

Prevalence of Smoking in Movies As Perceived by Teenagers

Longitudinal Trends and Predictors

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Background: Smoking in movies is prevalent. However, use of content analysis to describe trends in smoking in movies has provided mixed results and has not tapped what adolescents actually perceive.

Purpose: To assess the prospective trends in the prevalence of smoking in movies as perceived by teenagers and identify predictors associated with these trends.

Methods: Using data from the Minnesota Adolescent Community Cohort Study collected during 2000–2006 when participants were aged between 12 and 18 years ($N=4735$), latent variable growth models were employed to describe the longitudinal trends in the perceived prevalence of smoking in movies using a four-level scale (*never to most of the time*) measured every 6 months, and examined associations between these trends and demographic, smoking-related attitudinal and socio-environmental predictors. Analysis was conducted in 2009.

Results: At baseline, about 50% of participants reported seeing smoking in movies *some of the time*, and another 36% reported *most of the time*. The prevalence of smoking in movies as perceived by teenagers declined over time, and the decline was steeper in those who were aged 14–16 years than those who were younger at baseline ($p \leq 0.05$). Despite the decline, teenagers still reported seeing smoking in movies *some of the time*. Teenagers who reported more close friends who smoked also reported a higher prevalence of smoking in movies at baseline (regression coefficients = 0.04–0.18, $p < 0.01$).

Conclusions: Teenagers' perception of the prevalence of smoking in movies declined over time, which may be attributable to changes made by the movie industry. Despite the decline, teenagers were still exposed to a moderate amount of smoking imagery. Interventions that further reduce teenage exposure to smoking in movies may be needed to have an effect on adolescent smoking.
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Introduction

Smoking in movies is prevalent. About 74%–98% of the top-grossing movies released during 1985–2003 contained at least some depictions of smoking.^{1–5} Each year, an estimated 13.9 billion smoking images have been delivered to those aged 10–14 years by the top 100 box-office hits.⁵ Several studies have demonstrated the

association between exposure to these depictions and adolescent smoking,^{6–9} leading the National Cancer Institute to conclude a causal relationship exists between exposure to smoking in movies and initiation of smoking among adolescents.¹⁰ Although the Master Settlement Agreement prohibits tobacco companies from engaging in product placement activities with the movie industry,¹¹ scholars found that the frequency of tobacco brand appearances in movies did not change after the agreement was implemented.¹²

Research on changes in prevalence of smoking depictions in movies over time has produced mixed results. A content analysis of the annual 25–30 highest-grossing films in the U.S. found a decline in the prevalence of smoking depictions in movies during 2000–2006^{13,14}; a similar trend was observed when the weekly ten top-

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grossing movies were analyzed.¹⁵ In contrast, a report¹⁶ based on content analysis of the five highest-grossing films annually in 2000–2002 observed an increase in the prevalence of smoking images in movies; others also observed an increase in the incidence of smoking in movies after analyzing the top 50–150 box-office films during 2000–2006.¹⁷ In addition to the discrepancies in the observed trends, these trends do not necessarily represent changes in exposure to smoking in movies among teenagers because they may watch movies other than those analyzed.

An alternative approach to monitor trends in smoking in movies is to ask teenagers about their perceived prevalence of smoking in movies over time. Their perception can be conceptualized as a function of their exposure to smoking depictions, and is independent of the movie sampling frames and coding schemes determined by investigators. Two previous reports used this approach to examine the trend in exposure to smoking in movies and TV and found a decline in the perceived exposure to smoking depiction in movies and TV during 2000–2004.^{18,19} However, because of the serial cross-sectional study design, they were unable to examine changes in perceived exposure to smoking in the media within an individual over time and the interaction between age, cohort, and period effects on the trends. Furthermore, only limited numbers of demographic variables were included in these studies. Smoking-related attitudes and socio-environmental factors, which generally are accepted as predictors of adolescent smoking behavior, were not included in these analyses.

Using data from the Minnesota Adolescent Community Cohort, which collected data on teenagers' perception of prevalence of smoking in movies at 6-month intervals, the association between these trends and smoking-related attitudinal and socio-environmental factors were assessed in addition to demographic characteristics. Because of the longitudinal data used in the analysis, the present study provides additional insights regarding changes in prevalence of smoking in movies, and may further characterize teenagers who are more receptive to smoking images in movies.

