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## Exposure to Movie Smoking: Its Relation to Smoking Initiation Among US Adolescents

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**ABSTRACT.** *Objective.* Regional studies have linked exposure to movie smoking with adolescent smoking. We examined this association in a representative US sample.

*Design/Methods.* We conducted a random-digit-dial survey of 6522 US adolescents aged 10 to 14 years. Using previously validated methods, we estimated exposure to movie smoking, in 532 recent box-office hits, and examined its relation with adolescents having ever tried smoking a cigarette.

*Results.* The distributions of demographics and census region in the unweighted sample were almost identical to 2000 US Census estimates, confirming representativeness. Overall, 10% of the population had tried smoking. Quartile (Q) of movie smoking exposure was significantly associated with the prevalence of smoking initiation: 0.02 of adolescents in Q1 had tried smoking; 0.06 in Q2; 0.11 in Q3; and 0.22 in Q4. This association did not differ significantly by race/ethnicity or census region. After controlling for sociodemographics, friend/sibling/parent smoking, school performance, personality characteristics, and parenting style, the adjusted odds ratio for having tried smoking were 1.7 (95% confidence interval [CI]: 1.1, 2.7) for Q2, 1.8 (95% CI: 1.2, 2.9) for Q3, and 2.6 (95% CI: 1.7, 4.1) for Q4 compared with adolescents in Q1. The covariate-adjusted attributable fraction was 0.38 (95% CI: 0.20, 0.56), suggesting that exposure to movie smoking is the primary independent risk factor for smoking initiation in US adolescents in this age group.

*Conclusions.* Smoking in movies is a risk factor for smoking initiation among US adolescents. Limiting exposure of young adolescents to movie smoking could have important public health implications. *Pediatrics* 2005;116:1183–1191; *adolescent smoking, media impact.*

ABBREVIATIONS. RDD, random-digit-dial; OR, odds ratio; CI, confidence interval.

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The adoption of smoking during adolescence is not thought to be the result of a rational or highly premeditated thought process; instead, smoking initiation typically signifies a reaction to social events in which adolescents find themselves confronted by the opportunity to smoke.<sup>1</sup> Given that opportunity, some adolescents initiate the behavior, and some do not. Children become attitudinally susceptible<sup>2</sup> to trying smoking in response to social influences, including people they observe modeling the behavior in their social environment. It has long been acknowledged that social influences are the primary reason that children try smoking, and behavioral researchers have extensively documented the social influence effect of family<sup>3–6</sup> and peers<sup>7</sup> on adolescent smoking initiation. Social influences also include images such as those contained in tobacco marketing, which has been shown to influence adolescent smoking,<sup>8,9</sup> and entertainment media. Although entertainment stars have modeled smoking in movies and on television, reaching large audiences since the early days of these industries,<sup>10</sup> the relative contribution of entertainment media in promoting smoking has not been studied extensively.

A contemporary scientific literature is developing on the relation between seeing movie depictions of smoking and the adoption of smoking, beginning with the publication of 2 cross-sectional studies that linked adolescent smoking to the screen smoking status of the adolescent's favorite star.<sup>11,12</sup> These findings were bolstered by a cross-sectional study in which a strong relation was found between a content-specific measure of exposure to movie smoking and adolescent smoking initiation, independent of a number of other smoking risk factors.<sup>13</sup> In the same study, never-smokers with higher exposure to movie smoking had more favorable attitudes toward smoking.<sup>14</sup> When these never-smokers were observed longitudinally, exposure to movie smoking at baseline was associated with smoking initiation 1 to 2 years later.<sup>15</sup> Another longitudinal study confirmed smoking status of favorite movie stars at baseline as a predictor of smoking initiation, although only in girls.<sup>16</sup>

Although previous studies provide strong evidence that smoking in movies is a risk factor for smoking initiation, most of the evidence is based on 2 regional US samples of adolescents, and the findings may not generalize to all racial/ethnic groups or

adolescents from different geographic regions. The objective of this study is to measure exposure to movie smoking in a nationally representative sample of US adolescents and to determine if this exposure is associated with smoking initiation.

**METHODS**

Between June and October, 2003, we conducted a random-digit-dial (RDD) telephone survey of 6522 US adolescents aged 10 to 14 years. The telephone surveys were conducted by trained interviewers using a computer-assisted telephone interview system from Westat (Rockville, MD), a national research organization with survey sites across the United States. Interviewers were trained to administer the survey in English or Spanish. We obtained parental consent and adolescent assent before interviewing each respondent. To protect confidentiality, adolescents indicated their answers to sensitive questions by pressing numbers on the telephone rather than speaking aloud. All aspects of the survey were approved by the institutional review boards at Dartmouth Medical School and Westat.

