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Smoking in Movies and Adolescent Smoking Initiation: A Longitudinal Study among Argentinian Adolescents

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Abstract

Objective—To assess whether exposure to movie smoking is associated with cigarette smoking among Argentinian adolescents.

Study design—School-based longitudinal study involving 33 secondary schools in Argentina. The sample included 2502 never smokers (average age at entry =12.5y), 1,700 (67.9%) of whom completed follow-up surveys 17 months later. Exposure to the top 100 grossing films for each year between 2009 and 2013 was assessed by content-coding films for tobacco, and then asking adolescents whether they had seen each of 50 titles, randomly selected from the larger pool, then parsing exposure into tertiles. Logistic regression models estimated adjusted odds ratio (AOR) for the following transitions: non-susceptible to susceptible never smoker, never smoker to ever smoker, and never smoker to current smoking (last 30 days).

Results—At follow-up, 34.4% of non-susceptible never smokers became susceptible, 24.1% reported having tried smoking, and 9.6% were current smokers. Most exposure to movie smoking

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was from US-produced films (average 60.3 minutes compared with only 3.4 minutes from Argentine films). Higher exposure to smoking in movies was significantly associated with increased odds of becoming susceptible ($AOR_{1st \text{ vs } 3rd \text{ tertile}} = 1.77$, 95% confidence interval 1.30–2.41), of trying smoking ($AOR_{1st \text{ vs } 3rd \text{ tertile}} = 1.54$, 1.14–2.08), and marginally associated with current smoking ($AOR_{1st \text{ vs } 3rd \text{ tertile}} = 1.54$, 0.99–2.40). Exposure to smoking in US- or Argentine-produced films had similar associations.

Conclusion—In Argentina, exposure to smoking in the movies predicted future smoking transitions among early adolescents, with most exposure coming from viewing US movies.

Keywords

Tobacco; film industry; Latin America; youth

Despite a growing awareness of the health threat posed by tobacco use, many Latin American countries continue to experience high smoking rates. An estimated 25.1% of Argentinian adults¹ and 21.5% of girls and 17.4% of boys (13 to 15 years old) were smokers in 2012.² Exposure to tobacco use in movies is considered a cause of adolescent smoking.^{3, 4} The World Health Organization (WHO)⁵ has recommended multinational cooperation and governmental action to reduce adolescent exposure to smoking imagery in films.⁶ This conclusion is based on results from cross-sectional studies conducted in 14 countries^{7–13} and longitudinal studies in the US, Europe^{14–20} and Mexico.²¹ However, none of these studies have examined whether exposure to tobacco imagery from films produced in the non-US country where the study was conducted has the same impact as exposure to tobacco imagery from foreign, Hollywood films. Indeed, studies among US adolescents have shown differential effects of exposure to film smoking among adolescents, especially for Black adolescents, who seemed to respond to Black actor film smoking only.^{22, 23} The lack of cultural congruence between characters in US-produced films and South American adolescents may dampen film influences. This study seeks a better understanding of the impact of nationally-produced films on youth smoking in countries like Argentina.

Previous studies have shown that tobacco depictions and brand appearances were significantly higher in Argentine films compared with US films, where tobacco product placement is prohibited.²⁴ Furthermore, popular US and Argentine movies deliver millions of smoking images and character smoking depictions to Argentinian adolescents²⁵. The Argentine National Tobacco Control Law includes a comprehensive ban on tobacco advertising, but it does not regulate tobacco in movies. The National Rating System for films does not include tobacco content as a criterion. Because this system tends to assign younger age ratings for US films in general, including for adult-rated US films that are most likely to contain tobacco, films with tobacco are more likely to be rated for general audiences in Argentina than in the US.²⁶

The objective of this study was to assess whether exposure to movie smoking was associated with progression towards cigarette smoking among early adolescents from Argentina. Our hypothesis was that exposure to tobacco smoking in movies would predict higher risk of progression to cigarette smoking after adjusting for other known risk factors for smoking onset, and that there would be a stronger association for exposure to tobacco in

domestically-produced movies than in Hollywood movies. The results of this study could be used to inform policy development to limit movie portrayals that promote risk behaviors in Argentina and in other Latin American countries.

