

Does Film Smoking Promote Youth Smoking in Middle-Income Countries?: A Longitudinal Study among Mexican Adolescents

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Abstract

Objective: To determine whether exposure to smoking imagery in films predicts smoking onset among never-smoking Mexican adolescents.

Methods: The analytic sample was comprised of 11- to 14-year-old secondary school students who reported never having tried smoking at baseline, 83% (1,741/2,093) of whom were successfully followed-up after 1 year. Exposure to 42 popular films that contained smoking was assessed at baseline, whereas smoking behavior and risk factors were assessed at baseline and at follow-up. Logistic regression was used to estimate bivariate and adjusted relative risks (ARR) of trying smoking and current smoking at follow-up.

Results: At follow-up, 36% reported having tried smoking and 8% reported having smoked in the previous month. Students who were successfully followed-up were exposed to an average of 43.8 minutes of smoking

in the films they reported viewing at baseline. ARRs indicated that students in the two highest levels of exposure to film smoking were more than twice as likely to have smoked in the previous 30 days at follow-up [ARR_{3v1} = 2.44; 95% confidence interval (CI), 1.31-4.55; ARR_{4v1} = 2.23; 95% CI, 1.19-4.17]. The ARR of having tried smoking by the time of follow-up reached statistical significance only when comparing the third highest to the lowest exposure group (ARR_{3v1} = 1.54; 95% CI, 1.01-2.64). Having a parent or best friend who smoked at baseline were the only other variables that independently predicted both outcomes.

Conclusions: Exposure to movie smoking is a risk factor for smoking onset among Mexican youth, although this risk appears weaker than in countries with stronger tobacco marketing regulations. (Cancer Epidemiol Biomarkers Prev 2009;18(12):3444-50)

Introduction

The National Cancer Institute monograph on mass media and smoking concluded that "evidence from cross-sectional, longitudinal, and experimental studies indicates a causal relation between exposure to youth smoking depictions and youth smoking initiation" (1). Since the National Cancer Institute monograph was written, additional cross-sectional (2-5) and longitudinal studies (6-9), including those that evidence how cumulative exposure to movies influence behavior over time by promoting pro-tobacco attitudes and perceived norms (5, 6, 10). Recent cross-sectional and longitudinal studies in Germany (3, 9) suggest the consistency of this causal relationship outside of the United States. However, there has been little research on movie smoking as a risk factor for youth

smoking in low- and middle-income countries, where the burden of the global tobacco epidemic is shifting.

The global distribution of films from the United States may influence youth in low- and middle-income countries who aspire to American cultural values. This kind of aspirational motivation for cigarettes from other countries of origin was documented for Thai youth (11), among whom a desire to "magically change yourself for 1 year" into an American teenager was associated both with higher exposure to American movies and consumption of Marlboro cigarettes. Our previous cross-sectional research found that exposure to movie smoking among Mexican adolescents was independently associated with current smoking and having ever smoked (5). Moreover, among never smokers, there was an association between higher exposure to movie smoking and hypothesized psychological mediators of the relationship between this exposure and smoking behavior, including higher susceptibility to smoking, more favorable attitudes toward smoking, and perceptions of higher peer smoking prevalence. This report describes the factors that predict smoking onset and current smoking after 1 year among those who reported never smoking at baseline.

Materials and Methods

Sample Population. Secondary schools that participated in this study included 18 secondary schools (4 in

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Zacatecas and 14 in Cuernavaca) from the 2003 Mexican administration of the Global Youth Tobacco Survey (12). Details on school selection for the current study have been described elsewhere (5). The study protocol was approved by the Institutional Review Board at the Mexican National Institute of Public Health, and passive parental consent procedures were followed. In June 2006, 90.6% of the registered students in selected classrooms ($n = 3,874$) completed a self-administered survey, which took ~45 min to finish. In June 2007, students in grades two and three in each school were again surveyed. We eliminated from the analytic sample observations from students who were in grade three at baseline because they were not followed-up due to graduation to a different school ($n = 622$). Because of our interest in smoking uptake, we included only students who reported never having tried smoking at baseline ($n = 2,093$). Elimination of those who had tried smoking at baseline was done to remove concerns about reverse causality, whereby adolescents who have tried smoking could be drawn to movies that contain smoking. Of the baseline never smokers, 83% ($n = 1,741$) were successfully followed-up.

