Market characteristics						
Population, no.	4 795 374	4 735 375	5 405 032	5 326 894	5 060 380	4 711 295
Median household income, $	50 382	50 311	51 542	51 644	50 491	50 327
Population with ≥college degree, %	16.6	16.6	0.17.1	17.1	16.5	16.5
Median age, y	35.3	35.3	35.3	35.3	35.3	35.3
Renters, %	33.3	33.3	33.8	33.6	33.5	33.3

Note. TRPs = targeted rating points. Means are for the weighted sample. The data for drug use outcomes and individual characteristics came from the Monitoring the Future Study, 2006–2008. The data for the market characteristics came from the 2006 American Community Survey.
[a] We used past 4 months of TRPs, with each month depreciated; $\lambda = 0.3$.

advertisements were uniquely related to reduced marijuana use for eighth-grade adolescent girls.

Eighth-Grade Adolescent Girls

Finally, we examined the sensitivity of our main results for eighth-grade adolescent girls to alternative measures of exposure to antidrug advertisements. In accordance with previous advertising research, we used the Koyck transformation,[10] which takes the previous 4 months of advertising and depreciates each month by a factor of 0.3. However, antidrug advertisements could affect adolescent drug use in other ways. We considered 3 alternatives as shown in Table 3, whose format is similar to that in Table 2 with each cell showing the AOR from a multivariate regression model in equation 1, but in this case only for eighth-grade adolescent girls and past-month marijuana use.

For model 1 in Table 3, we reprinted the estimate from Table 2 that greater exposure to antidrug advertisements was significantly related to reduced past-month marijuana use for eighth-grade adolescent girls. In model 2, we replaced depreciated TRPs (the 4-month depreciated lag) with an alternative measure that used the past-month TRPs without depreciation. This approach assumed that the most recent advertising mattered for current drug use decisions, but that advertising more than a month old had no relationship with current drug use. This model produced the same substantive relationship as did model 1, suggesting a protective association between antidrug advertising exposure and past-month marijuana use among eighth-grade adolescent girls (AOR=0.60; 95% CI=0.45, 0.81; $P<.01$).

TABLE 2—Estimated Relationships Between Exposure to Antidrug Advertisements and Adolescent Drug Use in the United States: American Community Survey, 2006, and Monitoring the Future Study, 2006–2008

	Grade 8		Grade 10		Grade 12	
	Adolescent Girls (n = 21 710), AOR (SE)	Adolescent Boys (n = 20 705), AOR (SE)	Adolescent Girls (n = 22 598), AOR (SE)	Adolescent Girls (n = 21 042), AOR (SE)	Adolescent Boys (n = 20 086), AOR (SE)	Adolescent Girls (n = 18 236), AOR (SE)
Lifetime marijuana use[a]	0.760** (0.079)	0.983 (0.104)	0.954 (0.102)	0.979 (0.074)	0.877 (0.095)	0.897 (0.090)
Past-month marijuana use[b]	0.672** (0.087)	1.024 (0.143)	1.025 (0.116)	0.987 (0.103)	0.832 (0.121)	0.933 (0.122)
Past-month alcohol use[c]	1.000 (0.090)	0.943 (0.069)	0.942 (0.085)	0.960 (0.070)	0.907 (0.102)	0.938 (0.108)

Note. AOR = adjusted odds ratio; TRP = targeted rating points. The outcome data came from the Monitoring the Future Study, 2006–2008. The advertising exposure data came from the Office of National Drug Control Policy. We estimated multiple logistic regression models for each outcome for each subgroup; each entry is from a separate model. AORs are reported for the advertising exposure variable, which was set equal to depreciated TRPs/1000, according to the past 4 months of TRPs, with each month depreciated; $\lambda = 0.3$. Models also controlled for survey year and region fixed effects, respondent age in months at time of survey, race/ethnicity dummies, parental education dummies, and market-level characteristics measured from the 2006 American Community Survey[14] (population size, median household income, percentage of the population with at least a bachelor's degree, median age, and percentage of the population in rental housing). Observations were weighted with the Monitoring the Future Study student weight.

[a] Outcome was an indicator variable equal to 1 if student ever used marijuana.

