

Modifying Exposure to Smoking Depicted in Movies

A Novel Approach to Preventing Adolescent Smoking

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Background: Most behavioral approaches to adolescent smoking address the behavior directly. We explore an indirect approach: modifying exposure to portrayals of smoking in movies.

Objectives: To describe adolescents' exposure to smoking in movies and to examine factors that could modify such exposure.

Design: Occurrences of smoking were counted in each of 601 popular movies. Four thousand nine hundred ten northern New England junior high school students were asked to report which movies they had seen from a randomly generated subsample of 50 films, and responses were used to estimate exposure to the entire sample.

Analysis: The outcome variable was exposure to movie smoking, defined as the number of smoking occurrences seen. Risk factors for exposure included access to movies (movie channels, videotape use, and movie theater); parenting (R [restricted]-rated movie restrictions, television restrictions, parenting style); and characteristics of the child (age, sex, school performance, sensation-seeking propensity, rebelliousness, and self-esteem). We used multiple regression to assess the association between risk factors and exposure to movie smoking.

Results: Subjects had seen an average of 30% of the movie sample (interquartile range, 20%-44%), from which they were exposed to 1160 (interquartile range, 640-1970) occurrences of smoking. In a multivariate model, exposure to movie smoking increased (all *P* values < .001) by about 10% for each additional movie channel and for every 2 videos watched per week. Exposure increased by 30% for those going to the movie theater more than once per month compared with those who did not go at all. Parent restriction on viewing R-rated movies resulted in a 50% reduction in exposure to movie smoking. There was no association between parenting style and exposure to movie smoking. Much of the protective effect of parent R-rated movie restriction on adolescent smoking was mediated through lower exposure to movie smoking.

Conclusions: Adolescents see thousands of smoking depictions in movies, and this influences their attitudes and behavior. Exposure to movie smoking is reduced when parents limit movie access. Teaching parents to monitor and enforce movie access guidelines could reduce adolescent smoking in an indirect, yet powerful, manner.

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SMOKING, WHEN depicted in movies, sends a powerful and enticing message to the adolescent viewer. Movie directors and actors use smoking to project character traits typically seen in tobacco advertising: toughness, rebelliousness, and sexiness. Not surprisingly, the tobacco industry has historical interests in movie smoking, in part, because it is not processed as advertising but is seamlessly incorporated into the movie, limiting viewer skepticism regarding the message.^{1,2}

Evidence is accumulating that viewing smoking in movies may influence adolescent smoking. Viewing smoking in only 1 movie has been shown to result in more positive attitudes toward the behavior.³ In addition, adolescents whose favorite movie

stars smoke are more likely to smoke themselves.^{4,5} In a previous study,⁶ we directly measured exposure to smoking in movies and found an association with adolescent smoking, independent of other social influences, personality characteristics of the adolescent, and parenting. In addition, among those who had never smoked, higher exposure to movie smoking was associated with more positive attitudes toward smoking⁷ and a higher risk of starting smoking in the future.⁸

Given the strength of the evidence, reducing adolescent exposure to movie smoking is a reasonable goal. Despite criticism,⁹⁻¹¹ many in the movie industry have been unwilling to restrict smoking on screen, claiming first amendment protection of artistic speech.¹² Thus, it may be