Methods

A school-based longitudinal study was conducted in 33 schools from 3 large cities in Argentina (Buenos Aires, Cordoba, and Tucuman), with public schools identified by the Ministry of Health and Ministry of Education (n=18) and private schools identified through personal contacts (n=15; 26% of Argentinian students attend private schools. The percentage of students by school whose parents had more than 12 years of educational attainment ranged between 14 at 98% (median = 38%) indicating a wide range of economic diversity. A detailed description of school selection has already been published.²⁷ Baseline surveys were administered between May and July 2014, among students enrolled in the first year of secondary school (the US equivalent of 8th grade), with an 83% participation rate. The average age at entry was 12.5 years old. Follow-up surveys were conducted between October and November 2015 (mean interval between waves=17.1 months; range=16 to 19.3 months) with 86% of students participating. Self-administered questionnaires were completed under supervision of trained research staff unaffiliated with the schools. Participation involved passive consent from parents or caretakers and active consent from students. The surveys were conducted anonymously, with follow-up accomplished through an anonymous linking procedure.²⁸ The research protocol was approved by the human subjects research board at the Centro de Educación Médica e Investigaciones Clínicas (CEMIC), Buenos Aires.

The questionnaire included items used in surveys for adolescents previously implemented in Argentina, Mexico, and in the US.^{29–32} Items in English were translated and reviewed by Spanish-speaking research staff, and pilot tested to ensure adequate understanding of questions, instructions and confidentiality statements. The study questionnaire included a range of items on media use, tobacco marketing exposures, social influences, and perceptions of tobacco use.³³

Exposure to Smoking in Films (Independent variable)

We selected all films released in Argentina between 2009 and 2013 and listed by the Argentinian National Institute of Cinema and Visual Arts (INCAA) among the 100 highest-earning films released each year. Excluded films were: unavailable for purchase (n=6 Argentine films); produced in other countries besides the US and Argentina (n=20); not popular in the US and therefore not coded by the Dartmouth Media Research Laboratory (DMRL) (n=52 Hollywood films). The final sample included 377 Hollywood films and 45 Argentine films. All movies were content coded for smoking occurrences with a standard method validated by the DMRL.^{34, 35} The total seconds in which tobacco products, tobacco packaging, smoke known to emanate from combusting tobacco products, and tobacco advertising (e.g., billboards) appeared on screen were timed (hereafter referred to as movie smoking), other paraphernalia as ashtrays or matches were not counted as movie smoking. To evaluate inter-rater reliability for the US films, a random sample of 10% of movies was coded by two coders, yielding a kappa of 0.97 for movie smoking time depictions. Because

the sample of Argentine films was small (45 movies), 20% were double coded, yielding a kappa of 0.84.

The Beach method³⁶ was used to assess exposure. Each student received a randomly selected unique subsample of 50 film titles from the list of 422 films and indicated which ones they had seen. Movie smoking exposure was determined by: (1) summing the seconds of movie smoking exposure across all films the adolescent reported having seen; (2) dividing seconds of movie smoking seen by the total seconds of movie smoking across all 50 films in the participant's unique list; and (3) multiplying the proportion in step 2 by the total seconds of movie smoking in the full list of films (n=30417 seconds). Exposure to movie smoking was scaled to minutes of exposure, then classified into tertiles for use in logistic regression. We assessed movie smoking using the entire sample and separately for US-produced films and Argentine-produced films. There was much less exposure to smoking in the Argentine films, so, in order to allow the comparison, exposure was categorized as 0, >0 & < 30 min, and >=30 min.