Methods

Study Population

The Minnesota Adolescent Community Cohort (MACC) is a prospective cohort study designed to examine the effect of state- and local-level tobacco prevention and control programs on youth and young adults in Minnesota, and to deepen the understanding of the transitional process from nonsmoking to smoking in adolescence. The design of the study was detailed elsewhere.²⁰ Briefly, participants were selected through cluster random sampling from geopolitical units (GPUs) in Minnesota, North and South Dakota, Mich-

igan, and Kansas, using modified random-digit dialing and a combination of probability and quota sampling methods to obtain an even distribution from ages 12 to 16 years during 2000–2001.

An additional cohort of 585 children aged 12 years were recruited in Minnesota using the same random-digit-dialing method during 2001–2002, resulting in an overall sample of 4826. Participants were surveyed every 6 months since recruitment through 2008, except in 2004 because of a gap in funding. For this analysis, participants needed to complete at least two surveys before the age of 18 years (N=4735). Because perceptions of prevalence of smoking in movies did not differ by state ($p>0.3$), all participants were included as one group in the analysis.

The University of Minnesota IRB approved the current study. Parents provided active informed consent for their children to participate in the study. Once study participants reached the age of consent, active informed consent was obtained for each survey completed.

Measures

Perception of prevalence of smoking in movies was assessed by asking participants, *When you watch movies, how often do you see actors and actresses smoking?* Four options were provided: *most of the time* (4), *some of the time* (3), *hardly ever* (2), and *never* (1).

Participants were asked about their gender and ethnicity (collapsed into two categories, which are white and nonwhite, from six options). They also were asked about the highest education level achieved by their fathers and mothers. The highest education levels of the two parents in a household were selected to represent parent education level, categorized into high school or less, some college, college graduate, some graduate school or above. Participants' addresses were used to determine their counties of residence, and corresponding rural urban continuum codes (1–9)²¹ were retrieved and reversed so that a higher value represented a higher level of urbanization of their counties of residence.

Attitudes related to tobacco companies marketing toward teenagers were measured by assessing participants' levels of agreement (1=*strongly disagree* to 5=*strongly agree*) on three statements: *tobacco companies try to get teenagers smoking, tobacco companies make too much money from teenagers, and tobacco companies get too much blame for underage smoking*. The order of the responses of the last item was reversed so that it was in the same direction as the other two items.

Participants were asked if they lived with their parents and if their parents smoked. Those who lived with at least one parent who smoked were classified as having a parent who smoked. Participants also reported whether they lived with a sibling who smoked (yes/no). To assess home smoking policies, participants were asked whether adults living in the participants' homes were allowed to smoke and whether adult guests were allowed to smoke. Responses to these questions were combined into a three-level score—no smoking allowed, only guests allowed to smoke, or both guests and adults living in home allowed to smoke. Participants also were asked to report the total number of close friends who smoked (four maximum). Data on all variables were collected at each survey except gender, ethnicity, and parent education.

Statistical Analysis

The analysis was stratified by age cohort. Those recruited in 2000–2001 were stratified into cohorts of those aged 12, 13, 14, 15, and 16 years, and those aged 12 years that were recruited in 2001–2002 (1

year later) were classified as being in the cohort of those aged 11 years. Depending on the age and year entering the study, the observation period ranged from 2 years in the cohort of those aged 16 years to 6 years in the cohorts of those aged 11 and 12 years.

Latent variable growth curve models²² were used to estimate the trajectory of the perceived prevalence of smoking in movies over time in each age cohort. A number of unconditional latent variable growth curve parameters (e.g., intercept only, linear, quadratic, and cubic) were estimated in different models to characterize the nature of changes in the perceived prevalence of smoking in movies over time. Linear models were found to best describe changes in the perceived prevalence of smoking in movies in all age cohorts based on model fit, parsimony, and significance of parameter estimates. The slopes of trajectories of the age cohorts were compared to examine differences in the trends by cohort. The predicted perceived prevalence of smoking in movies at each age in each age cohort were estimated and compared across age cohorts to examine changes in the perceived prevalence of smoking in movies over time.

The effects of time-invariant and time-variant predictors on the longitudinal trend of the perceived prevalence of smoking in movies were examined in each age cohort. To determine whether a predictor changed significantly over time, the difference between its baseline measurement and its last measurement in each age cohort measured at the same time of the year as the baseline (e.g., between baseline and the third survey in the cohort of those aged 16 years) was tested for its significance ($p < 0.05$). This difference was divided by numbers of years of observation to represent the rate of change of predictors that demonstrated significant changes over time.

