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Smoking in the Movies Increases Adolescent Smoking: A Review

Annemarie Charlesworth, MA, and Stanton A. Glantz, PhD

ABSTRACT. *Objective.* Despite voluntary restrictions prohibiting direct and indirect cigarette marketing to youth and paid product placement, tobacco use remains prevalent in movies. This article presents a systematic review of the evidence on the nature and effect of smoking in the movies on adolescents (and others).

Methodology. We performed a comprehensive literature review.

Results. We identified 40 studies. Smoking in the movies decreased from 1950 to ~1990 and then increased rapidly. In 2002, smoking in movies was as common as it was in 1950. Movies rarely depict the negative health outcomes associated with smoking and contribute to increased perceptions of smoking prevalence and the benefits of smoking. Movie smoking is presented as adult behavior. Exposure to movie smoking makes viewers' attitudes and beliefs about smoking and smokers more favorable and has a dose-response relationship with adolescent smoking behavior. Parental restrictions on R-rated movies significantly reduces youth exposure to movie smoking and subsequent smoking uptake. Beginning in 2002, the total amount of smoking in movies was greater in youth-rated (G/PG/PG-13) films than adult-rated (R) films, significantly increasing adolescent exposure to movie smoking. Viewing antismoking advertisements before viewing movie smoking seems to blunt the stimulating effects of movie smoking on adolescent smoking.

Conclusions. Strong empirical evidence indicates that smoking in movies increases adolescent smoking initiation. Amending the movie-rating system to rate movies containing smoking as "R" should reduce adolescent exposure to smoking and subsequent smoking. *Pediatrics* 2005;116:1516–1528; tobacco, prevention, film, initiation, susceptibility, media, parenting.

ABBREVIATIONS. MSA, Master Settlement Agreement; MPAA, Motion Picture Association of America; CI, confidence interval; OR, odds ratio.

The tobacco industry has long recognized the value of smoking in movies to promote cigarettes and developed extensive programs to promote smoking in the movies.¹ After the US Congress held hearings on smoking in the movies in 1989 in response to the revelation that Philip Morris paid

to place Marlboros in the film *Superman II*, the tobacco industry amended its voluntary advertising code² in 1990 to prohibit paid brand placement. In 1998, the tobacco industry signed the Master Settlement Agreement (MSA) with state attorneys general, which prohibited direct and indirect cigarette advertising to youth and paid product placement in movies.³ Despite these agreements by the tobacco industry, the amount of smoking in the movies increased rapidly in the 1990s compared with the 1980s, reversing the downward trend that had existed since the 1950s and returning in 2002 to levels comparable with that observed in 1950⁴ (Fig 1). The Centers for Disease Control and Prevention attributed the slower-than-expected decline in adolescent cigarette use during the 1990s in part to the effects of smoking in the movies.^{5,6} In recent years, there has been a wide range of research, including content analyses of films over time, focus groups, psychological experiments, and epidemiological studies on the effects of smoking in the movies, which, when taken together, provide strong and consistent empirical evidence that smoking in the movies promotes adolescent smoking.

METHODS

Using the search terms "smoking/tobacco" and "movies/films," we searched health, psychology, and social science databases (including PubMed, PsychInfo, and Eric) for research articles on smoking in the movies. We searched the Science Citation Index to find subsequent articles that cited the articles located in the initial searches, as well as following up citations in the articles that were located by using these 2 strategies. We also conducted a supplemental Internet search to locate unpublished research arti-

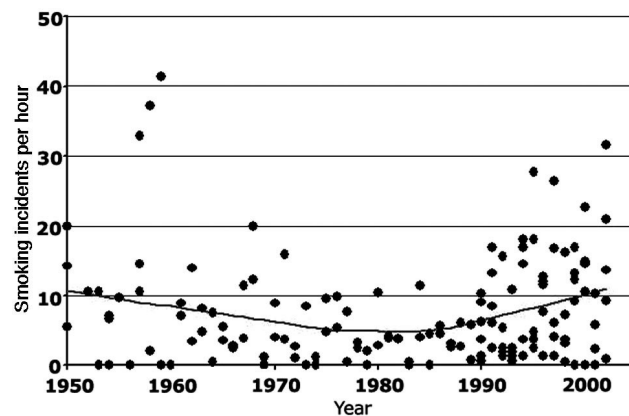


Fig 1. Smoking incidents per hour fell slowly through the 1950s through the 1980s and then increased rapidly beginning around 1990. By 2002, smoking intensity in movies had returned to the levels observed in 1950. (Redrawn from data in Glantz SA, Kacirk K, McCulloch C. Back to the future: smoking in movies in 2002 compared with 1950 levels. *Am J Public Health.* 2004;94:261–263.)

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cles (nonindustry funded) regarding smoking in the movies, resulting in reports written by the American Lung Association, World Health Organization, Massachusetts Public Interest Research Group, and University of California, San Francisco Center for Tobacco Control, Research, and Education and a doctoral dissertation from the University of Melbourne. We did not limit our search to films produced within the United States, studies conducted within the United States, or studies conducted with certain age groups. This search resulted in a compilation of 40 studies.

CONTENT ANALYSES

We examined content analyses to determine the prevalence of tobacco (including actual or implied tobacco use, smoking advertisements, and paraphernalia) in samples of movies released between 1940 and 2002. Studies involved all top-grossing films⁷⁻¹⁵ (generally the top 20 or 50 each year) or random samples drawn from top-grossing films.^{4,16-22} Results did not seem to vary according to the sampling frame; therefore, they will be combined in the discussion.

Except for children's animated cartoons, which tended to feature more cigar use,^{8,10} cigarettes are by far the most prevalent form of tobacco shown in movies.^{11,13,17} A study of movies released each decade from 1940 to 1989 found that characters shown smoking in movies peaked in the 1950s.¹⁹ The prevalence of smoking among major characters was substantially higher than among comparable (generally high socioeconomic status) people in the real world through the 1960s, 1970s, and 1980s.¹⁶ The overall prevalence of smoking among major characters in movies was close to the levels observed in the general population (~25% in the 1990s).^{19,23,24}

Magnitude of Smoking in Movies

A random sample of top-grossing films from 1950 through 2002 indicated that the amount of smoking (or other tobacco-related events) decreased from an average of 10.7 events per hour in 1950 to a low of 4.9 events per hour in 1980-1982 and then increased rapidly to 10.9 events per hour in 2002.^{4,16,17,20,22} (Fig 1). (Other studies based on more intensive samples over shorter periods yielded similar results.^{11,13,14}) Eighty-seven percent of popular films between 1988 and 1997 contained tobacco occurrences, with two thirds of those movies depicting tobacco use by ≥ 1 major character.¹¹ Almost half (46%) of the popular films from 1985 to 1995 featured at least 1 lead character who used tobacco.¹⁸ Leading actors smoked in 60% of popular films from 2002 to 2003.¹³ Although these different studies used different measures of smoking intensity, they consistently show that the pattern of smoking in movies does not mirror changes in the intensity of smoking in the actual population; between 1950 and 2000, adult smoking prevalence in the United States fell from 44% to 22.8%.⁴

