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Comparison of Trends for Adolescent Smoking and Smoking in Movies, 1990-2007

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To the Editor: The National Cancer Institute reported that “the total weight of evidence from cross-sectional, longitudinal, and experimental studies indicates a causal relationship between exposure to depictions of smoking in movies and youth smoking initiation.”¹ Attributable risk estimates suggest that movie smoking accounts for one-third to one-half of adolescent smoking onset,^{2,3} raising the possibility that trends in movie smoking could influence trends in adolescent smoking. We compared current (past 30-day) smoking among US eighth-grade adolescents with smoking in popular movies.

Methods

Each year from 1990 to 2007, the 25 movies with highest US box-office gross revenues⁴ were content coded for tobacco use by 2 coders. Only tobacco use was coded (>90% was cigarette or cigar smoking). A smoking occurrence was counted whenever a movie character handled or used tobacco or when tobacco use was depicted in the background. A 10% subsample of movies was double-coded (interrater correlation = 0.96 for this outcome).

Current smoking was obtained from the Monitoring the Future survey,⁵ which has assessed smoking among US eighth graders since 1991, with a study sample that ranged from 15 100 to 18 600 and a response rate greater than 80% for each year during the study period. Smoking among eighth graders was chosen because most studies linking movies with adolescent smoking involve teens in this age group.

Trends for movie smoking occurrences and adolescent current smoking with 95% confidence intervals (CIs) were graphed with Lowess smoothed plots,⁶ and a test for trend was conducted. Because the distribution for movie smoking was skewed left, we examined geometric mean. Least squares regression was used to determine linear trend for smoking in movies for the entire period, and among adolescents after 1996, using Stata 9.0 (StataCorp, College Station, Texas). The slope estimates from each regression with 2-sided 95% CIs are reported.

Author Contributions: Dr Sargent had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Financial Disclosures: None reported.

Role of the Sponsors: The sponsors had no role in the design and conduct of the study; in the collection, management, analysis, and interpretation of the data; or in the preparation, review, or approval of the manuscript.

Additional Contributions: For the adolescent smoking analyses, Lloyd D. Johnston, PhD; Patrick O'Malley, PhD; Patricia Berglund, MBA; and Timothy Perry, MS, University of Michigan Institute for Social Research, obtained the information on sample size for eighth graders, calculated the 95% CIs, and conducted the linear test for trend. None of these individuals received compensation for their role in the study.

Results

The Figure illustrates parallel downward trends for movie smoking and adolescent smoking after 1996. Geometric mean for movie smoking was 3.5 occurrences (95% CI, 1.8-6.9) in 1990 and 0.23 (95% CI, 0.06-0.93) in 2007. The narrowing of the CIs for movie smoking reflected a decline in the variability over time, due in part to a significant increase in the percentage of movies without any smoking (Table). Trend analysis indicated that geometric mean for movie smoking declined by an average of 0.84 smoking occurrences (95% CI, 0.80-0.89) per year between 1990 and 2007. Smoking among eighth graders increased in the early 1990s and then declined from a peak of 21.0% (95% CI, 19.6%-22.4%) in 1996 to 7.1% (95% CI, 6.2%-8.0%) in 2007. Trend analysis indicated that current smoking declined by an average of 1.3 percentage points (95% CI, 1.2-1.4) each year after 1996.

Comment

There has been a significant decline in both movie smoking in top US box-office hits and annual assessments of smoking among US eighth graders since 1996. These trends are consistent with a causal hypothesis and reported attributable risk figures. During the first 6 years of the period, movie smoking declined but youth smoking increased. This could be the result of a lagged effect for the relation between newly released movie smoking and adolescent current smoking, a possibility we could not assess because our data on movie smoking only go back to 1989. Additionally, movie smoking represents only one of several factors that contribute to youth smoking trends, including the marketing of tobacco, price of cigarettes, restrictions imposed by the Master Settlement Agreement in 1999, and state tobacco prevention programs. The main limitation of this study is that it is an ecological analysis and can only demonstrate association. Nonetheless, the downward trend in movie smoking is consistent with an influence on downward trends in adolescent smoking.