Selection of the sample (Fig 1) involved 3 stages, through which we identified a list-assisted randomly generated sample of 377 850 residential phone numbers (stage 1), identified households with age-eligible children (stage 2), and enrolled age-eligible adolescents into the study (stage 3). In stage 1, we used an automated system in combination with interviewer calls to purge nonworking and business numbers from the list, which reduced the sample to 129 002 known residential telephone numbers. In stage 2, interviewers called each number and successfully completed screener interviews with 69 516 households. Through the screening interviews we identified 9849 eligible households with adolescents between 10 and 14 years of age. For households with >1 age-eligible adolescent, we randomly selected 1 for enrollment. In stage 3, we obtained permission from 77% (*N* = 7492) of the parents to interview their child, and 87% (*N* = 6522) of the adolescents agreed to participate and completed the survey.

The American Association for Public Opinion Research identifies several ways to calculate survey response.<sup>17</sup> The completion rate (the number of completed interviews [*N* = 6522] divided by

the number of eligible households [*N* = 9849]) for this survey was 66%. The response rate is more conservative and includes estimates of eligible households lost during stages 1 and 2 (see Fig 1).<sup>17</sup> Using methods of Brick et al,<sup>18</sup> we estimated that 15 057 of the 38 696 nonanswered phone numbers in stage 1 were residential. In addition, 59 667 households did not complete the screening interview in stage 2. Assuming the same proportion of these 74 724 (15 057 + 59 667) unscreened households had age-eligible adolescents as in the screened sample (0.14), we estimate that 10 587 households in stages 1 and 2 could have been eligible for the study. When these households are included in the denominator, our most conservative estimate of the response rate is 32% (6522 interviewed adolescents/an estimated 20 436 [9849 + 10 587] eligible households).

**Weighting the Sample**

We weighted the sample to produce response estimates that are representative of the population of adolescents aged 10 to 14 years in US households. Weights were used to compensate for the increased probability of selecting households with >1 residential voice line and the decreased probability of selecting an individual from households with >1 age-eligible adolescent. Poststratification weights<sup>19-21</sup> were also used to reduce potential bias resulting from survey nonresponse and coverage shortfall (eg, households without telephones).

The distributions of age, gender, household income, and census region in our unweighted sample were almost identical to percentages approximated in the 2000 US Census (Table 1) (household income distribution was obtained from the American Community Service PUMS 2002 for households with 10- to 14-year-old children). Compared with the 2000 US Census, our unweighted sample had higher percentages of Hispanic adolescents and slightly lower percentages of black adolescents; we adjusted for these differences in the poststratification weighting procedure.

**Exposure Measurement**

We estimated adolescents' exposure to movie smoking by using previously validated methods.<sup>13,15,22</sup> We selected the top 100 US box-office hits per year for each of the 5 years preceding the