Measurement

Exposure to Smoking in Films. Each baseline survey included the same list of 42 popular films that portrayed tobacco for at least 1 min (Fig. 1). The top 50 grossing films each year from 2003 until 2005 ($n = 150$) and the top 60 grossing films each year from 2000 until 2002 ($n = 180$) were determined using Mexico City box office earnings from the Mexican National Film and Video Industry Chamber. Films eligible for inclusion in our survey included 150 films from the 2003 to 2005 period (128 U.S. films, 12 Mexican films, and 10 films from other countries) and 15 Mexican-made films among the 160 top films from 2000 to 2002. These 15 Mexican films from the earlier period were included because of their continued popularity, as indicated by their being shown regularly on television and being sold by street vendors at the time of data collection. Also, future analyses aimed to determine whether the effect of imagery differed for Mexican versus U.S. films. For each of these 165 eligible films, we assessed the total seconds of screen time in which tobacco products, tobacco packaging, and smoke known to emanate from lighted tobacco products were portrayed. All tobacco products were assessed in this measure; however, we generally refer to "smoking" exposure because smoking comprises the vast majority of tobacco use in popular films (13). Inter-rater assessments of screen-time smoking in a subset of coded films was high ($r = 0.99$). A fuller discussion of our methodology has been published elsewhere (5).

We eliminated from consideration films with <1 min of screen-time smoking (69 of 165), to capture a broader range of exposures than a random selection of films would have allowed. To have a sufficient number of Mexican films, all Mexican films with >1 min of smoking were included in the final list (15 of 15). However, due to concerns about response burden, we randomly selected ~60% of the remaining U.S. (23 of 38) and other foreign films (4 of 6). The films included had slightly higher average screen-time exposures to smoking than the eligible but excluded films (4 versus 3.5 min, respectively). Two bogus film titles were also included, and a dummy variable was derived to assess and adjust for overreport of seeing either (1) or neither

(0) of these films. The total seconds of exposure to smoking portrayals were summed across all films each student reported having seen, and this was converted into minutes of exposure. Total film tobacco exposure was divided into quartiles, with the lowest quartile as the reference group.

Smoking Susceptibility and Behavior. As is standard practice (14, 15), students were classified as not susceptible if they indicated that they would "definitely not" accept a cigarette if a friend offered it to them and "definitely not" smoke in the next year, whereas students who stated otherwise to either question were classified as susceptible. Students who reported having never smoked even a puff of a cigarette at baseline were selected into the analytic sample. Because movie smoking seems to have its strongest effect on smoking onset (9, 16), we studied follow-up reports of having ever smoked even a puff as "trying smoking" and having smoked at least once in the previous 30 days as "current smoking." This measure of current smoking is standard for national surveys of adolescents, such as the annual Centers for Disease Control Youth Risk Behavior Survey (17). Progression to more established smoking is rare among nonsmoking youth of this age, but past-month smokers have higher nicotine addiction and likelihood of progression toward daily smoking than those who have only tried smoking (18, 19).

Control Variables. A variety of factors were assessed which could confound the association between exposure to smoking in films and smoking outcomes. Sensation seeking involves seeking and enjoying high sensory experiences (20), including risk behaviors (16, 21, 22), and has been associated with more frequent media exposure (23). The Brief Sensation Seeking Scale-4 has good measurement properties in surveys of U.S. (24, 25) and Mexican youth (5, 26), and had good internal consistency in our analytic sample ($\alpha = 0.80$). Responses to these four questions were averaged, with higher scores indicating higher sensation seeking. Tertiles were derived, with the reference group being those with lowest sensation seeking. Low self-esteem also predicts adolescent smoking uptake among U.S. youth (16) and is positively associated with susceptibility to smoking (26) and smoking behavior among Mexican adolescents (5). Related psychological constructs, such as low personal adjustment (27) and contentedness (28), have been associated with higher mass media exposure. Three items (i.e., "I hate how I am," "I would like to be someone else," "I feel ashamed of myself") from the Coopersmith Self-esteem Inventory, which has been validated for Mexican adolescents (29), were used to assess self-esteem.

These items had good internal consistency in our sample ($\alpha = 0.86$), were averaged together, and their average used to create tertiles, with the reference group being those with the highest self-esteem.