The crude association between each predictor and the longitudinal trend of the perceived prevalence of smoking in movies in each age cohort was examined by first regressing the intercept (i.e., the average perceived prevalence of smoking in movies at baseline) and the slope (i.e., the average change in the perceived prevalence of smoking in movies over time) of the longitudinal trend in each age cohort on the baseline value of a predictor, and then on the

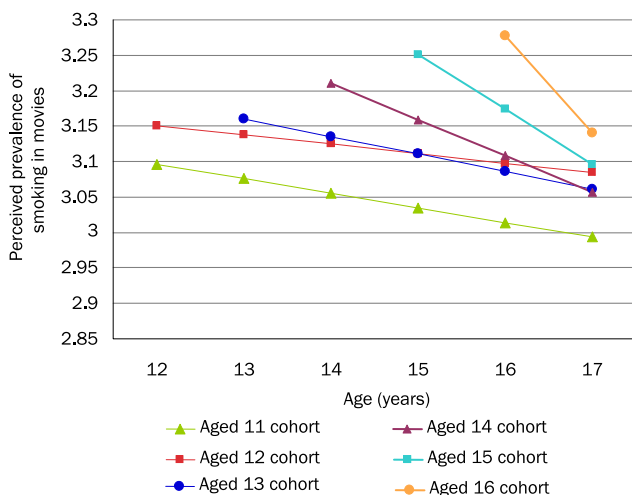


Figure 1. Prevalence of smoking in movies as perceived by adolescents in different age cohorts

Note: (2=hardly ever, 3=some of the time, 4=almost all the time); ages given in years

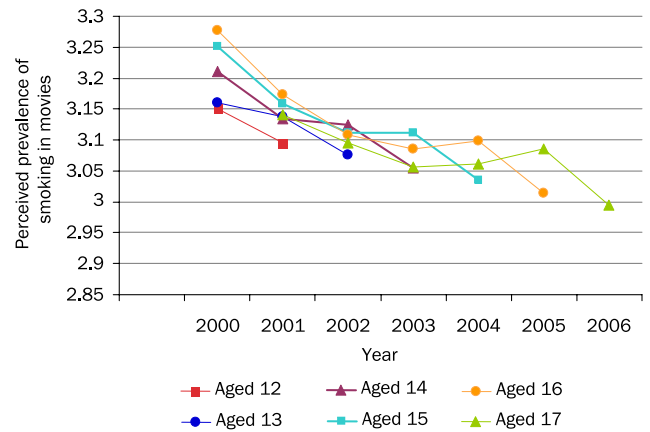


Figure 2. Prevalence of smoking in movies as perceived by adolescents at different ages

Note: (2=hardly ever, 3=some of the time, 4=almost all the time); ages given in years

baseline value and changes of a predictor if the predictor demonstrated significant changes over time. If the association between a predictor (either its baseline value or changes over time) and the trend (either the intercept or the slope) was significant using a liberal criterion of $p < 0.1$, the predictor would enter the multivariate analysis. Predictors were entered into the multivariate models in two blocks: The first block included only notable demographics (gender, race/ethnicity, parent education level, and/or level of urbanization), and in the second block included all other predictors that were significant in the bivariate analysis.

All models were estimated using Mplus®, version 5.21.²³ All variables were modeled as continuous, and the SEs of all estimates were obtained through the sandwich estimator option to handle the clustering by GPU. The analysis was conducted in 2009.

Results

Among the 4735 participants, 49.1% were male and 85.1% were white. About 35% had a parent who graduated from college, and 47.1% lived in counties in metropolitan areas of 1 million people or more at baseline. About 50% of the participants reported seeing actors and actresses smoking in movies “some of the time,” and another 35.5% reported “most of the time” at baseline.

The frequency of smoking in movies as perceived by MACC participants declined as they aged in all age cohorts (Figure 1), and the decline was significantly more rapid in cohorts of those aged 14–16 years than in cohorts of those aged 11–13 years in pair-wise comparisons ($p \leq 0.01$). When plotting the estimated values for the same ages across age cohorts against time (i.e., holding age constant [Figure 2]), the frequency of smoking in movies as perceived by teenagers also demonstrated a downward trend from 2001 to 2006 in all ages, with the last estimated value at each age being significantly lower than at baseline ($p < 0.005$), except at age 12 years.