Acknowledgments

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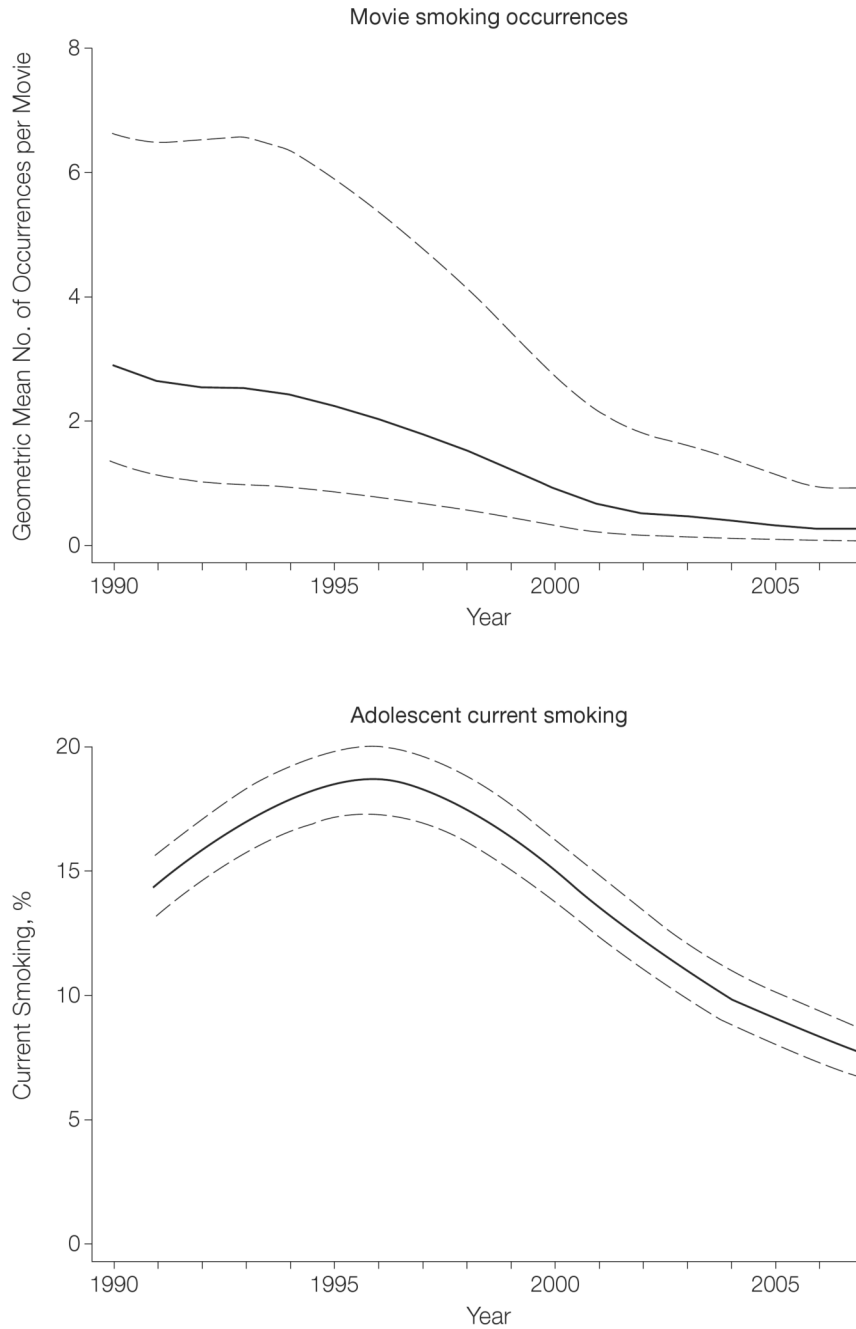


Figure. Smoking Occurrences in Highest Grossing Movies and Adolescent Smoking in the United States

Trends for the geometric mean for the number of smoking occurrences in the 25 movies with the highest US box-office gross revenues released each year between 1990 and 2007 and current (past 30-day) smoking among eighth graders from the Monitoring the Future study for each year between 1991 and 2007. Differences from the data in Results section reflect Lowess smoothing. Dashed lines indicate 95% confidence intervals.

Table
Smoking Occurrences for the 25 Movies With the Highest Annual US Box-Office Gross Revenues, 1990 to 2007

Year	Smoking Occurrences per Movie, Median (IQR), No.	Movies With No smoking, No. ^a (%)	Smoking Occurrences by MPAA Rating Category, No. (No. of Movies) ^b					Smoking Occurrence Type ^c	
			G	PG	PG-13	R	Character	Background	
1990	5 (1-9)	1 (4)	-	82 (7)	37 (9)	76 (9)	137	58	
1991	7 (1-15)	5 (20)	0 (1)	8 (6)	46 (7)	312 (11)	274	92	
1992	3 (1-9)	3 (12)	3 (1)	36 (5)	29 (4)	106 (15)	111	63	
1993	2 (2-7)	4 (16)	-	20 (9)	33 (8)	107 (8)	104	56	
1994	8 (2-17)	3 (12)	0 (1)	23 (5)	103 (8)	157 (11)	197	86	
1995	3 (1-9)	5 (20)	1 (2)	49 (6)	77 (9)	70 (8)	130	67	
1996	7 (3-12)	2 (8)	14 (2)	37 (5)	37 (7)	126 (11)	159	55	
1997	4 (2-8)	3 (12)	1 (1)	12 (3)	75 (13)	80 (8)	119	49	
1998	1 (0-5)	11 (44)	1 (3)	2 (4)	48 (14)	62 (4)	66	47	
1999	2 (0-8)	9 (36)	2 (3)	2 (4)	56 (9)	54 (9)	81	33	
2000	2 (1-4)	6 (24)	1 (1)	0 (3)	93 (15)	32 (6)	96	30	
2001	2 (0-6)	9 (36)	0 (2)	5 (5)	102 (14)	50 (4)	113	44	
2002	3 (0-14)	9 (36)	0 (1)	0 (6)	160 (15)	42 (3)	122	80	
2003	2 (0-6)	11 (44)	0 (1)	1 (4)	80 (14)	19 (6)	64	36	
2004	1 (0-2)	10 (40)	0 (2)	6 (6)	63 (13)	6 (4)	44	31	
2005	0 (0-3)	13 (52)	0 (1)	1 (7)	63 (13)	42 (4)	84	22	
2006	1 (0-4)	10 (40)	0 (2)	2 (7)	62 (13)	41 (3)	70	35	
2007	1 (0-3)	11 (44)	0 (1)	10 (7)	33 (13)	105 (4)	82	66	

Abbreviations: IQR, interquartile range; MPAA, Motion Picture Association of America; -, no movies were released in this rating category.

^a $P < .001$, χ^2 test for trend.

^b Data for all movies collapsed across year and rating.

^c Data for all movies collapsed across year and occurrence type.