Social network members who smoke may also promote both adolescent smoking and selective viewing of films that contain smoking. These influences were assessed with three dichotomous variables: any (1) versus no parent who smoked (0), any (1) versus no siblings who smoked (0), and best friend smoked (1) or not (0). Assessment of parental rules about smoking involved asking students what their parents would do if they found them smoking, with responses recoded as indicating punishment (0) versus no punishment (1). To assess perceived legitimacy of parental authority, students were asked whether they thought their

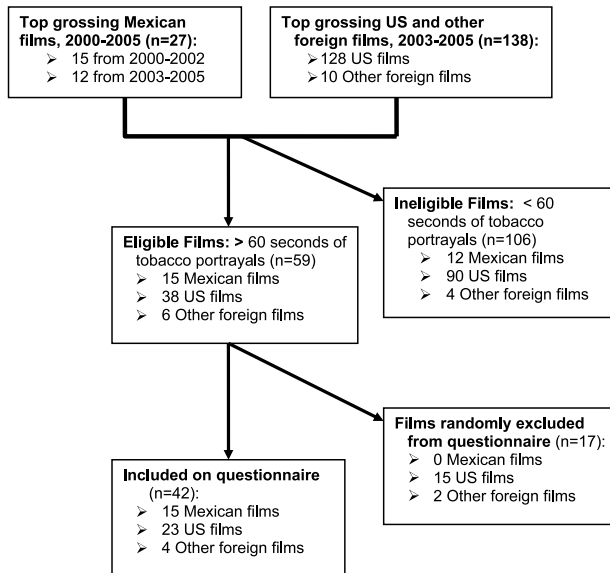


Figure 1. Selection of top-grossing films for inclusion in the questionnaire.

parents should tell them what to do about smoking, which has been validated as a correlate of smoking among U.S. youth (30). Students who responded “definitely not,” “probably not,” or “probably yes” were classified as perceiving low parental legitimacy (1) and those who responded “definitely yes” were classified as perceiving high parental legitimacy (0). We also asked whether participants had a TV in their bedroom (1) or not (0), which is a proxy for higher levels of media exposure among U.S. youth (23). Self-reported possession of an object that had a cigarette logo on it was used as an indicator of openness to tobacco industry marketing. Finally, we used private school attendance as an indicator of socioeconomic status because upper and middle class students mostly attend private school.

Analyses. All data analyses were conducted using STATA, version 11.0 (StataCorp). χ^2 and *t* tests were used to assess significant differences between students who were and were not followed-up. In further analyses, we adjusted for clustering within schools. Bivariate relative risk (RR) of having tried smoking at follow-up, as well as of current smoking at follow-up, were estimated using logistic regression models for each variable under consideration. Logistic regression was also used to estimate adjusted relative risks (ARR) of experiencing each outcome, including in multivariate models variables for which a statistically significant bivariate RR was found.

Results

Attrition Analysis. Table 1 shows the characteristics of adolescents lost to follow-up compared with those retained in the analytic sample. Adolescents lost to follow-up were significantly older, more likely to be male, to have a parent or best friend who smoked, to have reported seeing a bogus film, and to have higher exposure to movie smoking at baseline. There was no difference between

those lost and retained on exposure to sibling smoking, susceptibility to smoking, sensation seeking, attending private school, having a TV in their bedroom, or possession of something with a tobacco logo.

Main Effects Analysis. At follow-up, 35.8% ($n = 624$) of the sample reported having tried smoking and 8.1% ($n = 134$) reported having smoked in the previous 30 days. Students saw an average of 48.3 minutes of smoking, with the lowest quartile spanning no exposure ($n = 69$) to 17.89 minutes, the second, third, and fourth quartiles ranging up to 39.5, 64.3, and 176.9 minutes, respectively. Bivariate and multivariate ARRs of baseline factors associated with each smoking outcome are shown in Table 2. In bivariate analyses, the following variables were significantly associated with increased risk of trying smoking in the year after baseline: older age; having parents, siblings, or a best friend who smoked; perceiving low versus high legitimacy of parental authority over smoking; high versus low sensation seeking; low versus high self-esteem; possessing something with a tobacco logo; report of having seen a bogus film; and being in the third or fourth highest quartile versus lowest quartile of movie smoking exposure. In the adjusted model, having a parent, sibling, or best friend who smoked, as well as having high sensation-seeking propensity and low self-esteem remained statistically significant predictors of trying smoking within the year after baseline. A statistically significant association between film exposure and trying smoking was found when examining the third highest versus lowest exposure quartiles ($ARR_{3v1} = 1.54$; 95% CI, 1.01-2.64). When comparing the highest versus the lowest exposure quartiles, this association become nonstatistically significant ($ARR_{4v1} = 1.41$; $P = 0.08$).