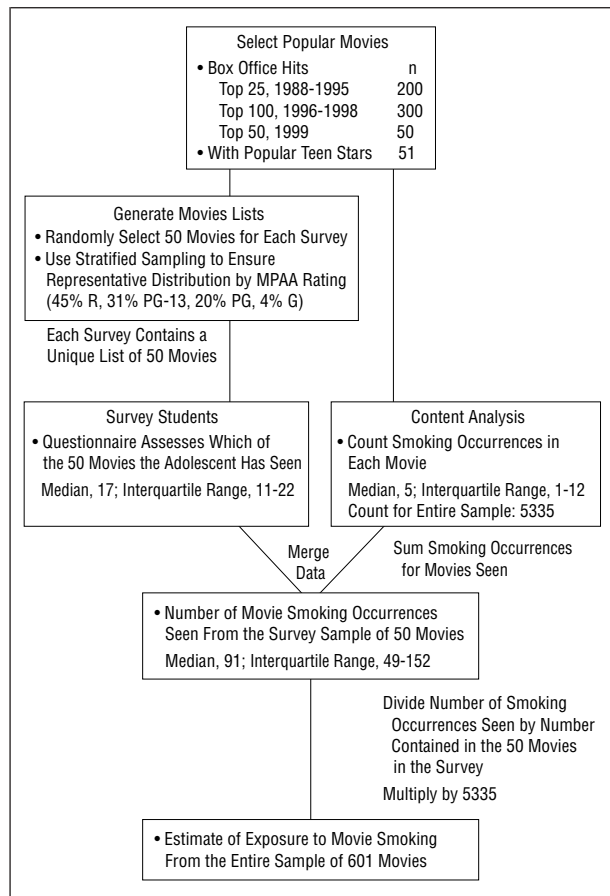


Figure 1. Method for determining exposure to smoking in movies. MPAA indicates Motion Picture Association of America; G, general audiences; PG, parental guidance suggested; PG-13, parents strongly cautioned; and R, restricted.

Table 1. Tertile Split Procedure for Authoritative Parenting Measure

Parenting Category	Tertile Rank for Support Index		Tertile Rank for Control Index	Expected Percentage of Sample in Each Category
Authoritative	1	and	1	15
Neglectful	3	and	3	15
Indulgent	1	and	3	7.5
Authoritarian	3	and	1	7.5
Tertile 2	2	or	2	55

incumbent on pediatricians and parents to find ways to limit exposure. To assist them and others who supervise adolescents, we describe exposure to movie smoking and examine factors that modify such exposure.

METHODS

The methods for surveying adolescent exposure to movie smoking are detailed elsewhere.⁶ Briefly, we recruited 15 New Hampshire and Vermont middle schools, limiting eligibility to those with at least 150 students. The communities served by these schools ranged from towns with fewer than 2000 persons to cit-

ies of 100 000 or more. The population was predominantly white, and most parents had graduated from high school. A confidential student survey was administered during class time by survey proctors in September 1999 after informing parents about the survey by mail. The study protocol was approved by the human subjects committee at Dartmouth College (Hanover, NH).

One hundred twenty-eight (2.1%) parents or students refused participation, and 380 students (6.3%) were absent (average participation rate by school, 92.5%). Of the 5490 students who completed the survey, 565 were excluded because of missing data and 15 because of inconsistent responses, providing a final sample of 4910 subjects.

To determine exposure to smoking in films (**Figure 1**), we first counted occurrences of smoking in each of 601 popular contemporary films, selected according to box office success.⁶ Next, we estimated exposure to these films by asking whether the respondent had seen each of a set of 50 film titles, randomly selected from the larger pool. To conduct the survey, we created 5500 paper questionnaires (the only difference among questionnaires was the titles of the 50 movies). We summed the number of smoking occurrences in each movie viewed by the survey respondent as the measure of adolescent exposure to movie smoking. This measure was strongly and independently associated with trying smoking.⁶

The disadvantage of this measure of exposure to movie smoking used previously is that it is not scaled to estimate exposure to the entire sample of 601 films. To estimate exposure to smoking in popular contemporary movies, we divided the number of smoking occurrences seen by the number of smoking occurrences in all 50 movies; the denominator for each subject was different because each responded to a unique set of movies (median, 436; interquartile range, 387-492). We multiplied that proportion by 5335 (the number of smoking occurrences in the 601 movies). This method provides an unbiased estimate of exposure to smoking for this sample of movies.

We examined factors associated with exposure to movie smoking. These factors were grouped into movie access, parenting factors, and characteristics of the child. Movie access factors included movie channels ("Do you have any of these special channels at home? Check all that you have." [Cinemax, HBO (Home Box Office), Showtime, The Movie Channel, none of these]); videotape use ("How many videos do you usually watch per week?" [none, 1 or 2, 3 or 4, 5 or more]); and movie theater outings ("How often do you go out to a movie theater to watch movies?" [none, less than once per month, once per month, more than once per month]). Parenting factors included restriction of R-rated movies ("How often do your parents let you watch movies or videos that are rated R? [never = full restriction, once in a while = partial restriction, sometimes/all of the time = little or no restriction]); television restriction ("Are you allowed to watch anything you want on television? [yes, no]); and authoritative parenting, assessed using a subset of the questions from Jackson et al¹³ and determined by the tertile-split procedure,^{13,14} which has been widely used for this measure. In this procedure, responses for the 2 domains measured by authoritative parenting (support and control) are split into tertiles and divided into 4 parenting categories, presented in **Table 1**. In the analysis, we retained the second tertile as a separate category. Characteristics of the child included age and sex, self-reports of school performance, sensation-seeking propensity,^{15,16} rebelliousness,¹⁷ and self-esteem.¹⁸ (The survey questions used to assess authoritative parenting, sensation-seeking, rebelliousness, and self-esteem, plus their reliabilities, have been previously published.⁶) We asked the subjects how many hours they spent watching television and playing video games each week-day and each weekend day (these variables were not included in the analysis because they had no association with movie smoking exposure after the above factors were accounted for).