[b] Outcome was an indicator variable equal to 1 if student used marijuana in the past month.

[c] Outcome was an indicator variable equal to 1 if the student used alcohol in the past month.

**$P < .01$.

Model 3 included cumulative or total TRPs prior to each MTF survey, with no depreciation. This approach tested whether cumulative advertising exposure (total stock to date) predicted adolescent drug use. As a result, the average value of the cumulative exposure measure in model 3 (and model 4) is an order of magnitude larger than the exposure measures used in models 1 and 2, so the magnitudes of the results are not directly comparable across models in Table 3.

In model 3, the estimate for cumulative exposure to antidrug advertising on past-month marijuana use among eighth-grade adolescent girls was not statistically significant. In model 4, we followed the method of Farrelly et al.,[9] including both a measure for cumulative TRPs and its squared term, with no depreciation. The squared term was important to detect whether the advertising effect got weaker as it cumulated. The cumulative exposure variable indicated a significant protective association between antidrug advertising and past-month marijuana use among eighth-grade adolescent girls (AOR = 0.871; 95% CI = 0.786, 0.964; $P < .01$). The squared term was also statistically significant, suggesting that cumulative exposure reduced past-month marijuana use at a decreasing rate (AOR = 1.003; 95% CI = 1.001, 1.006; $P < .05$). Farrelly et al. reported a similar pattern of a significant protective association between anti-tobacco advertising and smoking only for eighth-grade adolescents, but they did not report effects by gender.[9]

DISCUSSION

We examined the relationship between adolescent exposure to antidrug advertisements (specifically, TRPs, or exposure potential) in 210 media markets and adolescent marijuana use from 2006 to 2008. We did not find evidence of a widespread protective association between antidrug advertisements and reduced marijuana use among adolescents. However, we did find that higher antidrug advertising exposure in a media market was associated with lower rates of past-month and lifetime

TABLE 3—Sensitivity Analysis of Exposure to Antidrug Advertisements and Past-Month Marijuana Use Among Eighth-Grade Adolescent Girls in the United States: American Community Survey, 2006, and Monitoring the Future Study, 2006–2008

Annual Antidrug Advertising Exposure Variable, TRPs/1000	Model 1, AOR (SE)	Model 2, AOR (SE)	Model 3, AOR (SE)	Model 4, AOR (SE)
Depreciated[a]	0.672** (0.087)	–	–	–
Past mo[b]	–	0.601** (0.092)	–	–
Cumulative[c]	–	–	0.985 (0.025)	0.871** (0.045)
Cumulative squared	–	–	–	1.003* (0.001)

Note. AOR = adjusted odds ratio; TRPs = targeted rating points. The outcome data came from the Monitoring the Future Study, 2006–2008. The advertising exposure data came from the Office of National Drug Control Policy. The sample was eighth-grade adolescent girls in the Monitoring the Future study; n = 21 710. We estimated multiple logistic regression models, and the outcome variable in all models was an indicator variable equal to 1 if the student reported past-month marijuana use. We report AORs for the relevant advertising exposure variable. The scale of the independent variables differed substantially in models 3 and 4 from that in models 1 and 2; thus, the AORs were not directly comparable across models. Models also controlled for survey year and region fixed effects, respondent age in months at time of survey, race/ethnicity dummies, parental education dummies, and market-level characteristics measured from the 2006 American Community Survey[14] (population size, median household income, percentage of the population with at least a bachelor's degree, median age, and percentage of the population in rental housing). Observations were weighted with the Monitoring the Future student weight.

[a] Past 4 months of TRPs with each month depreciated; $\lambda = 0.3$ (from Table 2).

[b] No depreciation.

[c] Total TRPs to date with no depreciation.

*$P < .05$; **$P < .01$.

marijuana use by eighth-grade adolescent girls, consistent with the idea that these advertisements may have delayed marijuana initiation and reduced use among these students. We did not find any such significant associations for eighth-grade adolescent boys or for students in grades 10 and 12. As expected, we found no association between the antidrug advertisements and rates of past-month alcohol use among any of the gender or age groups. We also found that the relationship between advertisements and marijuana use by eighth-grade adolescent girls was robust to alternative measures of exposure to the antidrug advertisements.