Tobacco use in films in the 1980s and 1990s was not related to movie genre.^{11,18} Tobacco use was rarely relevant to a scene and even less likely to be the major focus of the scene. In a sample of 1609 tobacco-use occurrences by major and minor characters in popular movies between 1988 and 1997, only

16.2% of occurrences were relevant to the scene, and only 5% were the major focus of the scene.¹¹

Tobacco Presence According to Film Rating

The Motion Picture Association of America (MPAA) (the major film studios' lobbying organization) introduced its voluntary rating system on November 1, 1968, and has modified it several times since then²⁵ in response to public or congressional pressure. There are 5 ratings: G (general audiences, all ages admitted), PG (parental guidance suggested, some material may not be suitable for children), PG-13 (parents strongly cautioned, some material may be inappropriate for children under 13), R (restricted, under 17 requires accompanying parent or adult guardian), and NC-17 (no one 17 and under admitted).

Tobacco use remained stable in children's G-rated animated films from 1937 to 2000.^{8,10} Disney films made after 1964 (when the first Surgeon General's report linked smoking to lung cancer²⁶) contained similar rates of smoking to before 1964: at least 1 character in almost half of the films smoked.^{8,10} Good and bad characters were equally likely to smoke.^{8,10} Although the short-term negative health effects (ie, coughing) were depicted in some films (20%⁸ or 37%¹⁰ depending on the sample), none of the films depicted long-term health consequences. All children's animated feature films released from 1996 to 1997 depicted at least 1 character smoking.⁸

Until the mid-1990s, the number of smoking occurrences in films increased with the rating of the film, with R-rated movies featuring significantly more smoking than G-, PG-, or PG-13-rated films.^{7,9,21,24} In films between 1988 and 1997, R-rated films featured significantly more tobacco use by major characters (81%) than G-rated (54.6%), PG-rated (53.1%), and PG-13-rated (64%) films.¹¹

Beginning in the mid-1990s, the MPAA began to "down-rate" movies,²⁷ resulting in PG-13 ratings for many films that would have previously been rated R. This "ratings creep" also shifted the presentation of smoking incidents from mostly R-rated movies to teen-rated (PG-13) movies.^{12,13,15} By 2002, youth-rated (G/PG/PG-13) movies delivered more tobacco impressions (1 person seeing tobacco use once) than R-rated movies¹⁵ (Fig 2).

Character Tobacco Use and Motivation

The themes common to cigarette advertising²⁸ are common in movies. Smoking is routinely used to portray glamour, independence, rebelliousness,^{20,22} relaxation or stress relief,^{11,13,16,17,24} romance,¹⁹ socializing or celebrating,^{11,13,24} pensive thinking, and confiding in others.^{11,24} In contrast to true smoking-prevalence patterns, which tend to be concentrated among people with lower socioeconomic status,²⁹ smoking movie characters are primarily male, white, and from upper socioeconomic brackets.^{7,11,13,16-18,20} From the 1960s through the 1990s, the prevalence of smoking by major movie characters remained ~3 times that of comparable (high-socioeconomic-status) people in the actual population.^{16,17}

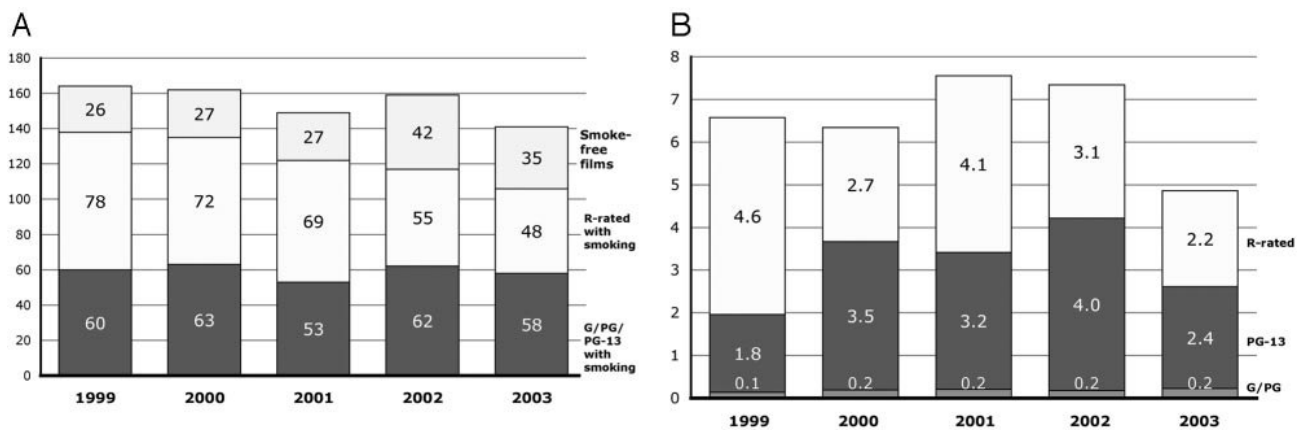


Fig 2. Beginning in 2002, more tobacco impressions were delivered to theatrical audiences in youth-rated (G/PG/PG-13) films than adult-rated (R) movies. A, Between 1999 and 2003, the number of youth-rated movies with smoking held steady, whereas the number of R-rated releases with smoking decreased 38%. B, The 20% drop in tickets sold from 2002 to 2003 (1.36–1.1 billion) accounts for 60% of the decline in tobacco impressions delivered by films in theatrical release. (This estimate does not include the number of impressions delivered through home video and broadcast television, which may have increased.) (Reproduced with permission from Polansky JR, Glantz SA. First-run smoking presentations in US movies 1999–2003. 2004. Available at: <http://repositories.cdlib.org/ctcre/tcpmus/Movies2004>.)