A χ^2 test or analysis of variance was used to evaluate the association between exposure to movie smoking and each of

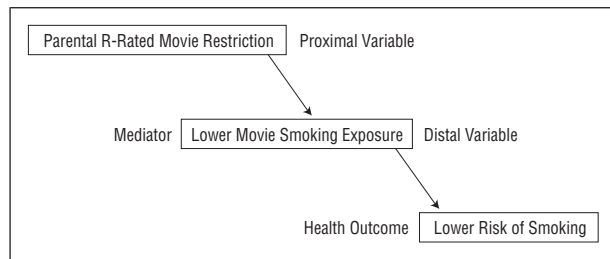


Figure 2. Mediation hypothesis. The effect of parental R (restricted)-rated movie restriction on adolescent smoking is mediated through lower exposure to smoking in movies.

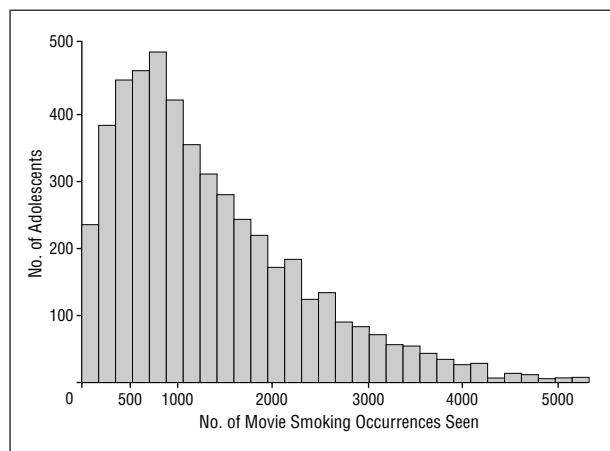


Figure 3. Distribution for exposure to movie smoking among 4910 adolescents.

the covariates. A multivariate least squares regression analysis was performed, with exposure to movie smoking as the dependent variable. All covariates that had a statistically significant bivariate association with exposure to movie smoking were included in the multivariate model, for which the β coefficients were equivalent to the number of additional episodes of movie smoking attributable to that factor. Interactions between age and sex and each of the movie access and parenting factors were examined. All *P* values were 2-sided, and *P* < .05 was considered significant.

A mediation analysis was performed to test the hypothesis that the association between parent restriction of R-rated movies and lower risk of adolescent smoking is mediated by lower exposure to movie smoking. Statistically, mediation is similar to confounding; the difference is that the mediator is considered to be part of a causal chain rather than an independent covariate (**Figure 2**). According to Baron and Kenny,¹⁹ the mediational hypothesis can be tested by first regressing the dependent variable (whether or not the adolescent has tried smoking) against the distal variable (parental R-rated movie restriction) and then adding the mediator (exposure to movie smoking). Mediation is suggested if adding the mediator substantially attenuates the logit estimates for the distal variable.

RESULTS

On average, the subjects had seen 30% of the movie sample (interquartile range, 20%-44%), from which they were exposed to 1160 (interquartile range, 640-1970) occurrences of movie smoking (**Figure 3**). The distribution was skewed, with some subjects exposed to as many as 4000 occurrences of movie smoking.

Table 2. Number of Movie Smoking Occurrences Seen by Selected Media Exposure, Parenting and Characteristics of the Adolescent