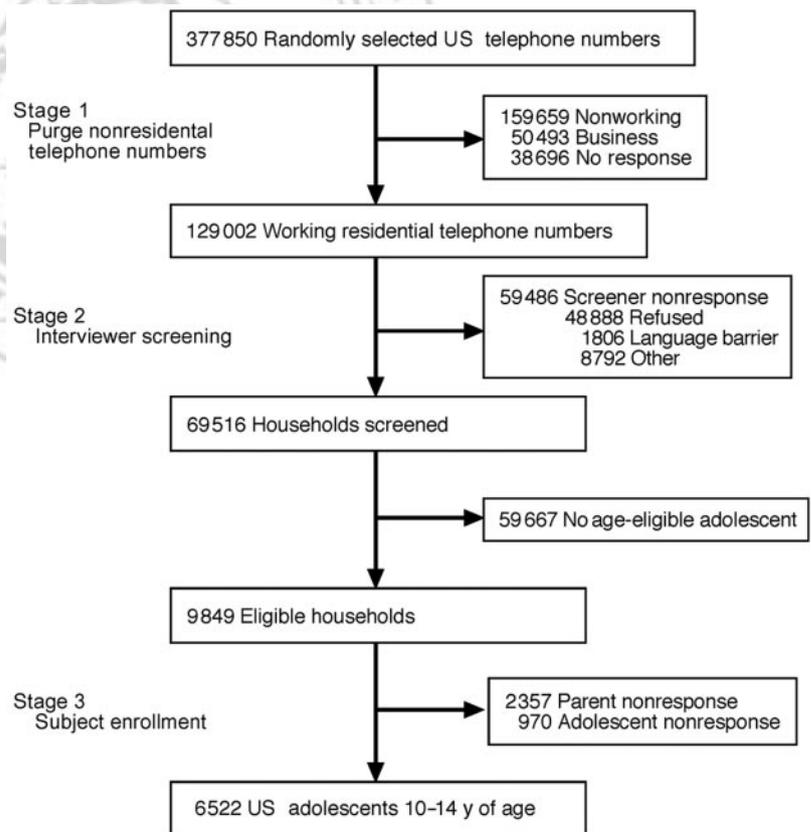
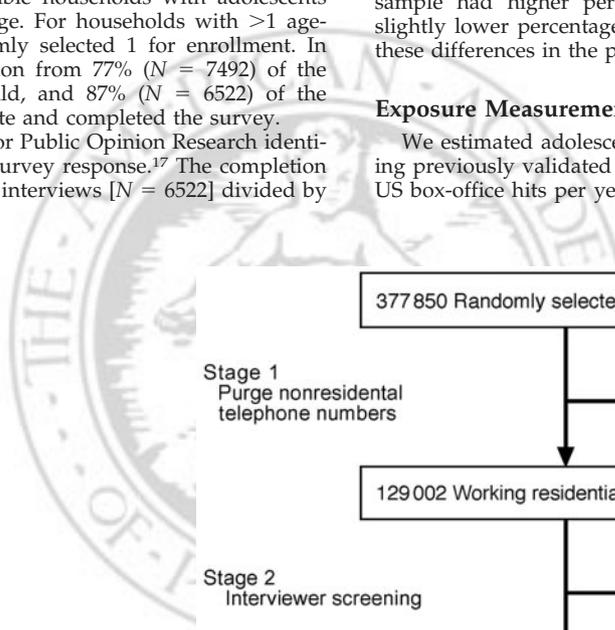


Fig 1. Sample-selection process.

**TABLE 1.** Demographic Characteristics for 6522 Adolescents Aged 10–14 Years in the Baseline Survey Compared With 2000 US Census

	Baseline Sample, %		US Census, %
	Unweighted	Weighted	
Age, y			
10	18	21	21
11	20	20	20
12	21	20	20
13	21	20	19
14	20	19	20
Gender			
Female	49	49	49
Male	51	51	51
Race			
White	66	65	70
Black	11	15	15
Asia/Pacific Islander	2	2	4
Amer Indian	1	1	1
Other	20	17	10
Ethnicity			
Hispanic	19	16	15
Non-Hispanic	81	84	85
Census region			
Northeast	18	18	19
Midwest	24	22	23
South	34	36	35
West	24	24	23
Household income, \$			
per y			
≤10 000	8	6	7
10 000–20 000	10	10	9
20 000–30 000	12	11	10
30 000–50 000	21	23	21
50 000–75 000	19	22	23
>75 000	30	28	30

survey (1998–2002; *N* = 500) and 32 movies that earned at least \$15 million in gross US box-office revenues during the first 4 months of 2003. The computer-assisted telephone interview survey was programmed to randomly select 50 movie titles from the larger pool of 532 movies for each adolescent interview. Movie selection was stratified by the Motion Picture Association of America rating so that the distribution of movies in each list reflected the distribution of the full sample of movies (19% G/PG, 41% PG-13, 40% R). Respondents were asked whether they had ever seen each movie title on their unique list. To assess the possibility of false-positive responses, we asked all adolescents whether they had seen a sham movie titled “Handsome Jack,” and <2% reported seeing it. We previously demonstrated that adolescents reliably remember movies that they have seen 1 to 2 years before a survey.<sup>13</sup>

Trained coders counted the number of smoking occurrences in each of the 532 movies using previously validated methods.<sup>23</sup> A smoking occurrence was counted whenever a major or minor character handled or used tobacco in a scene or when tobacco use was depicted in the background (eg, “extras” smoking in a bar scene). Occurrences were counted irrespective of the scene’s duration or how many times the tobacco product appeared during the scene. To create a measure of exposure to movie smoking, we summed the number of smoking occurrences in films that each adolescent had seen from his/her unique list of 50 movies. For the statistical analysis, exposure to movie smoking was then classified into quartiles based on the median (46 movie smoking occurrences) and interquartile range (19, 88).