Smoking is often portrayed with drinking^{8,10,11} and other risky behaviors.¹¹

There are gender differences in the portrayal of smoking. Male tobacco use is associated with violent behavior, dangerous acts, and gambling, whereas female tobacco use is associated with sexual affairs, illegal activities, and reckless driving.¹¹ Men were more likely to be depicted using tobacco to reinforce their masculinity, whereas women were more likely to be portrayed using tobacco to control emotions, manage stress, manifest power and sex appeal, enhance body image or self-image, control weight, or to give themselves comfort and companionship.²¹ Various studies of movies made between 1960 and 1995 show strong majorities of male characters smoking.^{16–18,20} Smoking among female leads nearly tripled from 11% in the 1960s to 30% in 1997.^{16,17,20} An analysis of films released between 1993 and 1997 featuring the most popular female actresses²¹ (aged 21–40 years) revealed that the rate of smoking lead or supporting characters were about the same for men (38%) and women (42%). Smoking was more common in movies starring younger actresses than older actresses; movies starring actresses in the youngest age quartile depicted 3.6 times more movie smoking incidents than movies featuring actresses in the oldest age group.²¹

Smoking in films is most commonly depicted as an adult behavior, with adolescents rarely depicted smoking^{11,16}; from 1988 to 1997, adolescents were depicted smoking in only 3.7% of smoking occurrences.¹¹

Smoking is rarely presented realistically as an addiction that leads to disease and death or that causes anguish and suffering in smokers' families,^{11,16,28} especially in films made for younger audiences.²¹ Health messages related to tobacco use represented only 2% of tobacco events in the 1960s, 1% in the 1970s, and 4% in the 1980s.¹⁶ In the top 25 US films released from 1988 to 1997, negative health, social, or legal consequences of smoking were depicted by

only 3% (12 of 349) of the major characters using tobacco, and negative reactions to others using tobacco (such as negative comments or coughing) were depicted in only 6% of smoking occurrences.¹¹

A World Health Organization report that examined the prevalence of smoking in Indian films and its impact on adolescents reported similar patterns of smoking in Indian movies as had been observed in US-produced movies.³⁰ Although cigarette smokers comprise only 14% of India's total tobacco-using population, tobacco use appeared in 76% of the films sampled, and cigarettes accounted for 72% of these incidents. As in the US, smoking was associated with stress reduction, rebellion, health, romance, popularity, and masculinity. Adolescents reported that they are influenced by smoking in the movies, because they wish to emulate the stars' behavior, and that off-screen smoking was equally as influential as on-screen smoking.

The fact that the presentation of smoking in the movies was rarely realistic and rather mirrored cigarette advertising themes was not coincidental. Internal tobacco-industry documents reveal extensive efforts by the tobacco industry not only to encourage product placement and smoking in movies but also to avoid negative portrayals.¹

FOCUS GROUPS: HOW ADOLESCENTS PERCEIVE SMOKING IN THE MOVIES

Focus groups conducted in New Zealand^{31,32} and Australia³³ examined how nonsmoking adolescents perceive and interpret smoking in movies. The results reflect what adolescents say about smoking in movies, not their responses to specific questions designed by adult researchers. Despite some differences in methods, their findings were consistent: both younger (12- to 13-year-old) and older (16- to 17-year-old) teens accepted smoking images as a reflection of everyday life, perceived smoking as a common and acceptable way of relieving stress, expressed a nonchalant attitude about the presence of

smoking in movies and real life, and, although acknowledging health risks associated with smoking, still found smoking desirable.³¹⁻³³ These findings are consistent with tobacco patterns and use trends found in the content analyses.

Adult themes permeated adolescents' perceptions and attitudes about smoking, who saw smoking depictions as realistic. The prevalence of adult smoking in films (versus adolescent smoking) seems to reinforce stereotypes of adult behavior. Similarly, nonacceptance or judgment of smoking was regarded by adolescents as immature.³² Adolescents did not consider movie smoking as influential on their behavior but expressed concern that "younger" children may be impressed, which may also reaffirm their desired "adult" self-image.^{31,32} These findings suggest that adolescents do not smoke to look like other adolescents; they smoke to look like adults.

The unconscious acceptance of the smoking imagery in the movies is what may make it so powerful,³² a fact long appreciated by the tobacco industry.¹ A 1972 letter from a movie production executive to RJ Reynolds Tobacco explained that "film is better than any commercial that has been run on Television or any magazine, because the audience is totally unaware of the sponsor involvement."³⁴

EXPERIMENTAL STUDIES

Several experimental studies have examined the short-term effects of exposure to smoking in the movies on adolescents' and adults' attitudes and beliefs about smoking, smokers,³⁵⁻⁴⁰ and intent to smoke.^{35,38} The strength of experiments is that they provide data collected in a controlled environment, making it easier to draw causal conclusions. The weakness of the experiments is that it is only possible to assess effects on short-term outcomes such as attitudes in an artificial environment. These experiments, taken in the context of the other evidence, however, add substantially to the confidence we can have in the conclusion that smoking in the movies stimulates adolescent smoking. Consistent with the focus-group results, these studies found that exposure to movie smoking scenes made nonsmokers more tolerant and accepting of smoking and smokers and increased their likelihood of smoking in the future.^{35-37,40}

Effects on Adolescents

To test the effects of movie smoking on nonsmoking adolescents' self-reported levels of positive arousal (emotional reactions) and beliefs about smokers, an experiment was conducted in which 9th-grade nonsmoking teens from California viewed movie scenes from 2 youth-oriented movies containing either the original scenes with smoking or professionally edited scenes with smoking removed without changing other content by simply reframing the image to remove the smoking.³⁵ (Students were allocated randomly to the different experimental groups.) Ninety-two percent of the adolescents accurately recalled seeing the smoking. These results confirmed a 1981 correspondence between the product-placement firm Associated Film Promotions and

Brown and Williamson Tobacco that concluded that recall ability varied based on products and respondents under the age of 18 had the best overall recall rates and the highest recall for tobacco products.^{1,41}

More important, smoking scenes, compared with nonsmoking scenes, elicited significantly more positive arousal, positively impacted beliefs about how a smoker's stature and vitality are perceived by others, and positively impacted beliefs about how smokers perceive their own stature. These findings suggest that smoking in movies evokes feelings of excitement and pleasure and weakens viewers' perceptions that smoking is socially objectionable.³⁵

A study of Australian 7th- and 8th-grade students provided more details on how the portrayal of smoking by popular actors and actresses in selected 8-minute film clips affected student attitudes using a $2 \times 2 \times 2$ design: (no smoking/smoking) \times (low/high social status) \times (protagonist/antagonist).⁴⁰ Although it did not reach statistical significance, there was a trend for students to perceive high rates of smoking prevalence in the population if they saw the video clips containing smoking regardless of the other experimental conditions. Viewing the high-status smoking characters was associated with more favorable attitudes toward smoking and higher smoking susceptibility; viewing the low-status characters smoking had the opposite effect. Regardless of the social status of the protagonist or antagonist, students who saw the protagonists smoke were more likely to think smoking would enhance their social stature, whereas students who saw antagonists smoke were more likely to think that smoking would detract from their social stature. These results are consistent with other studies suggesting that smoking in movies by characters with favorable social characteristics, which represent the vast majority of smoking presentations on screen, send a prosmoking message to adolescents.

