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

James D. Sargent; Todd F. Heatherton


http://jama.ama-assn.org/cgi/content/full/301/21/2211
the overarching point made by both us and Ebbeling et al, who, in providing the context for their clinical trial, wrote that “observational data link [NSB] consumption with excessive weight gain; however, randomized, controlled trials are lacking and necessary to resolve the debate.” Where feasible, randomized, controlled trials are the best means to answer the scientific question but are only one element informing policy decisions. A point of our Commentary was that this topic has become politicized, and we called for a commitment to principles of scientific and scholarly inquiry.

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Financial Disclosures: Dr Allison reported that he has received grants, honoraria, donations, and consulting fees from numerous food, beverage, and pharmaceutical companies and other commercial and nonprofit entities with interests in obesity, including but not limited to Eli Lilly, Abbott Laboratories, Slim-Fast Foods, Frito-Lay, Kellogg Co, Coca-Cola, PepsiCo, the Dairy Council, General Mills, Kraft Foods, and Pom Wonderful. Dr Mattes reported that he has received grants, honoraria, and consulting fees from numerous food, beverage, and pharmaceutical companies and other commercial and nonprofit entities with interests in obesity, including but not limited to Eli Lilly, Abbott Laboratories, Slim-Fast Foods, Kellogg Co, Kraft Foods, and the Dairy Council.


RESEARCH LETTERS

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

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 (intrater 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.

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.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Smoking Occurrences per Movie, Median (IQR), No.</th>
<th>Movies With No Smoking, No. (%)</th>
<th>Smoking Occurrences by MPAA Rating Category, No. (No. of Movies)</th>
<th>Smoking Occurrence Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>G</td>
<td>PG</td>
</tr>
<tr>
<td>1990</td>
<td>5 (1-9)</td>
<td>1 (4)</td>
<td>-</td>
<td>82 (7)</td>
</tr>
<tr>
<td>1991</td>
<td>7 (1-15)</td>
<td>2 (20)</td>
<td>0 (1)</td>
<td>8 (6)</td>
</tr>
<tr>
<td>1992</td>
<td>3 (1-9)</td>
<td>3 (12)</td>
<td>3 (1)</td>
<td>36 (5)</td>
</tr>
<tr>
<td>1993</td>
<td>2 (2-7)</td>
<td>4 (16)</td>
<td>-</td>
<td>20 (9)</td>
</tr>
<tr>
<td>1994</td>
<td>8 (2-17)</td>
<td>3 (12)</td>
<td>0 (1)</td>
<td>23 (5)</td>
</tr>
<tr>
<td>1995</td>
<td>3 (1-9)</td>
<td>5 (20)</td>
<td>1 (2)</td>
<td>49 (6)</td>
</tr>
<tr>
<td>1996</td>
<td>7 (3-12)</td>
<td>2 (8)</td>
<td>14 (2)</td>
<td>37 (5)</td>
</tr>
<tr>
<td>1997</td>
<td>4 (2-8)</td>
<td>2 (12)</td>
<td>1 (1)</td>
<td>12 (3)</td>
</tr>
<tr>
<td>1998</td>
<td>1 (0-5)</td>
<td>11 (44)</td>
<td>1 (3)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>1999</td>
<td>2 (0-8)</td>
<td>9 (36)</td>
<td>2 (3)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>2000</td>
<td>2 (1-4)</td>
<td>6 (24)</td>
<td>1 (1)</td>
<td>0 (3)</td>
</tr>
<tr>
<td>2001</td>
<td>2 (0-6)</td>
<td>9 (36)</td>
<td>0 (2)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>2002</td>
<td>3 (0-14)</td>
<td>9 (36)</td>
<td>0 (1)</td>
<td>0 (6)</td>
</tr>
<tr>
<td>2003</td>
<td>2 (0-6)</td>
<td>11 (44)</td>
<td>0 (1)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>2004</td>
<td>1 (0-2)</td>
<td>10 (40)</td>
<td>0 (2)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>2005</td>
<td>0 (0-3)</td>
<td>13 (52)</td>
<td>0 (1)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>2006</td>
<td>1 (0-4)</td>
<td>10 (40)</td>
<td>0 (2)</td>
<td>2 (7)</td>
</tr>
<tr>
<td>2007</td>
<td>1 (0-3)</td>
<td>11 (44)</td>
<td>0 (1)</td>
<td>10 (7)</td>
</tr>
</tbody>
</table>

Abbreviations: IQR, interquartile range; MPAA, Motion Picture Association of America; -, no movies were released in this rating category. *P < .001, † test for trend. ‡ Data for all movies collapsed across year and rating. § Data for all movies collapsed across year and occurrence type.