**Outcome Measurement**

We assessed smoking initiation by asking: “Have you ever tried smoking a cigarette, even just a puff?” Those who answered “yes” were classified as having tried smoking. We used this measure rather than current (30-day) smoking, because smoking is infrequent in the early stages of experimentation.<sup>24</sup> Smoking initiation is an important outcome, because studies indicate that approxi-

mately one third of initiators go on to become addicted smokers.<sup>25–30</sup>

**Covariates**

As in 2 previous studies,<sup>13,15</sup> we controlled for a broad range of covariates including age, gender, race, parent education, self-reported school performance, sensation seeking (“I like to do scary things”; “I like to do dangerous things”; “I often think there is nothing to do”; “I like to listen to loud music”; [Cronbach’s  $\alpha$  = .59]),<sup>31,32</sup> rebelliousness,<sup>33</sup> self-esteem (“I wish I were someone else”; “I like myself the way I am”; “I am happy with how I look”; “I feel like I’m smart in school” [ $\alpha$  = .61]),<sup>34</sup> parent and sibling smoking, peer smoking, and parenting style.<sup>35</sup>

Additional covariates, assessed in a sensitivity analysis, included adolescents’ weekly spendable income, access to cigarettes in the household (“If you wanted to, could you get cigarettes from home without your parents knowing?”), extracurricular activities (team sports, other sports without a coach, church or other religious activities, music or dance, school clubs, and other clubs), weekday television use (“On school days, how many hours a day do you usually watch TV?”), weekday video-game use (“On school days, how many hours a day do you usually spend playing video or computer games?”), and self-regulation (“I am good at waiting my turn,” “I get my homework done first so I can have fun later,” “I bother other students trying to work,” and “I have to be reminded several times to do things”), parental oversight of smoking behavior (“If you smoked, do you think your parents would notice?”), and parent report of household income.

**Statistical Analysis**

Preliminary analyses consisted of descriptive frequencies using weighted  $\chi^2$  tests to compare differences in proportions and weighted *t* tests to compare mean differences by group. Lowess (locally weighted scatter plot) smoothed methods<sup>36</sup> were used to graph the relation between exposure to movie smoking and adolescent smoking. We used weighted logistic-regression models to assess smoking initiation as a function of movie smoking exposure (categorized by quartiles) and covariates. The procedure uses the Taylor expansion method to estimate sampling errors of estimators based on complex sample designs.<sup>37,38</sup> All statistical tests were conducted by using the “survey” commands in SAS (SAS Institute, Inc, Cary, NC). We conducted multivariate analyses by using fully adjusted models that included all the terms for child characteristics, social influences, and parenting characteristics used in our previously published models<sup>13,15</sup> with the exception of ownership of a branded cigarette promotional item, in part because distribution of branded promotional items ended in 1999 with the implementation of the Master Settlement Agreement. We assessed model fit and interaction terms with changes in deviances and standard diagnostic plots. Variance calculations were checked by using jackknife resampling. Results were judged significant if *P* < .05 in a 2-sided test. Using previously described methods,<sup>15</sup> the adjusted attributable risk for smoking initiation was estimated for each adolescent by setting their movie smoking exposure to the reference level (quartile 1), holding other measured covariates constant, and then applying weights to estimate the number and proportion of affected US adolescents.

We tested the robustness of our findings with a sensitivity analysis, first by adding the additional covariates (1 at a time) to the full model to determine if there was residual confounding. Any variable that changed the estimates for the effect of movie exposure by >10% when added to the model was considered potentially important. Simulation methods, similar to those used in our previous studies,<sup>15</sup> were then used to test whether an unmeasured confounder could falsely implicate movie exposure as a risk factor.

**RESULTS**

**Exposure to Smoking in Movies**

Movie smoking was present in 74% of movies in the total sample of 532 movies. The total number of movie smoking occurrences contained in each list of 50 movies was normally distributed (mean: 366; SD: 64). In accordance with previous findings,<sup>22</sup> the presence of movie smoking was directly associated with

the Motion Picture Association of America rating, with smoking occurrences present in 25%, 44%, 77%, and 87% of G-, PG-, PG-13-, and R-rated movies, respectively. Adolescents had seen a mean of 13 (SE: 0.11) of the 50 movies on their individualized list, through which they received a mean exposure of 61 (SE: 0.82) movie smoking occurrences. Exposure to smoking in movies was significantly higher among Hispanic (mean: 65 smoking occurrences [SE: 2.1]) and black (mean smoking occurrences: 74 [SE: 2.7]) adolescents compared with white adolescents (mean: 57 smoking occurrences [SE: 0.9]) ( $P < .001$ ).