Another experiment with nonsmoking 9th graders from California examined the effects of viewing an antismoking advertisement before a smoking movie.³⁵ For adolescents who did not see the antismoking advertisement, smoking scenes generated significantly more positive arousal, led to more favorable beliefs about a smoker's stature, and increased their intent to smoke. These effects were not found in adolescents who viewed an antismoking advertisement before movie smoking. Adolescents who saw the antismoking advertisement also had significantly more negative thoughts about the lead characters who were depicted as smokers. In addition, editing out the smoking did not affect adolescents' liking of the movie. Indeed, compared with a control advertisement (unrelated to smoking), showing the antismoking advertisement before both the smoking and nonsmoking versions of the movie significantly enhanced the adolescents' ratings of the film.³⁵

These classroom-based findings were confirmed in an experiment conducted with the general public in a real theater.⁴² In a survey conducted with female movie viewers (aged 12-17 years) as they left the theater, 48% of those who viewed an antismoking advertisement before a movie with smoking later

TABLE 1. Epidemiological Studies of Effects of Smoking in Movies on Adolescent Smoking

Author (Year)	Design Sample Method	Outcome Measure	Independent Variable	Control Variables*	Results
Distefan et al ⁴⁴ (1999)	Cross-sectional (6252 California adolescents aged 12–17; 51.5% male; 54.8% white); telephone survey	Susceptibility to smoking	Favorite-star smoking status	Sociodemographics; social influences; child characteristics; parenting characteristics; smoking attitudes; teen smoking status	Stars favored by male and female smokers and never smokers differed ($P < .01$), with adolescent smokers favoring stars who were more likely to smoke on screen; in adolescent never smokers who named a favorite star, those whose favorite star was preferred by ever smokers were more likely than others to be susceptible to smoking (OR: 1.35; 95% CI: 1.12–1.62; $P < .01$), an effect only slightly weaker than exposure to family/friends smoking (OR: 1.45; 95% CI: 1.13–1.85)
Tickle et al ⁴⁶ (2000)	Cross-sectional (632 New England students aged 10–19; 90% white); self-report survey	Susceptibility to smoking; adolescent smoking behavior	Favorite-star smoking status	Sociodemographics; social influences; child characteristics	For adolescents whose favorite stars smoked in only 1 film, the odds of being higher on the smoking index was 0.78 (95% CI: 0.53–1.15); for adolescents who chose stars who were smokers in 2 films, the adjusted odds of being higher on the smoking index was 1.5 (95% CI: 1.01–2.32); for those who chose stars smoking in ≥ 3 films, adjusted odds of being higher on the smoking index was 3.1 (95% CI: 1.34–7.12); adolescent never smokers who chose stars who were smokers in films were much more likely to be susceptible to smoking (adjusted OR: 4.8; 95% CI: 1.60–14.23, for stars who smoked in 2 films, and OR: 16.2; 95% CI: 2.33–112.61, for stars who smoked in ≥ 3 films)
Sargent et al ²⁶ (2002)	Cross-sectional (3702 never-smoking adolescents in New England in grades 5–8; primarily white); self-report surveys	Susceptibility to smoking	Exposure to smoking in films	Sociodemographics; social influences; child characteristics; parenting characteristics	Strong linear relationship between susceptibility and higher levels of exposure to movie tobacco use; 14% of never smokers in the lowest category of exposure were susceptible to smoking, compared to 36% of those who had viewed ≥ 150 occurrences ($P < .001$); strong association between endorsement of positive expectations and exposure to higher levels of tobacco use in movies; only 14% of those in the lowest category of exposure to tobacco use in movies endorsed >2 positive expectations compared with 31% of those in the highest category of exposure ($P < .0001$); category of exposure ($P < .0001$); compared with adolescents exposed to <50 occurrences of tobacco use, the adjusted OR of susceptibility to smoking for each higher category was 1.2 (51–100 occurrences) (95% CI: 0.9–1.5), 1.4 (101–150 occurrences) (95% CI: 1.1–1.9), and 1.6 (>150 occurrences) (95% CI: 1.3–2.1)
Dalton et al ⁴⁸ (2002)	Cross-sectional (4544 New England adolescents in grades 5–8; primarily white); self-administered surveys	Smoking (and drinking alcohol) initiation	Parental restriction on R-rated movies	Sociodemographics; social influences; child characteristics; parenting characteristics	Ninety percent of students in the sample were younger than 14, but only 16% reported that they were never allowed to watch R-rated movies; one third (31%) indicated that parents never restricted them from watching R-rated movies; across all grade levels, students who reported complete or partial restrictions for R-rated movies viewed

Sargent et al ⁴⁹ (2003)	Cross-sectional (4910 New England adolescents aged 9–15; primarily white); self-administered surveys	Exposure to movie smoking	Parental limits on children's movie access	Sociodemographics; social influences; child characteristics; parenting characteristics; media habits	<p>significantly fewer PG-13- and R-rated movies than students whose viewing was not restricted (mean for complete restriction: 0.9; mean for partial restriction: 4.0; mean for no restriction: 7.8); 18% of the student sample had tried smoking and 23% had tried drinking; both smoking and drinking were significantly associated with the level of restriction for R-rated movies; compared with children with no restrictions, the adjusted relative risk for having tried smoking were 0.74 (95% CI: 0.65–0.85) for those partially restricted and 0.29 (95% CI: 0.19–0.45) for those with complete restrictions</p> <p>Smoking exposure increased by ~10% (150 depictions) for each additional movie channel and for every 2 videos watched each week; going to the movie theater more than once per month was associated with an average increase of ~30% more movie smoking depictions; parental restriction of R-rated movies had the strongest and most significant effect on exposure to movie smoking; compared to children who reported full restrictions, those with no restrictions had seen an average of ~50% more smoking occurrences (650 occurrences), and those with partial restrictions had seen an additional 260 occurrences</p>
Dixon ⁴⁰ (2003)	Cross-sectional (2610 Victoria, Australia, adolescents in grades 7–12; primarily white; no former smokers); self-administered survey	Smoking status	Amount of on-screen smoking by favorite actors and actresses	Sociodemographics; social influences	<p>No significant effect of favorite-star smoking status on beliefs or intention to smoke among never and experimental smokers; on-screen smoking by favorite male actors was positively associated with smoking behavior, especially among female adolescents; no significant effect of on-screen smoking by female favorite actors</p>
Dalton et al ⁵⁰ (2003)	Cohort (2603 New England adolescents in grades 5–8; primarily white; never smoking at baseline); self-administered survey; follow-up 13–26 months later	Smoking initiation	Exposure to movie smoking	Sociodemographics; child characteristics; social influences; parenting characteristics	<p>Ten percent of the students (259) initiated smoking during the follow-up period; most (80%) of the initiated reported smoking "just a few puffs" of a cigarette (n = 208); only 2% (n = 6) of those had smoked >100 cigarettes during the follow-up period; relative to the lowest quartile of movie smoking exposure, the relative risk for smoking initiation was 2.71 (95% CI: 1.73–4.25) for adolescents in the top quartile of exposure, with a positive dose-response relationship; significant interactions were found between exposure and parental smoking behavior (P = .003); in adolescents with nonsmoking parents, the risk of initiating smoking increased substantially with greater exposure to movie smoking, with the risk of smoking among adolescents in the highest level of movie smoking exposure being similar regardless of parents' smoking behavior; after controlling for all other covariates, 52.2% (95% CI: 30.0–67.3%) of smoking initiation in this cohort can be attributed to exposure to smoking in the movies</p>