Independent Variable	No. of Subjects (N = 4910)	Mean No. of Movie Smoking Occurrences Seen	<i>P</i> Value*
Movie Exposure Factors			
Movie channels			
None	2456	1190	
1	769	1360	<.001
2	463	1500	<.001
3	440	1650	<.001
4	782	2032	<.001
No. of video exposures (per week)			
0	603	1010	
1 or 2	2983	1330	<.001
3 or 4	850	1750	<.001
≥5	474	1930	<.001
No. of theater exposures (per month)			
<1	2445	1150	
1	1262	1480	<.001
>1	1203	1910	<.001
Parenting Factors			
R-movie restriction			
Full restriction	750	600	
Some restriction	1217	1050	<.001
Little or no restriction	2943	1780	<.001
Television restriction			
Yes	1945	1065	
No	2965	1660	<.001
Authoritative parenting			
Neglectful	990	1630	
Indulgent	314	1500	.06
Authoritarian	288	1470	.02
Authoritative	778	1260	<.001
Middle tertile	2540	1380	<.001
Characteristics of the Child			
Age, y			
9-10	386	1030	.003
11	1062	1210	<.001
12	1448	1350	<.001
13	1517	1630	<.001
14-15	497	1770	
Sex			
Female	2488	928	
Male	2422	1622	<.001
School performance			
Excellent	1748	1190	
Good	1834	1440	<.001
Average or below average	1328	1700	<.001
Sensation seeking			
≤Median	2870	1160	
>Median	2040	1730	<.001
Rebelliousness			
≤Median	2637	1160	
>Median	2273	1730	<.001
Self-esteem			
≤Median	2557	1510	
>Median	2353	1330	<.001

**P* value reflects the statistical significance of the bivariate association between each variable and movie smoking exposure.

All of the factors included in the model were associated with exposure to movie smoking (**Table 2**) and were therefore included in the multivariate analysis. In the multivariate analysis, the following variables were no

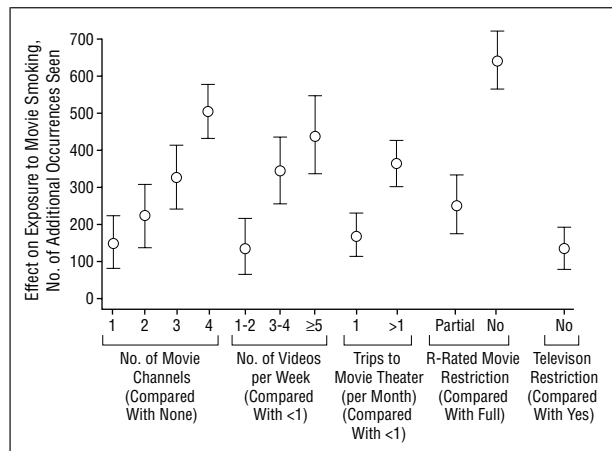


Figure 4. Effect of movie access factors and parenting factors on exposure to smoking in movies (N=4910; F=63.4; adjusted $R^2=0.34$). R indicates restricted. Note: Effects are estimated from a multivariate least squares regression, with the number of smoking occurrences in a movie as the dependent variable. Other covariates include parenting style, age, sensation seeking, rebelliousness, self-esteem, and school grades. Error bars represent 95% confidence intervals.

longer or only barely statistically significant: parenting style, school performance, and self-esteem. As shown in **Figure 4**, all movie access factors retained strong and statistically significant relationships with adolescent exposure to movie smoking. Smoking exposure increased by about 150 depictions (about 10%) for each additional movie channel and each additional video watched per week. In addition, going to the movie theater more than once per month was associated with an average increase of more than 300 movie smoking depictions (about 20%). Parental restriction of R-rated movies had the strongest and most significant effect on exposure to movie smoking. Compared with children who reported full restriction, those with no restriction had seen, on average, 650 (about 50%) more smoking occurrences, and those with partial restriction had seen an additional 260. Television restriction had a much weaker effect (140 additional occurrences for those with no restriction). There was a significant increase of about 100 movie smoking occurrences for each added year of age, and boys had seen, on average, 220 more occurrences than girls. Those who rated above the median for both sensation-seeking and rebelliousness had seen 200 and 120 more movie smoking occurrences, respectively.

Figure 5 compares the effect of R-rated movie restriction and parenting style. Whereas any category of movie restriction had a strong and significant effect on exposure to movie smoking, the effect for the various categories of parenting style was weak and, for the most part, not statistically significant.

We tested for interactions among movie access and parenting factors and found none, suggesting that the effects are additive. There were significant interactions between age and number of movie channels, number of videotaped movies watched per week, and R-rated movie restriction such that the effect of these on exposure to movie smoking diminished with age.