**Association Between Exposure to Smoking in Movies and Smoking Initiation**

The prevalence of ever having tried smoking, after applying population weights, was 0.10, an estimated 2.2 million US adolescents using the population weights. A smoothed lowess curve of the unadjusted association between exposure to movie smoking and adolescent smoking (Fig 2) illustrates a positive association between exposure to movie smoking (as a percentile ranking) and adolescent smoking initiation. Smoking prevalence rises steadily throughout the entire range of exposure, from <0.01 for minimally exposed adolescents to 0.30 for adolescents with maximum exposure. Similarly, smoking prevalence increased significantly with each higher quartile of movie smoking exposure: 0.02 for adolescents in quartile 1, 0.06 in quartile 2, 0.11 in quartile 3, and 0.22 in quartile 4 ( $P < .001$  for comparison of quartile 1 with quartile 2, quartile 2 with quartile 3, and quartile 3 with quartile 4). As illustrated in Fig 3, this relation is consistent across racial/ethnic categories. There was also no difference in response by region of the country.

**Relation Between Covariates, Exposure to Smoking in Movies, and Having Tried Smoking**

Table 2 shows the association between covariates and movie smoking exposure (column 2) and adolescent smoking initiation (column 3). Column 2 shows the mean movie smoking exposure for each

comparison category divided by mean movie smoking exposure in the referent category for each covariate. Age, peer smoking, sensation seeking, and rebelliousness were most strongly associated with the movie smoking exposure and adolescent smoking initiation. Other moderately strong confounders included sibling and parent smoking, maternal responsiveness, and school performance, whereas race, gender, and parent education were weak confounders.

**Multivariate Analysis**

Adolescents with higher exposure to movie smoking were significantly more likely to try smoking even after controlling for all covariates identified in Table 2, including sociodemographics, social influences, personality factors, and parenting style. Table 3 gives crude and adjusted odds ratios (ORs) for the relation between each of the variables and smoking initiation. As illustrated in Table 3, the magnitude of the movie smoking–adolescent smoking association was similar to parent or sibling smoking. Other factors significantly associated with smoking initiation in the fully adjusted model were age, parent education, peer smoking, sensation seeking, and rebelliousness. There were no statistically significant interactions.

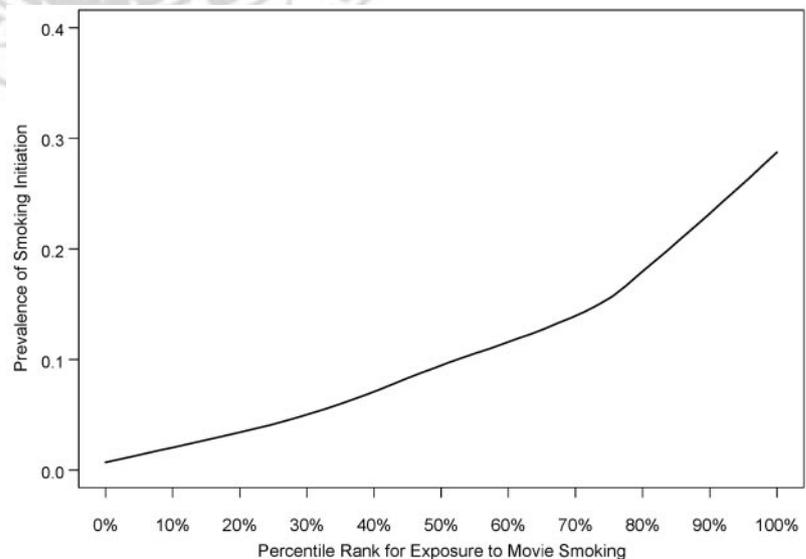
**Attributable Risk**

The adjusted attributable fraction, modeled by setting movie smoking exposure to quartile 1 for adolescents in higher quartiles and keeping other risk factors constant, was 0.38 (95% confidence interval [CI]: 0.20, 0.56). This indicates that exposure to movie smoking is an independent, primary risk factor for smoking initiation among 38% of those who had tried smoking.