TABLE 1. Continued

Author (Year)	Design Sample Method	Outcome Measure	Independent Variable	Control Variables*	Results
Distefan et al ⁴⁵ (2004)	Cohort (2084 California adolescents aged 12–15; nonsmokers at baseline); telephone survey; follow-up survey 3 years later	Smoking initiation	Favorite-star smoking status	Sociodemographics; social influences; child characteristics; parenting characteristics; smoking attitudes; teen smoking status	One third of never smokers nominated a star who smoked on screen, which independently predicted later smoking risk (OR: 1.36; 95% CI: 1.02–1.82); adolescents whose favorite stars smoked on screen (34.6%) were more likely to be girls (39.2% vs 29.9%) aged 14–15 at baseline (40.7%); significant interactions were also found between adolescent gender and favorite-star onscreen smoking ($P = .01$); when multivariate analysis was restricted to girls, having a favorite star who smoked on screen increased the risk of smoking almost twofold (OR: 1.86; 95% CI: 1.26–2.73); compared with adolescent girls whose favorite stars did not smoke, those whose favorite stars smoked in movies that were released from 1994 to 1996 (prebaseline) had increased odds of smoking by >80%
Sargent et al ⁵¹ (2004)	Cohort (2596 New England adolescents aged 10–14; non-smokers at baseline; primarily white); self-administered survey at baseline; telephone survey 13–26 months later	Smoking initiation	Parental restrictions on viewing R-rated movies	Sociodemographics; social influences; child characteristics; parenting characteristics	Only 19% of adolescents at baseline reported that their parents never allow them to view R-rated movies, 29% were allowed to see them once in a while, and 52% could see R-rated movies sometimes or all the time; 10% of the sample reported trying smoking during the follow-up period; exposure to R-rated movies decreased significantly with increasing parental R-rated–movie restriction; only 4.9% of adolescents who were never allowed to see R-rated movies had high exposure to movie smoking, compared with 20% who were allowed to watch once in a while, and 54% who were allowed to watch sometimes or all the time; smoking-initiation rates increased as parental restriction of R-rated movies decreased (2.9% for adolescents reporting that their parents never allowed R-rated movies, 7.0% for those who were allowed to view them once in a while, and 14.3% for those who were allowed to view them sometimes or all the time); compared with adolescents who were never allowed to view R-rated movies, the adjusted relative risk for trying smoking was 1.8 (95% CI: 1.1–3.1) for those who were allowed to watch R-rated films once in a while and 2.8 (1.6–4.7) for those who were allowed to watch some or all the time; effects were especially strong among adolescents from nonsmoking families for whom the adjusted relative risk for smoking was 4.3 (95% CI: 1.4–13) for those who were allowed to view R-rated films once in a while and 10.0 (3.6 to 31) for those who were allowed to view R-rated films sometimes or all the time
Sargent et al ⁵² (2005)	Cross-sectional (6522 US adolescents aged 10–14); random-digit-dial telephone survey	Smoking initiation	Exposure to movie smoking	Sociodemographics; child characteristics; social influences; parenting characteristics	Overall, 10% of the sample had tried smoking (corresponding to 2.2 million US adolescents); relative to the lowest quartile of exposure, the OR for smoking initiation was 2.6 (95% CI: 1.7–4.1) for adolescents in the top quartile of exposure, with a positive dose-response relationship

Sociodemographic factors include gender, school, age, and parental education. Social-influence factors include exposure to smoking by family members and friends and receptivity to tobacco promotions. Child characteristics include rebelliousness, sensation seeking, self-esteem, and school performance. Parenting characteristics include parenting style and parental disapproval of smoking. Smoking attitudes includes attitudes toward smokers, perceived benefits of smoking, and perceived safety of experimenting with cigarettes. Media habits include movie access (movie channels, videotape use, movie theater outings) and the number of hours spent watching television and playing video games.

*Control variables.

responded that movie smoking was “not okay,” compared with 28% of movie viewers who did not see the antismoking advertisement. Recall of the antismoking advertisement was greatest among the subjects who saw heavy smoking on screen. For current smokers, the antismoking advertisement had a significant effect on intention to smoke. Compared with smokers who did not see the antismoking advertisement, a significantly higher percentage of current smokers said they were unlikely to be smoking this time next year.

Effects on Young Adults and Adults

In studies conducted with young adults, identification with a smoking character seems to promote protobacco beliefs and attitudes and intent to smoke. As with adolescents, exposure to movie smoking is associated with adults' overestimation of smoking in real life. In a survey of Australian adults leaving theaters after the movie, more than half (52%) believed that smoking occurs more in real life than in the films; only 17% of the subject sampled believed that people in films smoke more than in real life.³⁹ Higher perceptions of smoking prevalence were associated with watching movies more frequently and lower educational status.

For smokers, exposure to movie smoking increased their desire to smoke,³⁸ likelihood to smoke in the future,^{37,38} and perceived positive image of smoking.^{36,37} Exposure to movie smoking also made nonsmokers more willing to become friends with a smoker³⁶ and increased their likelihood to smoke.³⁸ One study exposed smoking and nonsmoking undergraduate students to thematically similar 20-minute clips of the movie *Die Hard*, 1 with smoking and 1 without smoking. Compared with nonsmokers who viewed the nonsmoking clip, nonsmokers who viewed the smoking clip reported a greater willingness to become friends with a smoker.³⁶ Another study³⁸ asked smoking and nonsmoking undergraduate students to rate main movie characters from popular films on 12 dimensions, including sexiness, attractiveness, and popularity. One group rated characters in scenes with smoking and the other group rated the same characters in scenes in which they were not smoking. Viewing the smoking scenes increased the likelihood of future smoking by all participants and significantly increased male regular and occasional smokers' desires to smoke.³⁸

Similar to the effects of viewing an antitobacco advertisement before viewing movie smoking on studies with California adolescents,^{42,43} viewing antitobacco content in real movie theaters impacted Australian adults' attitudes about smoking and future intent to smoke.³⁹ Compared with subjects who saw a control movie (*Erin Brockovich*), those who saw a movie with antitobacco content (*The Insider*) showed a decline in intentions to smoke after the film regardless of whether they were current smokers, ex-smokers, or nonsmokers.