R-rated movie restriction has been shown to decrease the odds of smoking, independent of other parent-

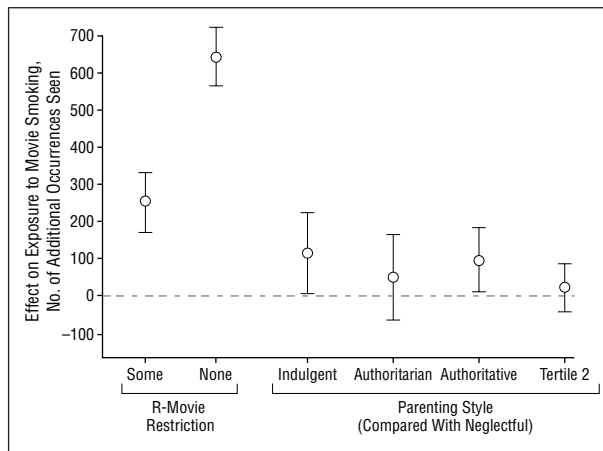


Figure 5. Comparing the effect of parental restrictions of R (restricted)-rated movies and parenting style on exposure to smoking in movies (N=4910; F=63.4; adjusted $R^2=0.34$). Effects are estimated from a multivariate least squares regression, with the number of smoking occurrences in a movie as the dependent variable. Other covariates include number of movie channels, number of videotapes per week, trips to the movie theater per month, parental R-rated movie restriction, age, sensation seeking, rebelliousness, self-esteem, and school grades. Error bars represent 95% confidence intervals.

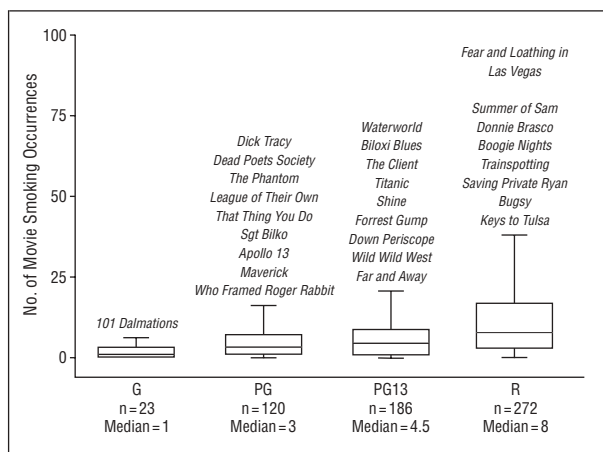


Figure 6. Distribution of smoking occurrences in movies by the Motion Picture Association of America rating. G indicates general audiences; PG, parental guidance suggested; PG-13, parents strongly cautioned; and R, restricted.

ing factors.²⁰ R-rated movie restriction would be expected to have a large effect on exposure to movie smoking because these movies contain more than twice the number of smoking episodes contained in other rating categories of the Motion Picture Association of America (**Figure 6**). This raises the question, diagrammed in **Figure 2**: Is the effect of parental R-rated movie restriction mediated through lower exposure to movie smoking?

To test this hypothesis, we used logistic regression to examine the association between parental restriction and exposure to movie smoking and adolescent smoking (almost 18% of the sample had tried smoking). Parental restriction and exposure to movie smoking were both strongly associated with trying smoking. When exposure to movie smoking was added to a regression model containing parental R-rated movie restriction, the estimates for the effect of movie restrictions on adolescent smoking dropped substantially. For example, the odds ratio for the effect of little or no restriction on trying smok-

Table 3. Mediation Analysis*

Variable	No. of Subjects (Percentage That Tried Smoking) (n = 4893)	Logistic Regression Model, Adjusted OR (95% CI)†		
		1	2	3
R-movie restriction				
Full restriction	748 (2)	1.0	NA	1.0
Some restriction	1214 (7)	2.0 (1.2-3.4)	NA	1.6 (0.9-2.7)
Little or no restriction	2931 (26)	8.8 (5.6-13.9)	NA	5.4 (3.3-8.7)
Exposure to movie smoking				
0-499 Occurrences	963 (5)	NA	1.0	1.0
500-999 Occurrences	1293 (12)	NA	2.1 (1.4-3.0)	1.5 (1.0-2.2)
1000-1500 Occurrences	906 (18)	NA	3.3 (2.3-4.8)	2.0 (1.4-3.0)
>1500 Occurrences	1731 (30)	NA	6.3 (4.4-8.8)	3.2 (2.2-4.6)

Abbreviations: CI, confidence interval; OR, odds ratio, R, restricted.

*The mediation analysis detects whether the effects of parental restriction of R-rated movies is mediated through lower exposure to movie smoking. Note: Seventeen subjects dropped out because of missing data on smoking status.