What explains our finding that antidrug advertising exposure is only significantly related to marijuana use among eighth-grade adolescent girls? By grade 10 or 12 most adolescents may have already made decisions about whether to initiate marijuana use, leaving less room for antidrug advertising to have any meaningful effect. Indeed, previous research on an antismoking media campaign revealed protective effects only in grade 8, and not in grades 10 and 12.[9] That study did not assess gender effects, but other research indicates that eighth-grade adolescent girls might be especially receptive to the antidrug advertising that we studied. Early adolescence (eighth-grade students are typically aged 13–14 years) is a period of major transition and vulnerability: puberty begins,[16] and difficult changes in school, peer, and family roles occur.[17,18] These changes cause negative emotions, emotional volatility, and social anxiety,[18] particularly among girls.[16,19–21] Consequently, eighth-grade adolescent girls might be especially receptive to the Above the Influence campaign's antidrug advertisements about achievement and living life above negative influences.

Our finding that the government's youth antidrug advertising campaign was associated with lower marijuana use among eighth-grade adolescent girls differs from the finding by Hornik et al. that this advertising did not lower marijuana use and may even have boomeranged among nonusers, creating more pro-marijuana norms, intent, and initiation months after exposure.[5] What might explain these discrepant findings? The boomerang findings of Hornik et al. pertain to a somewhat different population: marijuana nonusers aged 9 to 18 years, studied prospectively. Our findings pertain to eighth-grade adolescent girls, of whom 87% were nonusers and 13% were users, and our MTF data were cross sectional, although our initiation findings were specific to nonusers.

The study periods and campaign budgets were also different: Hornik et al. studied the campaign from 1999 to 2004, when it was novel; we studied the campaign from 2006 to 2008, when it was established and the budget was halved. The underlying relationship between antidrug advertisements and adolescent drug use could have changed over time or in the wake of expenditure changes. In fact, Hornik et al. speculated that the large initial advertising budget and extensive exposure could have enhanced norms that marijuana use was prevalent (a meta-message), causing a boomerang. Another difference was campaign targeting: the earliest campaign focused on youths aged 11 to 13 years and parents, and discussed other drugs besides marijuana; the later campaign targeted youths aged 12 to 17 years but not parents and addressed marijuana alone. Advertising copy testing (pretesting) was under development during the Hornik et al. study; by contrast, all the advertisements in our study were copy tested before airing and met stringent copy test criteria for significantly strengthening an antidrug belief or intent.[22]

The 2 studies also had methodological differences. We examined associations between adolescent antidrug TRPs in media markets and adolescent drug use. Hornik et al. examined associations between youths' self-reported antidrug advertising exposure and the same youths' self-reported drug use, and so there could have been reverse-causality effects (e.g., higher drug use intent led to higher antidrug advertising exposure later), although a multitude of covariates and lags were included to rule this out. Finally, MTF surveyed a different sample of adolescents annually at school, whereas Hornik et al. surveyed the same panel of youths annually at home. We were unable to pinpoint any 1 driving factor for our discrepant results and note that this important question merits further research.

Our data were derived from repeated cross sections of adolescents and did not follow the same adolescents over time (i.e., we did not have panel data). Therefore, we were unable to directly observe how outcomes changed among a fixed group of individuals when antidrug advertisements changed in a local media market. We also could not ascertain the specific causes of the variation in antidrug advertising exposure (TRPs) at the regional or year level, nor could we assess whether the variation was exogenous to unobserved determinants of adolescent drug outcomes. Therefore, we were unable to definitively assert a causal relationship between antidrug advertising and adolescent marijuana use.

We used large, current data sets to document the relationship between antidrug advertising and rates of adolescent marijuana use. We concluded that increases in antidrug advertising may be an effective way to delay initiation of and reduce marijuana use among eighth-grade adolescent girls. ■

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Contributors

Both authors originated the study, interpreted the findings, and wrote and edited the article. C.S. Carpenter performed the analysis.

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Human Participant Protection

No protocol approval was needed for this study because it was a secondary analysis of de-identified survey data.

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