Most of the same variables that had statistically significant, bivariate RRs associated with trying smoking were also associated with current smoking. In particular, having a parent, sibling, or best friend who smoked, high sensation seeking, low self-esteem, possessing tobacco paraphernalia, reporting having seen a bogus film, and being among the two highest quartiles of movie smoking exposure were all associated with RR of current smoking at 1 year follow-up. In contrast to the bivariate RR of trying smoking for the first time, lower perceived legitimacy of parental authority over smoking was unassociated with current smoking, and males were more likely than females to become a current smoker. In the multivariate model, having a parent or best friend who smoked, reporting having viewed a bogus film, and being in the third or fourth highest quartiles of movie-smoking exposure ($ARR = 2.44$ and 2.23 , respectively) were independent predictors of current smoking behavior.

Discussion

Results from the current study suggest that film smoking exposure predicts current smoking but has only a marginal influence on trying smoking at follow-up. The highest level of movie smoking exposure was not significantly associated with increased risk of trying smoking; however, the point estimate ($ARR_{4v1} = 1.41$) was similar to that found for statistically significant risk associated with the third highest exposure level ($ARR_{3v1} = 1.54$), suggesting that there may be a threshold effect. Longitudinal studies

in Germany (9) and the United States (16) found a stronger predictive, dose-response relationship between movie smoking exposure and trying smoking for the first time; however, this relationship was weaker in Germany than in the United States. Researchers hypothesized that this may be due to weaker tobacco regulation and a resulting greater range of social and marketing influences to smoke among German youth. The more permissive tobacco control environment in Mexico (31) may similarly account for the fact that movie smoking had a weaker influence over trying smoking. At the time of data collection in Mexico, youth smoking was on the rise (12), attitudes about smoking were generally permissive (32, 33), single cigarette sales were prevalent and allowed easy youth access (34, 35), and there were few marketing restrictions on the tobacco industry (31). Indeed, the incidence of trying smoking in our sample over the 1-year follow-up period was much higher (36%) than the 1- to 2-year incidence for similarly aged adolescents in studies conducted in Germany (19%), and much higher than among U.S. adolescents studied (10%). The findings from these three studies suggest that as the tobacco control environment strengthens and smoking incidence decreases, movies may become more important as a social influence to smoke. The role of other pro-tobacco messages and cues in Mexico may also account for why the influence of exposure seemed to have a threshold effect, with little difference in the increased risk associated with the third and fourth highest levels of exposure.

Another difference between this study and previous longitudinal studies mentioned above is that the present study found stronger movie effects for progression to a more advanced stage of smoking (30 days of smoking) than it did for having tried smoking in the previous year. In countries like Mexico, movie images of smoking may play a bigger role in helping the experimental smoker define himself or herself as a smoker. The dominance of the U.S. film industry in Mexico, as well as the market dominance of U.S. cigarette brands there (36), might mean that some youth use smoking to symbolize their affiliation with U.S. culture, as has been found for Thai youth (11).

Previous work among U.S. (37) and German (38) adolescents suggested that movie influences predominate over tobacco marketing influences in promoting trying smoking, whereas the reverse is true for the transition between onset and established smoking. Our data suggest that the effect of tobacco marketing, at least as measured

by the possession of a tobacco promotional item, does not have an independent influence on either transition. However, this measure only picks up a small range of tobacco marketing exposure and should include a fuller range of marketing influences in future analyses on this topic.

Our research involved a different method for determining film smoking exposure than has been used in other studies. For example, youth have reported their favorite movie stars, with the smoking status of these stars used to determine film influence on smoking (39). Other studies have randomly selected popular films for each students' survey and quantified exposure to the number of occurrences of tobacco use in films seen (2, 9). A random selection of movies for each survey allows for an unbiased estimate of overall exposure (40), but may be impractical for studies in lower-income countries that have fewer resources. Our approach involved determining total screen time of exposure to smoking imagery, which although correlated with the frequency of tobacco use occurrences, also accounts for the range of screen time exposures that takes place within any particular occurrence. Our fixed list of movies that each contained a minute or more of tobacco imagery achieved its aim of classifying youth along a broad range of exposure levels. The inclusion only of films with more tobacco imagery may help explain why we found a threshold effect, whereas random selection of films with more variable amounts of tobacco imagery may not allow assessment of the influence of variation at more extreme levels of exposure. The films we excluded from our list may provide important contributions to exposure, and their exclusion may have biased our results in unpredictable ways. Our particular list of movies may be confounded with other factors that explain smoking, such as seeking out movies with adult-rated themes. Nevertheless, our analyses adjusted for personality and social factors that might drive youth to view such movies. Furthermore, the fact that our results are relatively consistent with other studies, in spite of our different exposure assessment methods, suggests that the association found here is robust and may extend to other youth in other middle-income countries.