EPIDEMIOLOGICAL STUDIES

Epidemiological studies have been completed in 4 populations (Table 1): California,^{44,45} northern New

England,^{24,46–51} the entire United States,⁵² and Victoria, Australia.⁴⁰ After controlling for other known risk factors for smoking initiation, cross-sectional^{24,44,46–49} and longitudinal^{45,50,51,52} studies have demonstrated a strong dose-response relationship between the amount of movie smoking to which adolescents are exposed and the likelihood that they will begin smoking (Table 1).

Effects of Total Exposure to Smoking in the Movies

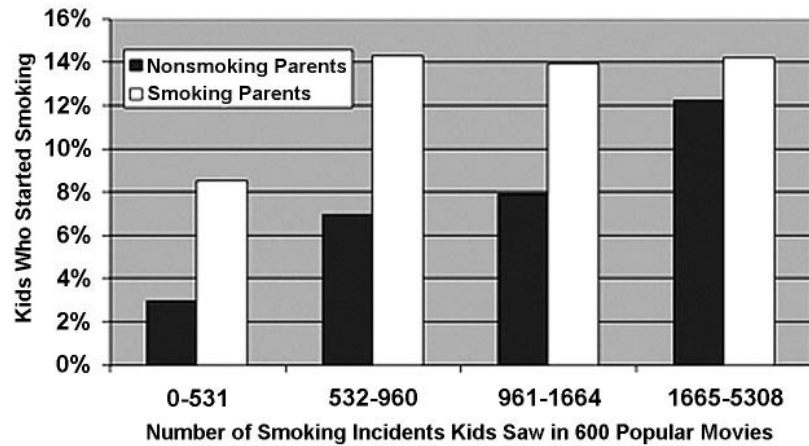
The most direct assessment of the dose-response relationship between exposure to smoking in the movies and adolescent smoking was a cohort study of nonsmoking adolescents (aged 10–14 at study entry) in Vermont and New Hampshire, who were followed for 13 to 26 months.⁵⁰ After adjusting for covariates associated with adolescent smoking initiation (Table 1), adolescents in the highest quartile of exposure to smoking in the movies were 2.71 times more likely to have started smoking than those in the lowest quartile of exposure. Fifty-two percent (95% confidence interval [CI]: 30% to 67%) of smoking initiation was attributable to exposure to smoking in the movies, a larger effect than that associated with cigarette advertising (34%).⁵³

A national cross-sectional study⁵² conducted in 2003 using the same methods as the New England longitudinal study⁵¹ yielded statistically indistinguishable results. The national study included 6522 US adolescents aged 10 to 14 who agreed to participate in a random-digit-dialing telephone survey. After adjusting for covariates, adolescents in the highest quartile of exposure to smoking in the movies were 2.6 times more likely to have started smoking than those in the lowest quartile of exposure, with a dose-response relationship. In contrast to the New England study,⁵¹ the national study did not show a significant interaction between parental smoking status and the effects of smoking in the movies; adolescents of smokers and nonsmokers were similarly sensitive to the amount of smoking in the movies.

The attributable risk fraction estimated from this national cross-sectional study⁵² was 38% (95% CI: 20–56%). Although this point estimate is lower than the 52% estimate from the New England longitudinal study, the CIs for the 2 studies overlap and both include both point estimates. Aside from random variation, the point estimates may be different because of differences in the population baseline characteristics. In particular, all the subjects in the New England longitudinal study were nonsmokers at baseline, whereas some of the subjects were (by design) already smokers in the national cross-sectional study. Therefore, the 52% estimate from the longitudinal study may be a cleaner estimate of the point estimate of the attributable risk. In either case, the effect of smoking in the movies on adolescent smoking is substantial.

The effects of smoking in the movies are especially pronounced for children of nonsmoking parents⁵¹ (Fig 3). High exposure to smoking in the movies can neutralize the effects of good (nonsmoking) parental role modeling. This observation is particularly relevant in terms of policy solutions to the problem of

Fig 3. The effects of smoking in the movies are stronger in adolescents whose parents are non-smokers than smokers. Indeed, heavy exposure to smoking in movies can negate the effects of good parental role modeling. The exposure ranges are quartiles of exposure to smoking in the movies. (Reproduced with permission from Stanton A. Glantz. Available at: www.smokefree-movies.ucsf.edu/problem/now_showing.html.)



smoking in the movies. The MPAA, which controls the voluntary ratings system, states that its “primary task [is] giving advance cautionary warnings to parents so that parents could make the decision about the movie going of their young children.”⁵⁴

Effect of Favorite-Star Smoking

On-screen smoking by adolescents’ favorite stars is another way to measure exposure to smoking in the movies (Table 1). In films from 1994 to 1996, 65% of adolescents’ favorite stars smoked in at least 1 film.⁴⁶

A cross-sectional study⁴⁴ of 6252 California adolescents aged 12 to 17 examined the relationship between teens’ smoking susceptibility and their favorite star’s smoking status. After controlling for covariates related to adolescent smoking susceptibility, they found that stars favored by adolescent smokers and nonsmokers significantly differed, with adolescent smokers favoring stars who were more likely to smoke on screen. Nonsmoking adolescents who named a favorite star preferred by smokers were more likely to be susceptible to smoking (odds ratio [OR]: 1.35).⁴⁴

In a follow-up longitudinal study⁴⁵ of 2084 California adolescents from the sample who were non-smokers at baseline, adolescents whose favorite stars smoked on screen were significantly more likely to have smoked 3 years later. After controlling for confounding variables, adolescent girls whose favorite stars smoked in movies had increased odds of smoking compared with adolescents whose favorite stars did not smoke (OR: 1.86). When multivariate analysis was restricted to boys, receptivity to tobacco promotions, but not having a favorite star who smoked on screen, was related to smoking at follow-up.⁴⁵

In a cross-sectional study of male and female adolescents in New England, the odds of having advanced smoking status and favorable attitudes toward smoking increased with the number of films in which their favorite star smoked.⁴⁶ Among never smokers, those who chose favorite stars who were smokers in films were much more likely to be susceptible to smoking (adjusted OR: 4.8 for stars who smoked in 2 films; OR: 16.2 for stars who smoked in ≥ 3 films).⁴⁶

A cross-sectional study of 2610 students from Victoria, Australia, in grades 7 to 12 who had a favorite

actor or actress did not detect any effect of on-screen smoking by the top 10 favorite actors or actresses on students’ beliefs or intentions to smoke.⁴⁰ More important, however, this study found that on-screen smoking by favorite male actors was positively associated with student smoking behavior, especially among female students. On-screen smoking by favorite female actresses did not show an association with student smoking.