Assessment of substance use and smoking susceptibility (Dependent variable)

The analytic sample included all students who reported never smoking (not even a puff) cigarettes at baseline (n =1700). At follow up, a respondent was "initiating smoking" if he or she reported having ever smoked (even a puff) and a "current smoker" if he or she reported smoking any cigarettes during the prior 30 days (these categories are not exclusive).^{37, 38} Among those who were never smokers at both waves, students were classified as not susceptible if they indicated both that they would "definitely not" accept a cigarette if a friend offered it to them and that they would "definitely not" smoke in the next year, and susceptible to smoke if they responded otherwise.

Covariates

Sociodemographic variables assessed included age (12 and younger, 13, 14 and older), sex, and highest educational attainment of either parent (7, 8–12, 12 years of formal education). Smoking-related variables included friend and household smoking (i.e. parents, siblings) (any vs none). We also controlled for sensation seeking (4 items, alpha =0.79);^{39, 40} parenting style (three items to describe responsiveness, alpha = 0.82 and another three items for demandingness, alpha = 0.70);^{31, 41} and access to media both in terms of ownership (eg, "Do you have a phone with internet access?"), and bedroom access (eg, "Do you have internet access in your room?").^{31, 35}

Analyses

All data analyses were conducted using Stata version v13 (Stata Corp, College Station, TX). To assess the extent of possible bias introduced by incomplete follow-up data, χ^2 and t tests were used to assess significant differences between students who were and were not followed-up. We ran a weighted model to reduce bias due to attrition and there was no difference in inference. As such, we present the non-weighted results because there was no evidence of attrition bias.

Bivariate odds ratios (ORs) were estimated using multilevel logistic regression with random intercept for school to regress each key outcome (changing from non-susceptible at baseline to susceptible at follow-up; initiated smoking at follow-up; current smoking at follow-up) on movie smoking exposure. Multilevel logistic regression was used to estimate adjusted odds ratios (AOR) for the relationship between movie smoking exposure and each outcome after adjusting for covariates mentioned above.

To evaluate the overall effect of exposure to movie smoking, we used tertiles of exposure to all film smoking imagery, independent of country of film production. We used tertiles due to the skewed distribution of exposure and because the cell size for using quartiles was insufficient due to overall sample size and the number of adjustment variables. Next, we assessed exposure to movie smoking in US-produced films and Argentine-produced films. Because we want to evaluate the independent effect of each variable, the exposure to US and Argentine movies was entered simultaneously into the same models. Spearman correlation coefficient between both variables was 0.30, precluding severe multicollinearity problems.

Results

The initial sample consisted of 3172 early adolescents who completed the baseline survey. Of those, 2502 (78.9%) had never tried smoking and were considered eligible. Wave 2 data collection was completed for 1700 (67.9%) of these 2502 baseline never smokers. Table I shows the characteristics of adolescents lost to follow-up compared with those retained. Adolescents lost to follow up were more likely to be male, significantly older, to attend public schools and have parents that were less educated. They also had more household members or friends who smoked.

Smoking exposure estimates were positively skewed. Students, on average, saw 114.6 minutes of movie smoking overall from the sample of 422 films (standard deviation [sd] = 111), with the lowest tertile spanning from no exposure to 41 minutes, with the second and third tertiles ranging up to 136 and 507 minutes respectively.

At follow-up, 34.4% (n = 442) of non-susceptible never smokers (n = 1286) became susceptible never smokers, 24.1% (n = 410) of the sample initiated smoking and 9.4% (n = 160) have smoked in the previous 30 days. After controlling for other baseline covariates, exposure to smoking in movies was significantly associated with increased adjusted odds ratios for smoking susceptibility (AOR_{1st tertile vs 3rd tertile} = 1.77, 95% CI: 1.30–2.41) and smoking initiation (AOR_{1st tertile vs 3rd tertile} = 1.54, 95% CI: 1.14–2.08). The adjusted association between exposure and current smoking was 1.54 and marginally significant (95% CI: 0.99–2.40, p = 0.058) (Table II and Figure 1).