Despite the strengths of this longitudinal study, there are some limitations. One year of follow-up among young adolescents was not enough time to assess the relation between movie exposure and established adolescent smoking. However, we assessed having smoked in the last 30 days, which confers a greater risk of progression

Table 1. Characteristics of students who were and were not successfully followed

Characteristics	Followed (n = 1,741)	Not followed (n = 352)	P
Age (y)			
11 or 12	22.0%	17.4%	<0.0001
13	56.6%	51.1%	
14	21.5%	31.4%	
Male	46.9%	54.3%	0.012
At least one parent smokes	33.0%	41.0%	0.004
At least one sibling smokes	16.6%	18.5%	0.402
Best friend smokes	11.9%	17.3%	0.006
Susceptibility to smoke	39.8%	43.2%	0.260
Sensation seeking	2.37	2.41	0.521
Self-esteem	1.84	1.94	0.085
Attended private school	17.7%	18.4%	0.749
TV in bedroom	72.3%	72.6%	0.905
Own something with cigarette logo	9.9%	10.3%	0.843
Reported viewing a bogus film	8.5%	12.2%	0.027
Minutes of film tobacco exposure	43.8	49.0	0.019

toward established smoking than having tried smoking more than a month ago (18, 19). Furthermore, we only assessed movie smoking exposure before baseline, not after. Although we missed exposures that took place between survey waves, lagged exposure has been shown to have similar influences on smoking uptake as more recent exposure (8). Our lagged exposure assessment method also addressed concerns about reverse causality (i.e., adolescents who had tried smoking in the interval may have subsequently been drawn to movies that contain smoking), which we also addressed by limiting our baseline sample to never smokers. This design is in line with theories of media socialization effects (41) which suggest that cumulative exposure to movie smoking is a more important influence on smoking than particular exposures close to the onset of smoking. Nevertheless, our baseline assessment of movie smoking exposure could be criticized for including films that were released as many as 5 years prior to baseline data collection. This was done because studies of U.S. adolescents have shown that they see many older movies on DVD, and we did not want to miss these exposures. We expect that Mexican adolescents, like their U.S. counterparts (42), are less likely to see movies in the theater than on DVDs after their release—which the black market makes very accessible and affordable (\$1 USD per DVD) in Mexico. Studies with longer follow-up times and with repeated assessments of exposure are needed to confirm whether film smoking exposure accounts for further progression toward established smoking among Mexican adolescents, as has been found for U.S. adolescents (42, 43).

There is always the possibility that an unmeasured third variable confounds our results. Our analyses controlled for expectations around parental punishment for smoking and perceived legitimacy of parental authority over smoking, which had not been treated as covariates in other studies; however, we did not address other parenting practices that could confound the association between exposure to media with smoking content and smoking. Nevertheless, among U.S. adolescents, similar dose-response curves relate film smoking exposure and smoking initiation across adolescents exposed to distinct parenting styles (44). Research on such parenting practices and their relationship to media consumption should aim to assess whether these practices differentially affect Latino youth, as has been found for some ethnic youth groups (7). We also limited our sample to those who had not tried smoking at baseline, thereby eliminating from the analyses youth who were more likely to progress to established smoking. Some studies have found that films have a weaker influence on higher-risk kids, such as those who have parents who smoke (9, 16), and this possibility should be explored for Mexican youth. Finally, our data came from a convenience sample in two Mexican cities, and hence, the results may not apply to other Mexican adolescents. Nevertheless, the study sample was selected from a set of randomly selected schools that have been used to estimate the prevalence of adolescent tobacco use and risk factors in Mexico (12).