The California^{44,45} and Australian⁴⁰ studies found that on-screen smoking had a stronger effect on girls than boys, whereas the New England^{46,51} and US⁵² studies found similar effects on both genders. The failure to find an effect of favorite stars on smoking by boys in California may reflect limitations in the way that the exposure measure was constructed. First, to be considered a smoker in the California study, a star had to smoke in at least 2 movies between 1994 and 1996. In contrast, the New England study classified the star as a smoker if he or she smoked in even 1 film. Hence, adolescents whose favorite stars smoked in only 1 movie in the New England study would be counted as “unexposed” in the California study, which would potentially bias the results toward the null. Second, Pamela Anderson Lee, a Playboy playmate who appeared in the television series *Baywatch*, was listed as one of the boys’ favorite stars in the California study, whereas the New England and Australian studies excluded her because her primary exposure was not in films in theatrical release. The Australian study used a continuous measure of the actual amount of smoking by the favorite actors and actresses and still found different effects for boys and girls. It may be that the finding of greater effect on girls may reflect the fact that girls prefer dramas, which contain more smoking than action/adventure films (boys’ general preference).

Preliminary studies (without controls for confounding) that examined teens’ media habits and smoking-related behaviors revealed that the more US movies that Thai and Hong Kong teenagers had seen, the greater the likelihood of their having smoked.^{55,56} For many of these teens, the desire to emulate an American lifestyle led to smoking.

Measuring total exposure in terms of total number of smoking events is a more complete and more

sensitive measure of exposure than rates of favorite-star smoking, because it captures all the exposure to smoking delivered to the viewer. It is possible to have significant smoking in a film by someone other than an adolescent's favorite star, but an adolescent seeing such a film would be considered "unexposed" in the analysis of the relationship between movie smoking exposure and adolescent smoking behavior. However, the fact that, despite these limitations, the California study found an overall effect of favorite-star smoking is consistent with the conclusions from the New England and national studies that the movies are having an effect on adolescent smoking behavior.

Relationship Between Reducing Exposure and Adolescent Smoking Initiation

Given the dose-response relationship between exposure to smoking in the movies and adolescent smoking initiation, one would predict that parental actions to reduce the "dose" would be associated with a reduction in adolescent smoking. That prediction is correct. In the New England cohort,⁵¹ exposure to movie smoking significantly decreased when parents increased restrictions on viewing R-rated movies. The reduced exposure to smoking was accompanied by corresponding reductions in smoking initiation (14.3% of the adolescents with little or no restrictions on viewing R-rated movies started smoking, compared with 7.0% for those allowed to view R-rated movies once in a while, and 2.9% for those never allowed to view them). As expected from the result that the effects of smoking in movies had the largest effects in children of nonsmoking parents (Fig 3), parental restrictions on R-rated movies had a greater impact in nonsmoking than smoking families. These findings also confirm those of earlier cross-sectional studies of the New England cohort that demonstrated that parental restriction of R-rated movies has a significant effect on exposure to movie smoking,⁴⁹ and that children with no restrictions or partial restrictions on R-rated movies were at greater risk for having tried smoking than those with complete restrictions.⁴⁸ Better enforcement of the R rating by parents and theaters could lead to a reduction in exposure to smoking in movies and, consequently, adolescent smoking.

The movie samples used in these epidemiological studies were collected from 1988 to 1997, when the majority of smoking presentations were in R-rated films. As a result, parental restriction on seeing R-rated films (presumably because of concern for language, violence, or sexual content) had a substantial effect in reducing adolescents' exposure to smoking in the movies. However, as of 2002–2003, most smoking depictions appeared in youth-rated (G/PG/PG-13) rather than adult-rated (R) films.^{12,13,15} This shift of smoking from R-rated films to youth-rated (mostly PG-13) films reduces the ability of parents who would choose to use the R rating as it was implemented in 2005 to reduce adolescent exposure to smoking in the movies. Modifying the rating system to rate smoking movies as R would permit both

parents and theaters the opportunity to prevent adolescent smoking.⁵⁷

TOBACCO USE IN MOVIES AND TOBACCO-INDUSTRY RESTRICTIONS

The Voluntary Cigarette-Marketing Code

Coming under congressional scrutiny for both youth-targeted advertising and paid product placement in 1989,¹ the tobacco industry avoided legislative control of their marketing practices by modifying their voluntary cigarette-advertising and -promotion code in 1990 to indicate that "[n]o payment shall be made by any cigarette manufacturer or any agent thereof for the placement of any cigarette, cigarette package, or cigarette advertisement as a prop in any movie produced for viewing by the general public."² The pervasiveness of brand placements in youth- and adult-rated films, however, did not change after the tobacco industry's voluntary self-regulation. In 250 top-grossing US movies released from 1988 to 1997,⁹ the frequency of tobacco brands remained stable. The type of tobacco brand appearance, however, changed after the tobacco industry's voluntary "ban" on brand placements: in films released before 1990, none contained both an actor using tobacco and background appearances (when the product's presence on screen was unrelated to characters' behavior). After 1990, 5% of films contained both actor use and background appearances, with actor use increasing from 1% to 11%. There were no differences in the frequency of brand appearances in films rated for adult versus adolescent audiences (35% vs 32%) before and after the ban (1988–1997).

The Master Settlement Agreement (MSA)

In 1998, 46 US state attorneys general settled the state lawsuits against the tobacco companies with the MSA.³ In addition to paying money to the states and accepting other restrictions on advertising, the cigarette companies agreed that they would not "make or cause to be made, any payment or other consideration to any other person or entity to use, display, make reference to or use as a prop any Tobacco Product, Tobacco Product package, advertisement for a Tobacco Product or any other item bearing a brand name in any motion picture, television show, theatrical production or other life performance, live or recorded performance of music, commercial film or video, or video game."³ Although not a law, this agreement, unlike the 1990 cigarette-marketing code, is a legally binding contract that could be enforced by a court. The MSA, however, is probably not effective in preventing unbranded movie smoking depictions (which probably would mostly benefit Philip Morris' Marlboro, the leading children's cigarette) and would not prevent tobacco companies from engaging in product-placement deals through their non-US subsidiaries.