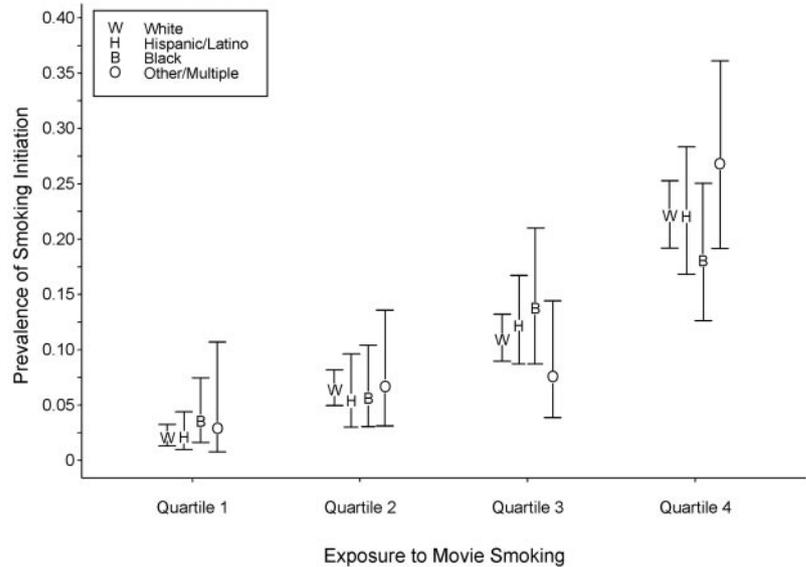
**Sensitivity Analysis**

The 8 additional covariates (adolescents’ weekly spendable income, access to cigarettes in the household, extracurricular activities, weekday television use, weekday video-game use, self-regulation, parental oversight of smoking behavior, and parent

Fig 2. Crude association between exposure to movie smoking and smoking initiation.



**Fig 3.** Association between exposure to movie smoking and smoking initiation by race/ethnicity. Error bars refer to 95% CIs for the proportion.



report of household income) were added singly and then simultaneously to the fully adjusted logistic model. Their introduction did not change the adjusted ORs for the association between exposure to movie smoking and smoking initiation by >10%. Based on the multivariate model with 22 variables (all variables in Table 3 plus the 8 additional covariates), the adjusted ORs for the relation between movie exposure and smoking initiation was strong and statistically significant; compared with quartile 1 the adjusted ORs for each quartile of smoking exposure, compared with the first quartile, were 1.7 (95% CI: 1.1, 2.7) for quartile 2, 2.0 (95% CI: 1.2, 3.1) for quartile 3, and 2.7 (95% CI: 1.7, 4.2) for quartile 4.

Our simulation studies indicate that it is highly unlikely that an unmeasured covariate was responsible for the association between exposure to movie smoking and smoking initiation. To falsely implicate movie smoking exposure as a risk factor, a potential confounder would need to be independent of all other covariates that we measured and be strongly associated with both movie exposure and smoking initiation. In this case, the product of the z value (a z value of 1.96 corresponds to a P value of .05) for the association between the unmeasured covariate and smoking in films with the z value for the unmeasured covariate and adolescent smoking would have to be >64. With regard to measured confounders, only age (with a z-value product of 150) and friend smoking (with a z-value product of 70) met this cutoff.

### CONCLUSIONS

This is the first study to demonstrate a direct relation between viewing smoking in movies and smoking initiation among a nationally representative sample of US adolescents. Our data indicate that the association is similar across broad geographic regions of the country and among different ethnic and racial groups. Moreover, the association estimates for this nationally representative sample are remarkably consistent with estimates, obtained previously by using similar methods in a predominantly white

northern New England sample.<sup>13,15</sup> The findings indicate that all US adolescents, regardless of race or place of residence, have a higher risk of smoking initiation as their exposure to movie smoking increases. Although the magnitude of the association was consistent across racial and ethnic groups, we found that Hispanic and black adolescents were exposed to significantly more movie smoking than their white counterparts; thus, the population impact of the exposure may be even higher for these minority groups.

The adjusted attributable fraction estimate of 0.38 reported on this cross-sectional sample is lower than, but well within the 95% CIs of, the adjusted attributable fraction estimate obtained from the longitudinal northern New England sample.<sup>15</sup> Exposure to movie smoking has a large population effect, in part because it is far more prevalent than other social influences in this age group. For example, although adolescents with friends who smoke were >3 times more likely to have tried smoking, only one fifth of adolescents in this sample reported having friends who smoke. In contrast, the majority of adolescents experienced movie smoking exposure at levels associated with a clinically important impact on smoking initiation. The combination of high exposure and a strong association between exposure and smoking initiation results in the large attributable risk estimate. It is notable that, because we did not assess the number of times that adolescents had seen each movie and we did not include all movies available to adolescents in the rental market, our measure may underestimate actual exposure.

The large attributable fraction has important public health implications because it identifies a modifiable risk factor that accounts for a substantial proportion of smoking initiation among adolescents in our country and provides a scientific basis for current public health campaigns to reduce adolescents' exposure to movie smoking. One approach would be to persuade the movie industry to voluntarily reduce depictions of smoking and cigarette brands. Alternatively, the movie industry could incorporate smok-