†The dependent variable is trying smoking. All regression models include controls for grade in school, sex, parent education, and school. In addition, regression 1 includes R (restricted)-rated movie restriction; regression 2 includes exposure to movie smoking; and regression 3 includes R-rated movie restriction and exposure to movie smoking.

ing dropped from 8.8 to 5.4. This suggests that a substantial portion of the effect of movie restriction on adolescent smoking is mediated through lower exposure to movie smoking.

COMMENT

This study documents high exposure of young adolescents to smoking in popular contemporary movies. The average adolescent in this sample had seen more than 1000 depictions of smoking from the 601 movies in this sample, with some seeing more than 4000. In many instances, the smoking was modeled by movie stars who serve as heroes and role models to adolescents. Adolescents are impressionable, and it is plausible that seeing smoking depicted in movies influences them to smoke.

We propose that a novel approach to this problem may be to limit access of young adolescents to movies. Adolescents see fewer movie smoking depictions when they have less exposure to movies in general (fewer movie channels, limits on television time, lower exposure to home videos, and fewer trips to the movie theater) or when they report that their parents modify their movie menu (by restricting them from seeing R-rated movies). Each of these factors contributes to movie smoking exposure in an additive fashion. For example, compared with an adolescent at minimum risk, one whose parents subscribe to 2 movie channels, allow 3 videos per week (the average for most adolescents), allow 1 or 2 trips to the movie theater per month, and allow some R-rated movie viewing would have seen about 1000 additional movie smoking depictions, raising his or her risk of trying smoking by a factor of 3 (Table 3, model 2). Pediatricians can use these data to offer specific advice for parents on how to accomplish movie restrictions in young adolescents.

We thought that parenting style would be related to monitoring of access to movies. Instead, authoritative parents (eg, those who have rules about when their child has to be home from school, who monitor where their child is, and who also have a close, interactive relationship with their child) do not appear to be any more likely to restrict

access to R-rated movies. This suggests that movie access management is a unique aspect of parenting, possibly with its own set of benefits to the child, eg, lower rates of smoking and drinking among young adolescents.²⁰

Because R-rated movie restriction and exposure to movie smoking are closely linked and because both predict lower risk of trying smoking, we suggest that the effect of movie restriction on smoking initiation is mediated through lower exposure to movie smoking. The idea that seeing smoking modeled on screen would influence adolescent behavior^{4,5} is consistent with the theoretical basis of our work.²¹ Social cognitive theory predicts that adolescents are responsive to smoking depicted by persons with star status. To the extent that smoking in movies is linked to something the adolescent wants to be, sexy, tough, or any number of other characteristics, movie smoking could exert a powerful influence. It is also true that risk behaviors tend to cluster in adolescents.²² Since other risky behaviors are presented in movies, it is possible that some adolescents adopted, for example, alcohol use as a result of seeing drinking in movies and then began to smoke in the context of drinking with friends.

Because this study is cross-sectional, we are limited in our ability to determine how well measures like parental R-rated movie restriction predict future behaviors. In addition, we did not elicit responses from each adolescent to all 601 titles, so there is measurement error in our estimate of movie exposure. Also, our sample of movies represents only a small number of the movies available on video and DVD; lifetime exposure to movie smoking is probably much greater than we have estimated. Finally, our analysis treats all smoking depictions as the same. Further studies should examine whether contextual variables, such as character traits of smokers (identity factors) or level of movie violence (arousal factors) modify the effect of movie smoking on adolescent behavior.

Despite the limitations, this study illustrates the scale of exposure to movie smoking, showing that adolescents see thousands of smoking depictions in movies. Moreover, exposure to movie smoking is not linked with parenting style but decreases dramatically when par-

What This Study Adds

Exposure to movie smoking has been linked with adolescent smoking in one cross-sectional study. However, there are no estimates of the magnitude of this exposure among adolescents and the factors that determine it. This study shows that adolescents are exposed to thousands of depictions of smoking and that parental restrictions on movie access, such as movie channels, videotapes, and theaters, have a major impact on limiting such exposure. Furthermore, our analysis suggests that the effect of restricting R-rated movies on adolescent smoking is mediated through lower exposure to movie smoking. Movie access restrictions do not seem to be associated with parenting style and need to be incorporated into pediatricians' discussions with parents. This method of reducing exposure to movie smoking may serve as a valuable addition to strategies to reduce adolescent smoking.

ents specifically limit access to movies. This suggests that exposure to movie smoking could be limited if pediatricians motivated and instructed parents to monitor and set rules around movie access. Such parenting measures could reduce rates of adolescent smoking without directly addressing the behavior.

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