The majority of the exposure to movie smoking was from US produced films (average 60.3 minutes, SD = 29.4) and compared with only 3.4 minutes (sd = 7.8) from Argentine films. Thus, more than one-half of participants (53.6%) were exposed to > 30 minutes of movie smoking from US-produced films, whereas only 10.3% of the sample had similar exposure to movie smoking from Argentine films. Students exposed to more than 30 minutes of movie smoking in Argentine-produced films had higher odds of smoking susceptibility (AOR =

1.45; 95%CI=1.03–2.02) and smoking initiation (AOR=1.42; 95%CI=1.03–1.95), but not of becoming current smokers (AOR = 1.48 (0.94–2.31) (Table III). Boys exposed for more than 30 minutes of US produced films had higher odds of smoking initiation (AOR = 2.15; 95%CI=1.12–4.10) but not of becoming susceptible to smoke (AOR = 1.53; 95%CI=0.90–2.61) or current smoking (AOR=3.10; 95%CI=0.94–10.18)

Discussion

Our study suggests that viewing smoking in movies promotes susceptibility to smoking and smoking initiation among early adolescents in Argentina, and that the effect increases significantly with greater exposure. The association is similar whether the exposure to smoking is through movies produced in the US or in Argentina, which was contrary to our expectations for a greater effect of smoking in Argentine films.^{22, 23} In the end, most of the movies seen by adolescents are produced in the US, and most of the exposure to movie smoking is through these films, even though the prevalence and duration of smoking in Argentine films is much higher than for US films.²⁴ Still, these findings support the implementation of policies the WHO recommends to comply with the FCTC and thereby reduce youth exposure to smoking in both nationally-produced and foreign-produced movies.⁵

The magnitude of the effects that we found are similar to a study from Mexico²¹, but weaker than studies in Germany⁴² and the US^{14, 43}. This difference from US and German studies could be explained by the fact that tobacco content in US-produced films has been declining from an average of 3.5 smoking occurrences per movie in 1990 to 0.23 occurrences per movie in 2007. The 1998 ban on paid tobacco product placement in US-produced films and because most popular films are from the US;^{24, 44, 45} hence, the highest levels of exposure in our study are relatively actually quite low compared with prior studies, limiting our ability to compare coefficients directly with prior studies. It appears likely that banning paid placement of tobacco products in films, pressure from public health advocacy organizations, and volunteer policies by major US film studios to reduce smoking in films rated for all audiences has resulted in lower exposure to tobacco imagery amongst contemporary Argentinian youth. Nevertheless, film smoking continues to be an important, independent risk factor for smoking initiation and is therefore a worthy target for policy action.

According to the World Health Organization, movies with tobacco portrayals should be assigned an adult rating (“18 or older”).⁶ This recommendation should be implemented in Argentina because currently tobacco content is not considered by the national rating system and films that portray tobacco, including films that receive adult ratings in the US, are likely to be rated as appropriate for youth.²⁶ Films produced in Argentina have amongst the highest prevalence and duration of smoking scenes compared with other film industries in the Americas and Europe, so the *Instituto Nacional de Cine y Artes Audiovisuales* should consider other policies recommended by WHO, such as prohibiting payments for tobacco placement and making films that include tobacco ineligible for receiving government subsidies.⁶