**TABLE 2.** Unadjusted Association Between Exposure to Movie Smoking, Covariates, and Smoking Initiation

Risk Factor	Percent*	Ratio of Means: Exposure to Smoking in Movies†	Prevalence of Smoking Initiation*
Quartiles of movie exposure			
First	24.8	Reference	0.022‡
Second	25.3	3.6	0.061
Third	25.1	7.4	0.112
Fourth	24.7	15.9	0.218
Age, y			
10	20.5	Reference‡	0.017‡
11	20.4	1.2	0.044
12	20.3	1.6	0.079
13	19.4	2.0	0.146
14	19.4	2.5	0.239
Gender			
Male	51.5	Reference‡	0.109‡
Female	48.5	0.8	0.097
Race			
White	61.6	Reference‡	0.098‡
Hispanic	16.1	1.1	0.107
Black	15.1	1.3	0.116
Other	7.1	1.1	0.113
Parent education			
High school graduate or less	39.2	Reference‡	0.134‡
Some college, vocational/technical, or associates degree	30.6	1.0	0.103
Bachelors, graduate, or professional degree	30.2	0.9	0.064
Peer smoking			
No	78.9	Reference‡	0.044‡
Yes	21.1	1.8	0.324
Parent smoking			
No	65.6	Reference‡	0.064‡
Yes	34.4	1.3	0.174
Sibling smoking			
No	86.1	Reference‡	0.077‡
Yes	13.9	1.4	0.262
School performance			
Excellent	30.2	Reference‡	0.053‡
Good	42.2	1.2	0.093
Average/below average	27.6	1.4	0.175
Sensation seeking			
Below median	48.5	Reference‡	0.034‡
Above median	51.5	1.7	0.168
Rebelliousness			
Below median	42.5	Reference‡	0.033‡
Above median	57.5	1.5	0.155
Self-esteem			
Below median	33.3	Reference‡	0.148‡
Above median	66.7	0.9	0.081
Parenting: style-demandingness			
Below median	46.8	Reference‡	0.135‡
Above median	53.2	0.8	0.076
Parenting: style-responsiveness			
Below median	45.8	Reference‡	0.146‡
Above median	54.2	0.8	0.067

\* Weighted to reflect the US population of adolescents aged 10–14 years.

† For each category the ratio equals mean movie smoking exposure divided by mean movie smoking exposure in the referent category.

‡  $P \leq .001$  for the test of overall significance of categories within this variable.

ing into the movie ratings system to make parents aware of the risks a movie with smoking poses to the adolescent viewer.<sup>37</sup> An additional consideration, from an intervention standpoint, is that parental restriction on viewing R-rated movies (which contain the highest amounts of smoking) is strongly associated both with lower exposure to movie smoking and less smoking initiation.<sup>33,39</sup> The implication for clinical practice is that interventions to motivate and

assist parents in restricting adolescent movie exposure should be explored as a way of further limiting exposure to movie smoking during early adolescence.

The findings of this study differ slightly from previous reports. In our previous study of northern New England adolescents, we detected a statistically significant interaction with parent smoking, such that the movie smoking effect was present only for ado-

**TABLE 3.** Relation Between Exposure to Movie Smoking and Adolescent Smoking Initiation

Risk Factor	Association With Smoking Initiation	
	Crude OR*	Adjusted OR (95% CI)†
Quartiles of movie smoking exposure		
First	Reference	Reference
Second	2.9*	1.7 (1.1, 2.6)
Third	5.5*	1.8 (1.2, 2.8)
Fourth	12.6*	2.6 (1.7, 4.1)
Age, y		
10	Reference	Reference
11	3.0*	2.5 (1.4, 4.5)
12	5.2*	3.2 (1.8, 5.7)
13	11.0*	4.4 (2.6, 7.6)
14	19.7*	6.3 (3.7, 10.7)
Gender		
Male	Reference	Reference
Female	0.9	1.1 (0.9, 1.4)
Race		
White	Reference	Reference
Hispanic	1.1	1.0 (0.7, 1.3)
Black	1.2	1.1 (0.7, 1.6)
Other	1.2	1.0 (0.7, 1.6)
Parent education		
High school graduate or less	Reference	Reference
Some college, vocational/technical, or associates degree	0.7*	0.8 (0.6, 1.0)
Bachelors, graduate, or professional degree	0.4*	0.6 (0.5, 0.9)
Peer smoking		
No	Reference	Reference
Yes	10.6*	3.3 (2.6, 4.2)
Parent smoking		
No	Reference	Reference
Yes	3.1*	1.8 (1.5, 2.3)
Sibling smoking		
No	Reference	Reference
Yes	4.3*	2.3 (1.8, 2.9)
School performance		
Excellent	Reference	Reference
Good	1.9*	1.0 (0.7, 1.4)
Average/below average	3.8*	0.9 (0.7, 1.4)
Sensation seeking‡	1.4*	1.1 (1.0, 1.1)
Rebelliousness‡	1.3*	1.2 (1.1, 1.2)
Self-esteem‡	0.8*	1.0 (0.9, 1.0)
Parenting: style-demandingness‡	0.9*	1.0 (0.9, 1.0)
Parenting: style-responsiveness‡	0.9*	1.0 (1.0, 1.0)

\*  $P < .05$ .