Table 1. Multivariate regression between predictors and intercept of the trends in the perceived prevalence of smoking in movies^a

Predictors	Age cohort (years)					
	11	12	13	14	15	16
Demographics						
Male (vs female)				0.04		-0.09
Nonwhite (vs white)	0.16		0.11	0.18*		
Parent education	-0.05	-0.07*	-0.07*	-0.05	-0.05*	-0.05
Level of urbanization			-0.01			
Attitudes toward tobacco companies						
Get too much blame (reversed)		-0.03			-0.01	
Make too much money from teens	0.05		0.03	0.06	0.06*	0.08*
Get teens smoking	0.05		0.06*	0.05		0.04
Social environment						
Number of smoking close friends	0.18*	0.11*	0.07*	0.09*	0.09*	0.04*
Living with smoking siblings	0.28*		0.22*	0.08	0.12	
Living with smoking parents	0.04	0.03	0.09	-0.01	0.13	
Home smoking restriction score	0.09*		-0.02	0.02	-0.03	0.02

^aPredictors not significantly associated with either intercepts or slopes in bivariate analysis ($p \geq 0.10$) were not included in the models. Demographic predictors were adjusted for each other; other variables were adjusted for all variables with significant bivariate associations with either the intercept or the slope.

* $p < 0.01$

In the multivariate analysis, a higher reported number of friends who smoked at baseline was associated consistently with an increase in the intercepts of the longitudinal trends (i.e., the average perceived prevalence of smoking in movies at baseline in all age cohorts [Table 1, regression coefficients ranging from 0.04 to 0.18, $p < 0.01$]). A higher level of parent education was associated with a decrease in the intercept (i.e., the average perceived prevalence of smoking in movies at baseline among three age cohorts [12, 13, and 15 years, regression coefficients ranging from -0.05 to -0.07, $p < 0.01$]). None of the associations between the predictors and the slopes of the longitudinal trends in the perceived prevalence of smoking in movies consistently reached significance across age cohorts (Table 2).

Discussion

More than 85% of those aged 12–16 years recalled seeing actors and actresses smoking in movies for at least some of the time at baseline. This finding agrees with other studies that depictions of smoking are ubiquitous in movies^{1–5} and a large proportion of teenagers have high perceived exposure to these images in movies.^{18,19} It also shows that these images are encoded by teenagers for later recall. Communication scholars have suggested that

these depictions can be consequential if encoded and stored, as they can activate other memories and also serve as a mental count of others' behavior.^{24,25} Therefore, it is possible that smoking depictions may serve as the basis of individuals' knowledge and attitudes toward smoking and subsequently may affect their smoking behaviors.

Teenagers' perception of how often they viewed smoking images in movies significantly declined in all age cohorts as they aged, particularly in the cohort of those aged 14–16 years; the perception also declined significantly from 2001 to 2006 within all ages, except at age 12 years, which was based on only two time points. This finding provides evidence to partially validate the downward trend of smoking in movies as observed by other scholars using a content analysis approach,^{13–15} and agrees with previous reports on trends in perceived exposure to smoking images in the media.^{18,19} This finding implies that along with the decline in smoking in top-grossing movies, teenagers' exposure to these images also declined.

The observed decline could be the result of the reduction in tobacco use by major characters in movies released over time,^{14,26} which may lead to a reduction in the total number of depictions of smoking, and subsequently a lower perceived prevalence of smoking in movies by

Table 2. Multivariate regression between predictors and slope of the trends in the perceived prevalence of smoking in movies^a

Predictors	Age cohort (years)					
	11	12	13	14	15	16
Demographics						
Male (vs female)				−0.03		−0.01
Nonwhite (vs white)	−0.00		0.02	−0.03		
Parent education	0.00	0.00	0.01*	0.00	0.02	0.00
Level of urbanization			0.00			
Attitudes toward tobacco companies						
Get too much blame (reversed)		−0.00			0.00	
Change in agreeing “get too much blame (reversed)”					0.03	
Make too much money from teens	−0.01		−0.01	0.00	−0.01	−0.04
Change in agreeing “make too much money from teens”				0.04*		
Get teens smoking	−0.01		−0.01	−0.01		0.02
Social environment						
Number of smoking close friends	−0.02	−0.01	0.01	−0.01	−0.03*	−0.00
Living with smoking siblings	−0.05		−0.06*	−0.04	−0.03	
Living with smoking parents	−0.01	0.01	−0.03	0.01	−0.06	
Change in living with smoking parents					−0.21*	
Home smoking restriction score	−0.00		0.00	0.00	0.01	0.02

^aPredictors not significantly associated with either intercepts or slopes in bivariate analysis ($p \geq 0.10$) were not included in the models. Demographic predictors were adjusted for each other; other variables were adjusted for all variables with significant bivariate associations with either the intercept or the slope.