Trends in movie smoking and adolescent current smoking with 95% confidence intervals (CIs) were graphed with Lowess smoothed plots, 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.

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 decrease 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.

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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. Study concept and design: Sargent, Heatherton. Acquisition of data: Sargent. Analysis and interpretation of data: Sargent. Drafting of the manuscript: Sargent. Critical revision of the manuscript for important intellectual content: Sargent, Heatherton. Statistical analysis: Sargent.
Obtained funding: Sargent, Heatherton.
Administrative, technical, or material support: Heatherton.
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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.


Firearm Use in G- and PG-Rated Movies, 2003-2007

To the Editor: In 2005, 1453 firearm deaths occurred among children in the United States, accounting for 8.2% of deaths among persons aged 1 to 17 years.1 Mass media have been reported to influence children’s behavior toward violence.2 From 1995 to 2002, 34% of the G- and PG-rated movies with the highest US box-office gross revenues depicted use of firearms.3,4 We examined movies released during 2003 through 2007 to determine whether depiction of firearms in movies marketed for children had changed.

Methods. The study used the original protocol from the 1995-1997 study.3 We identified the 25 G- or PG-rated mov- 
ies for 2003-2007 with the highest annual domestic box- 
office gross revenues for a total sample size of 125 movies.6 
Movies or scenes were excluded if they were animated, were not set in the present day (within 10 years of a movie’s release), or were documentaries. The coding unit was person- 
scene, defined as a scene in which 1 person was involved in 
an activity with a firearm. Possession or handling of fire- 
arms was recorded only for characters with speaking roles. 
Standardized data-collection forms were used, and movies 
were watched in DVD format. Each movie was viewed si-
mutaneously by 1 of 2 pairs of reviewers. A pilot was conducted to ensure consistency and interrater reliability.

Comparisons between previous studies and 2003-2007 data were analyzed by 2-sided $\chi^2$ test for trend using Epilinfo version 6 (Centers for Disease Control and Prevention, Atlanta, Georgia) and Wilcoxon rank sum test using SAS version 9.1 (SAS Institute, Cary, North Carolina). Clustering of person-
scenes within movies was controlled for using SAS version 9.1; because this had minimal effect, unadjusted results are presented. Differences were considered significant if $P < .05$.

Results. Of 125 movies, 67 (54%) met the inclusion criteria for the study with 5 G-rated movies (7%) and 62 PG-
rated (93%). Eighteen movies (27%) depicted characters with firearms (TABLE). One hundred six person-scenes depicted characters with firearms, with a median of 4.5 person-
scenes per movie (range, 1-22). Median (interquartile range) numbers of person-scenes per movie were 2 (1-8.2), 3 (1- 
11), and 4.5 (2-8.8) for 1995-1997, 1998-2002, and 2003-
2007, respectively ($P = .92$). Two movies accounted for 37% of the person-scenes with firearms.

Of characters with firearms, 105 (99%) were adults and 
1 (1%) was a child; 95 (90%) were male. Fifty-six characters (53%) with firearms were involved in law enforcement 
(e.g., police officers or security guards); 38 (36%) were criminals; and 12 (11%) were other characters (e.g., homeowners). Seventy-two person-scenes (68%) depicted charac-
ters handling firearms, and 56 person-scenes (53%) depicted characters making a threatening gesture with a firearm.


<table>
<thead>
<tr>
<th>Activity</th>
<th>Movies</th>
<th>Person-Scenes With Firearms</th>
</tr>
</thead>
<tbody>
<tr>
<td>---------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Depicting firearm in any context</td>
<td>20 (40%) [27-56]</td>
<td>17 (28%) [18-41]</td>
</tr>
<tr>
<td>Handling a firearm</td>
<td>18 (36%) [23-51]</td>
<td>15 (25%) [15-38]</td>
</tr>
<tr>
<td>Making threatening gesture with firearm</td>
<td>15 (30%) [18-45]</td>
<td>14 (23%) [14-36]</td>
</tr>
<tr>
<td>Character injured by firearm</td>
<td>3 (6%) [2-18]</td>
<td>1 (2%) [1-10]</td>
</tr>
<tr>
<td>Character killed by firearm</td>
<td>1 (2%) [0-12]</td>
<td>1 (2%) [1-10]</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval. 
a $\chi^2$ test for trend. 
b Wilcoxon rank sum test.

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