† Adjusted for all variables listed.

‡ Modeled as a continuous variable (OR represents a 1-unit increase in the variable).

lescents not exposed to parental smoking. Although this interaction was present in the cross-sectional and longitudinal northern New England samples, we did not detect it in this national sample. We wondered if this could be a regional phenomenon, not present among culturally diverse families; however, when we restricted the analysis to white adolescents from the Northeast, we detected no movie smoking–parent smoking interaction. The extent to which family smoking history influences the impact of media exposure remains an open question. In a separate longitudinal study, Distefan and colleagues<sup>16</sup> found that favorite stars who smoke on screen affect smoking incidence but only among adolescent girls. We have found no such gender interaction in any of our studies and suspect that the difference may be in the way the exposure was measured in that study (ie, focusing on star smoking rather than on overall smoking). It is also possible that this discrepant pattern is the result of different psychological processes such as girls more closely identifying with their favorite stars

and perhaps being more willing to adopt the behaviors they observe portrayed by the stars. By contrast, exposure to smoking per se affects boys and girls equally. Until additional research results in a better understanding of these interactions, we suggest that exposure to smoking in movies be considered a risk factor for smoking initiation among all young adolescents.

It is important to qualify that our findings do not address smoking initiation among older adolescents/young adults or the role of continued exposure to movie smoking on the transition from experimentation to addiction. Although longitudinal data from 2 regional samples have already demonstrated that movie exposure precedes adolescent smoking, the present study does not preclude the possibility that smoking initiation preceded movie smoking exposure in this sample. Another limitation of this and all observational studies is our inability to completely rule out the possibility of an unmeasured confounder. To address this in our past publications,

we have controlled for a number of personality and social influences covariates.<sup>13,15</sup> In this study, we extended that approach by controlling for additional covariates and showing that the findings are robust in the presence of an independent simulated confounding variable. Moreover, from a theoretical standpoint,<sup>40</sup> it is highly plausible that on-screen smoking would be influential because of the larger-than-life status of actors who model the exposure and the preoccupation of young adolescents with these sorts of social images.<sup>41,42</sup> Thus, we believe it is unlikely that an unmeasured risk factor confounded our results.

Low response rate can be a potential limitation to the generalizability of RDD sampling, with contemporary RDD survey response rates often falling below 50%. However, the demographic characteristics of our unweighted sample were similar to 2000 US Census results, indicating that the respondents did not differ substantially from the population at large with respect to the major sociodemographic 2000 US Census categories. In addition, our smoking-initiation prevalence estimates, overall and by race and ethnicity, were similar to those of another large study that recruited a nationally representative sample of young adolescents from schools in 2003.<sup>43</sup> Furthermore, 1 study that compared adult smoking prevalence from RDD surveys conducted over the 1990s, a period of declining response rates, with estimates of smoking prevalence from the Current Population Survey concluded: "There is no evidence that declining response rates have resulted in less accurate or biased estimates of smoking behavior."<sup>44</sup>

In summary, this study demonstrates, in a nationally representative US sample of young adolescents, that exposure to movie smoking has a strong association with smoking initiation and that the association holds within broad racial and ethnic categories and regardless of where the adolescent resides. Our study suggests that exposure to movie smoking is a primary independent risk factor, accounting for smoking initiation in more than one-third of US adolescents 10 to 14 years of age, and provides additional scientific support for public health programs aimed at reducing adolescent exposure to movie smoking.

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### MUCH DEPENDS ON DINNER

“[W]e are a nation of take-outers and drive-throughers, eating our meals on the go, dining by ourselves and laughing alone. The family dinner has become an endangered species. . . . These days, fewer than one-third of all children sit down to eat dinner with both parents on any given night. The statistics are worse if both parents are working and the family is Caucasian (Latino families have the highest rate of sharing a meal). The decline in the family dinner has been blamed for the rise in obesity, drug abuse, behavioral problems, promiscuity, poor school performance, illegal file sharing and a host of other ills. A recent study at the Harvard Medical School, for example, concluded that the odds of being overweight were 15% lower among those who ate dinner with their family on ‘most days’ or ‘every day’ compared with those who ate with their family ‘never’ or on ‘some days.’ The National Center on Addiction and Substance Abuse at Columbia University found that teens from families that almost never eat dinner together are 72% more likely to use illegal drugs, cigarettes and alcohol than the average teen.”

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