Despite these limitations, our results are consistent with other studies which indicate that exposure to

Table 2. RR of smoking initiation and current smoking at follow-up

Independent variables	Smoked in the last year		Smoked in the last 30 days	
	Bivariate RR (95% CI)	Multivariate* ARR (95% CI)	Bivariate RR (95% CI)	Multivariate* ARR (95% CI)
Age (y)				
13 vs. 11 or 12	1.37 (0.96-1.95)	1.29 (0.82-2.01)	1.60 (0.86-2.98)	—
14 vs. 11 or 12	1.41 [†] (1.03-1.93)	1.20 (0.74-1.95)	1.38 (0.93-2.04)	—
Male vs. female	1.19 (0.93-1.52)	—	1.60 [†] (1.09-2.35)	1.15 (0.76-1.74)
Any parent that smokes (1) vs. no parents who smoke (0)	1.56 [‡] (1.28-1.90)	1.52 [†] (1.18-1.95)	1.95 [‡] (1.52-2.51)	1.78 [†] (1.26-2.53)
Any sibling that smokes (1) vs. no sibling smokes (0)	1.73 [‡] (1.34-2.23)	1.49 [†] (1.14-1.95)	1.86 [†] (1.24-2.80)	1.32 (0.83-2.10)
Best friend smokes (1) vs. does not smoke (0)	2.04 [†] (1.33-3.12)	1.95 [†] (1.28-2.98)	2.85 [§] (1.60-5.06)	2.32 [†] (1.05-5.12)
Parent would not (1) vs. would (0) punish for smoking	0.99 (0.75-1.29)	—	0.80 (0.45-1.42)	—
Parental authority not legitimate (1) vs. legitimate (0)	1.22 [†] (1.01-1.46)	1.11 (0.92-1.35)	1.30 (0.98-1.74)	—
Sensation seeking				
Mid vs. low	1.19 (0.91-1.55)	0.99 (0.76-1.29)	1.03 (0.67-1.56)	0.94 (0.58-1.50)
High vs. low	2.20 [‡] (1.67-2.89)	1.50 [†] (1.10-2.04)	2.24 [§] (1.48-3.40)	1.45 (0.82-2.55)
Self-esteem				
Mid vs. high	1.14 (0.91-1.42)	1.13 (0.93-1.38)	0.95 (0.61-1.46)	0.82 (0.50-1.33)
Low vs. high	1.68 [‡] (1.34-2.11)	1.34 [†] (1.00-1.79)	2.10 [†] (1.38-3.18)	1.43 (0.78-2.60)
Private vs. public school	1.09 (0.84-1.42)	—	0.72 (0.38-1.37)	—
TV in bedroom vs. no TV in bedroom	1.12 (0.86-1.45)	—	1.58 (0.97-2.57)	—
Own something with a tobacco logo	1.84 [‡] (1.27-2.68)	1.58 (0.90-2.76)	1.99 [†] (1.12-3.54)	1.43 (0.66-3.11)
Reported seeing vs. not seeing any bogus film	1.79 [†] (1.24-2.57)	1.26 (0.70-2.28)	3.61 [‡] (2.30-5.68)	2.45 [†] (1.19-5.03)
Quartiles of film smoking exposure				
2nd vs. 1st	1.19 (0.84-1.69)	1.01 (0.64-1.60)	1.20 (0.64-2.25)	1.22 (0.59-2.51)
3rd vs. 1st	1.79 [‡] (1.35-2.37)	1.54 [†] (1.01-2.64)	2.59 [†] (1.40-4.80)	2.44 [†] (1.31-4.55)
4th vs. 1st	1.96 [§] (1.41-2.72)	1.41 (0.95-2.10)	3.71 [‡] (2.04-6.73)	2.23 [†] (1.19-4.17)

*Model includes all variables for which estimates are included in the table.

[†]*P* < 0.05.

[‡]*P* < 0.01.

[§]*P* < 0.001.

^{||}*P* < 0.0001.

portrayals of smoking in films promotes adolescent smoking. Although our results suggest that this influence may be stronger when tobacco marketing restrictions restrict or prohibit additional pro-tobacco messages, the existence of an influence appears independent of the strength of either the tobacco control environment or the sociocultural context. Policymakers should consider policies to reduce youth exposure to smoking portrayals in film and other mass media. One key policy strategy includes assigning an adult rating to films with tobacco content (45). The WHO supports this policy, which could be considered for incorporation into the WHO's Framework Convention on Tobacco Control. Indeed, the WHO-Framework Convention on Tobacco Control promotes a coordinated international response to address the challenges posed by the growing epidemic of tobacco use in low- and middle-income countries as the global tobacco industry foment this epidemic while expanding into new markets. Because ratings boards differ across each country, if this strategy is implemented in one country, it does not guarantee that a film with tobacco will be similarly rated in another country to which it is distributed. As the Conference of the Parties to the WHO-Framework Convention on Tobacco Control develops amendments to address emerging issues, including direct and indirect transnational advertising, film ratings should be included as part of that discussion.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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