In its first 2 years, the MSA had little short-term effect on smoking or tobacco-brand placements in youth-rated movies. A comparison¹² of youth-rated (PG-13) movies released in the 2 years before (1996–

1997) and 2 years after (1999–2000) the MSA showed that 80% of presettlement movies and 82% of post-settlement PG-13-rated movies contained tobacco use. In addition, the amount of screen time devoted to portraying tobacco increased by 50%, from an average of 0.89 minutes per film before the MSA to 1.35 minutes per film after it.¹² Brand placement in PG-13-rated movies continued after the MSA.^{12,58} The number of R-rated films with brand placements released each year did fall after the MSA, but the number of PG-13-rated films with brand display increased.⁵⁸ Although these findings may have resulted, at least in part, from the mid-1990s trend to “down-rate” movies from R to PG-13,^{15,27} the fact remains that the level of exposure to tobacco in adolescent-rated movies increased.

Although payment for tobacco placement in movies was supposed to have ended in 1990, the tobacco industry found other approaches to promote smoking in movies beyond traditional product-placement deals that met the letter of its voluntary advertising code.¹ This history suggests methods that a tobacco company might use to work around the restrictions in the MSA. In addition to formal product placement, strategies to increase tobacco’s visibility and use in entertainment media have included encouraging celebrity use and endorsement, sponsoring entertainment events, advertising in entertainment media, and using the “glamour” associated with Hollywood in advertisement campaigns.¹ In addition, internal tobacco-industry documents reveal that movie producers at times have eschewed check payments for product placement in movies, preferring cash, jewelry, or other nontraceable forms of payment.¹ Indeed, the tobacco industry has a long history of “working around” its agreements to limit its advertising and promotion activities. Analyses of cigarette advertising since the inception of the tobacco industry’s voluntary 1964 cigarette-advertising code and in succeeding years since its 1990 revision indicate that major provisions of the code have been routinely violated.^{59,60}

The MSA also does not apply to payments for product placement by the non-US subsidiaries of the multinational tobacco companies, as was done when Philip Morris Europe (based in Switzerland) made an agreement with Pinewood Studios (in England) to place Marlboros in *Superman II*.⁶¹ or when Philip Morris’ advertising agency (in Japan) worked through a Swiss intermediary to pay the London-based producers of the James Bond movie *License to Kill* \$350 000 to feature Lark cigarettes as part of its effort to open up the Japanese market.^{1,62,63} Both of these transactions could be executed today without violating the MSA.

Smoking in the movies increased in youth-rated films despite the 1998 MSA prohibiting tobacco marketing to youth. A population-attributable risk calculation suggests that the movies account for ~390 000 new adolescent regular smokers in the United States annually,⁵³ enough to replace the 400 000⁶⁴ active smokers that the tobacco industry kills every year. In addition, the distribution of movies featuring smoking to international audiences

with even less public health protections than in the United States promises to recruit an untold number of young new smokers around the world.

CONCLUSIONS

Content analyses, focus groups, psychological experiments, and epidemiological studies provide a consistent chain of evidence that smoking in the consistent leads adolescents to hold more protobacco attitudes and beliefs, which is consistent with the observed dose-response relationship between exposure to smoking in the movies and initiation of adolescent smoking. Movies teach children the same smoking stereotypes (glamour, coolness, attractiveness, sexiness, rebelliousness) and adult motivations (stress relief, celebration, romance) for smoking that pervade tobacco advertising and help establish the perception that smoking is normal, prevalent, and even desirable in society, especially among adults. The images of smoking in movies both normalize the behavior and downplay the negative health effects associated with smoking, encouraging more tolerant, neutral, or nonchalant attitudes about smoking. Although teens generally acknowledge the long-term health risks associated with smoking, they immediately experience the perceived short-term benefits of smoking, such as looking tough or sexy or fitting in with their peers, which reinforces and motivates adolescent smoking.⁶⁵ The overrepresentation of smoking in the movies with only positive outcomes contributes to adolescents’ increased perceptions of smoking prevalence and the benefits of smoking and increases their likelihood of beginning to smoke.^{66–68}

Movies are such a powerful influence on adolescents that they can negate the effects of positive parental role modeling on smoking²⁶ (Fig 3). Parental restrictions on viewing R-rated movies significantly reduced youth exposure to movie smoking and subsequent smoking.⁵¹ As of 2005, >80% of PG-13- and R-rated movies contain smoking. As the movie industry shifts a greater share of their movies from the R to the PG-13 category, the smoking depictions contained in these movies become accessible to more adolescent viewers. This shift of smoking from R-rated movies to PG-13-rated movies reduces the effectiveness of parental R-rated movie restriction would have on adolescent smoking. Amending the ratings system to rate movies with smoking as R (as is done with strong language) would reverse the effects of ratings creep and substantially reduce adolescent exposure to smoking in movies. (An exception could be made for the few films that actually portray the negative consequences of smoking or a real historical figure who actually smoked, such as Winston Churchill). Because PG-13-rated films generally make more money than R-rated movies, producers would simply leave tobacco out of movies designed to be marketed to youth audiences, further reducing exposure.⁵⁷

Such a policy change, as well as a requirement to disclose tobacco-industry involvement by the people involved in making a film (similar to the disclosures that are routinely required of people publishing articles in medical journals⁶⁹), an end to brand identi-

fication, and antismoking advertisements run before movies containing tobacco use could substantially reduce the number of adolescents who begin smoking quickly, painlessly, and at low cost.

None of these policy changes would prohibit any content in a film or preclude artistic decisions by film makers. In particular, modernizing the MPAA's voluntary ratings system to treat smoking in the same way as "adult" language and rate new movies with smoking as R is not censorship. It would leave the free choice of whether to include smoking and accept an R rating with the producers and directors.

There are several opportunities for pediatricians to intervene to reduce the effects of smoking in the movies on their patients and children generally. They should educate them about the powerful effect that smoking in the movies has on children and encourage parents to enforce the R rating, because doing so reduces youth exposure to smoking in the movies and adolescent smoking initiation. As of March 2005, people can determine the tobacco-use status of films in theaters and on video at www.SmokeFreeMovies.ucsf.edu, www.SceneSmoking.org, and www.ScreenIt.com. Until the motion picture industry amends its voluntary ratings system to treat smoking in the same way that it treats offensive language and rates movies with smoking as R, parents can consult these Internet resources to determine which youth-rated movies include smoking and avoid those films.

In addition to encouraging individual action, pediatricians and the families who they serve can join organized efforts to advocate for the 4 policies described above. These policies, first advanced by the University of California Smoke Free Movies project (www.SmokeFreeMovies.ucsf.edu), have been endorsed by the American Academy of Pediatrics, among others. Because of the strong evidence of the linear dose-response relationship between smoking exposure and adolescent smoking, such policy changes would eventually reduce adolescent exposure (and initiation) by ~60%, preventing ~200 000 adolescents from starting to smoke each year and preventing ~62 000 premature deaths.⁵³

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