* $p < 0.01$

teenagers. The differential reduction between the older and younger age cohorts also may be explained by the decline in the number of R-rated movies released during 2001–2003,⁴ because older adolescents are more likely to watch R-rated movies⁵ that are more likely to contain smoking images.^{2,4,5} Some studies that used content analysis did not observe a downward trend in the same period of time, probably because they included only a small number of films per year,¹⁶ or estimated incidence rather than counts of smoking impression in movies.¹⁷

Despite the decline in perceived prevalence of smoking in movies, an average teenager was still estimated viewing smoking images in movies “some of the time” at the end of the observation period (the last data point in Figure 2). Because the majority of the participants had a smoke-free social environment where their parents, siblings, and friends did not smoke and smoking was not allowed at home (data not shown), smoking images in movies may be the most prominent place where teenagers visualize smoking. Together with glamorization of smoking in

movies,²⁷ an unrealistically high prevalence of adult characters who smoke in movies,²⁶ and the strong influence of favorite movie stars who smoke on susceptibility to smoking among teenagers,²⁸ this amount of exposure could still have a substantial impact on teenagers’ smoking behaviors. Providing anti-smoking advertisements at the beginning of movies depicting smoking has been suggested to reduce immediate intention to smoke and immediate cigarette consumption among young smokers^{29–31}; however, the strategy does not reduce nonsmoking youth’s intention to smoke in the future.^{29,30} Therefore, other interventions to further reduce teenage exposure to these images may be needed.

Adolescents who reported socializing with close friends who smoke were consistently more likely to report a higher perceived prevalence of smoking in movies. This may be due to those teenagers actually witnessing relatively more smoking in the movies they watched. As sensation seeking is a personal trait associated with adolescent smoking,⁷ teenagers who socialize with smoking

teenagers may be encouraged to watch movies with high message sensation values (such as drama or adventure), which are likely to have more depictions of smoking than other movies.²

The heightened perceptions of smoking also may be the result of the encoding process. Teenagers who have close friends who smoke may remember these images since the images are relevant to their social environment. These images may then serve as reinforcement of their reality, and subsequently may influence them to smoke. Adolescents in all age cohorts who had more educated parents perceived a lower prevalence of smoking images in movies at baseline, and this association reached significance in three age cohorts. Because more-educated parents are more likely to prohibit their children from watching R-rated movies that have more smoking images,³² teenagers with more-educated parents are therefore exposed to fewer smoking images, resulting in a lower perceived prevalence of smoking in movies.

The validity of the current measure—perceived prevalence of smoking in movies—may be questioned. In addition to potential inaccurate recall, the perceived amount of smoking in movies may be influenced by unmeasured factors, such as health classes at school, conversations with other teenagers about smoking, and changes in social norms related to smoking because of tobacco control policies (e.g., increase in excise tobacco taxes). Further research is needed to validate this measure. Because the study follow-up period is relatively long (2–6 years), loss to follow-up and missing data also may have introduced bias. Latent growth modeling, however, is capable of including subjects with incomplete follow-up, which reduces selection bias. Additional analysis including only those who completed all surveys at each of the follow-up time point yielded results similar to those reported here (data not shown).

A regional sample of adolescents is also a limitation to the study as it may not be representative of adolescents in the U.S. However, participants were selected from the community; thus they include those who were not in school unlike previous reports using school-based samples.^{18,19} The longitudinal study design, which is a strength of this analysis, provided temporal certainty between predictors measured at baseline and subsequent trends in perceived exposure to smoking in movies. This allows the authors to examine the influence of smoking-related attitudes and socio-environmental factors (which change over time) on the trends.

Conclusion

The current findings suggest that the prevalence of smoking in movies as perceived by teenagers declined over

time. This provided evidence to support the observed decline in prevalence of smoking depictions in movies in the literature based on the content analysis approach. Even so, teenagers were still exposed to these images some of the time. Interventions may be needed to further reduce teenagers' exposure to these images or the influences of these images on adolescent smoking.

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