This study has several limitations. Loss to follow-up may affect generalizability, as higher risk adolescents in our study were more likely to be lost to follow-up. However, the follow-up retention rate was close to 70%, cushioning the attrition effects, and our analysis included statistical controls for many of the variables that are associated with smoking risk. The sample may not be representative of the general population in Argentina because schools were not randomly selected. However, selected schools had a wide range of economic diversity suggesting that the results might be generalizable to urban Argentinian populations. We only assessed movie smoking exposure before baseline and therefore our analysis missed exposures that took place between survey waves. However, lagged exposure has been shown to have similar influences on smoking uptake as more recent exposure.¹⁸ Availability of monetary resources is positively associated with smoking in some studies,⁴⁶ and even though these resources may also account for cinema attendance, this does not necessarily influence movie exposure given the widespread access to movies online and to cheap, pirated DVDs in Argentina. The movie sample was purposefully chosen to represent popular contemporary movies showing in Argentina. Some of the top movies were either unavailable for coding or could not be coded due to limited resources. If smoking in the excluded movies was higher or lower in those retained, this could have biased our estimates of exposure. Despite these limitations the results of this longitudinal study confirm the association between tobacco exposure in movies during early adolescence and smoking initiation and suggests that this global risk factor is independent of where the film is produced.

Our findings are also important for Argentina suggesting that tobacco exposure should be included in the rating system and films with tobacco content, accordingly, be given mature ratings. Because 30% of films get rated for minors eliminating smoking from these films is likely to substantially reduce exposure to this imagery. In addition, the government should limit funding supporting the production of movies with tobacco portrayals.

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Figure 1.
Distribution of tobacco exposure in movies in the entire sample and in movies produced in the US and in Argentina.

Figure 2.
Transition from non-susceptible to susceptible to smoking and transition from never smoker to ever smoker or current smoker by tobacco exposition in movies

Table 1

Characteristics of never smoker students who were and were not successfully followed

	Followed	Not followed	<i>P-value</i>*
	n = 1700 (100%)	n = 802 (100%)	
Sex			
boy	939 (55.6%)	516 (64.7%)	0.001
Age			
11–12	877 (51.6%)	301 (37.6%)	
13–14	788 (46.4%)	455 (56.9%)	
15–16	34 (2.0%)	44 (5.5%)	
mean (SD)	12.58 (0.79)	12.90 (0.92)	0.002
Public school	1,006 (59.2%)	606 (75.6%)	0.001
Parent education			
Primary in/complete	86 (5.1%)	57 (7.2%)	0.002
Secondary in/complete	663 (39.7%)	322 (40.8%)	
Tertiary or more	769 (46.0%)	313 (39.7%)	
Unknown education	152 (9.1%)	97 (12.3%)	
Sensation seeking (1–5)			
mean (SD)	3.03 (1.03)	3.22 (1.06)	0.001
Parenting style (1–5)			
mean (SD)	4.07 (0.70)	4.02 (0.77)	0.093
Tobacco exposition in movies (min)			
mean (SD)	115.1 (111.1)	134.1 (123.2)	0.001
Tobacco use			
Friends smoking	486 (28.7%)	335 (41.9%)	0.001
Household smoking	828 (49.1%)	452 (57.0%)	0.001
Susceptible to smoke	411 (24.2%)	251 (31.5%)	0.001

* t-test for continuous variables and chi square test for categorical variables

Table 2

Crude and adjusted odds ratios (AOR) of becoming susceptible to smoking and smoking initiation and current smoking at follow-up by tobacco exposition in movies

Variable (reference)	Transitions					
	from non-susceptible to susceptible		from never smoking to smoking initiation		from never smoking to current smoking	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Age	0.91 (0.76–1.08)	1.00 (0.82–1.23)	1.16 (0.97–1.39)	1.15 (0.95–1.40)	1.27 (0.99–1.62)	1.23 (0.94–1.61)
Sex (Boys)	1.57 (1.22–2.02)	1.77 (1.34–2.34)	1.65 (1.3–2.09)	1.15 (1.4–2.38)	1.98 (1.39–2.82)	2.36 (1.62–3.45)
Parent education						
8–12 yrs. (7 yrs.)	1.59 (0.85–2.96)	1.35 (0.70–2.58)	1.13 (0.67–1.90)	1.02 (0.59–1.78)	1.42 (0.63–3.23)	1.51 (0.62–3.69)
>12 yrs. (7 yrs.)	1.46 (0.78–2.72)	1.12 (0.59–2.15)	0.78 (0.46–1.33)	0.70 (0.40–1.22)	1.10 (0.48–2.55)	1.20 (0.48–3.00)
Unknown (7 yrs.)	1.68 (0.83–3.41)	1.57 (0.75–3.27)	0.89 (0.48–1.65)	0.78 (0.40–1.51)	1.55 (0.61–3.94)	1.58 (0.57–4.34)
Public school (No)	0.63 (0.48–0.82)	0.58 (0.40–0.84)	0.79 (0.59–1.06)	0.57 (0.4–0.81)	0.96 (0.60–1.56)	0.71 (0.41–1.21)
Sensation seeking (range 1–5)	1.38 (1.23–1.55)	1.37 (1.20–1.55)	1.48 (1.31–1.66)	1.44 (1.2–1.64)	1.45 (1.22–1.72)	1.48 (1.22–1.78)
Parenting style (range 1–5)	0.92 (0.78–1.09)	0.94 (0.78–1.13)	0.78 (0.67–0.91)	0.84 (0.70–0.99)	0.84 (0.67–1.05)	0.94 (0.73–1.20)
Tobacco Use						
Friends smoking (No)	1.33 (1.01–1.76)	1.33 (0.98–1.79)	2.20 (1.73–2.81)	1.97 (1.52–2.57)	2.22 (1.5–3.13)	1.86 (1.28–2.70)
Household smoking (No)	1.26 (1.00–1.60)	1.13 (0.88–1.45)	1.66 (1.32–2.08)	1.48 (1.16–1.89)	1.55 (1.10–2.17)	1.28 (0.89–1.83)
Access to media in bedroom (range 0–1)	1.38 (0.84–2.26)	1.21 (0.70–2.09)	1.19 (0.7–1.94)	0.99 (0.57–1.71)	1.32 (0.64–2.69)	1.14 (0.51–2.53)
Tertiles of movie tobacco exposure*						
2nd vs. 1st	1.25 (0.93–1.67)	1.30 (0.95–1.77)	1.04 (0.78–1.79)	1.03 (0.76–1.41)	1.18 (0.77–1.81)	1.29 (0.82–2.03)
3rd vs. 1st	1.69 (1.27–2.25)	1.77 (1.30–2.41)	1.62 (1.24–2.14)	1.54 (1.14–2.08)	1.56 (1.04–2.35)	1.54 (0.99–2.40)

Table 3

Crude and adjusted odds ratios (AOR) of becoming susceptible to smoking and smoking initiation and current smoking at follow-up after by tobacco exposure in US-produced or Argentine-produced movies

Tobacco exposure by film country of production (Ref. 0 minutes)*	Transitions					
	from non-susceptible to susceptible		from never to smoking initiation		from never to current smoking	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
US, > 0 – 30 min	1.40 (0.82–2.41)	1.15 (0.66–2.03)	2.25 (1.20–4.21)	2.15 (1.10–4.21)	2.52 (0.87–7.26)	2.95 (0.87–9.98)
US, > 30 min	1.83 (1.11–3.04)	1.53 (0.90–2.61)	2.50 (1.38–4.55)	2.15 (1.12–4.10)	2.95 (1.06–8.19)	3.10 (0.94–10.18)
Argentina, > 0 – 30 min	1.37 (1.04–1.79)	1.16 (0.87–1.56)	1.43 (1.10–1.86)	1.24 (0.93–1.65)	1.25 (0.84–1.85)	1.09 (0.71–1.66)
Argentina > 30 min	1.63 (1.19–3.23)	1.45 (1.03–2.02)	1.71 (1.29–2.28)	1.42 (1.03–1.95)	1.68 (1.12–2.52)	1.48 (0.94–2.31)

Adjusted by age, sex, parent education, type of school, sensation seeking, parenting style, friends smoking, household smoking and media access

* 107 (6.3%) and 868 (51.1%) of the students showed zero minutes of exposition to US and Argentina movies, respectively