Population-Based Assessment of Exposure to Risk Behaviors in Motion Pictures

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Abstract

The aim of most population-based studies of media is to relate a specific exposure to an outcome of interest. A research program has been developed that evaluates exposure to different components of movies in an attempt of assess the association of such exposure with the adoption of substance use during adolescence. To assess exposure to movie substance use, one must measure both viewing time and content. In developing the exposure measure, the study team was interested in circumventing a common problem in exposure measurement, where measures often conflate *exposure* to media with *attention* to media. Our aim in this paper is to present a validated measure of exposure to entertainment media, the Beach method, which combines recognition of a movie title with content analysis of the movie for substance use, to generate population based measures of exposure to substance use in this form of entertainment.

Over the past decade, epidemiologic studies have demonstrated that exposure to smoking in movies is associated with adolescent smoking uptake (Sargent et al., 2001; Dalton et al., 2003; Sargent, 2005; Sargent et al., 2005; Sargent et al., 2007). Across multiple populations (Hanewinkel and Sargent, 2007) and using both cross-sectional and longitudinal designs, it has been shown that the more smoking children see in the movies, the more likely they are to take up smoking (Charlesworth & Glantz, 2005). Indeed, the movie smoking effect compares in influence to peer smoking (Sargent et al., 2007) and longitudinal research from this group has estimated that observing smoking in movies is the most important attributable risk factor for nearly half of nonsmoking teenagers who begin smoking (Dalton et al., 2003). This manuscript describes various challenges inherent in measuring the influence of movie smoking on behavior and the development of a valid and reliable measure of movie exposure to smoking that can be administered in large population-based surveys.

In developing the exposure measures, many general types of movie exposure measures were considered with final choice of variables listed in Table 1. Movie smoking exposure measures were divided into indirect measures—where the metric assesses a characteristic of the media environment, such as access to movie channels—and direct measures that attempt to quantify exposure to movies or movie smoking. In developing the final list, a number of potential queries

[1]Note that when box office rank is employed (as is shown in the table), the correlation is negative because the number 1 rank is the most popular movie (when gross receipts is used, the correlation is positive).

were ruled out, particularly if they could confuse *attention* to smoking in movies with *exposure* to smoking in movies, for example, "How often do you see smoking when you watch movies?" The concern with this type of media exposure assessment is in the interpretation of an association with behavior, especially in a cross-sectional study. One cannot rule out that the association is the result of increased attention to movie smoking as a result of other factors, such as exposure to tobacco advertising, that have prompted the adolescent to be more apt to pay attention to movie smoking scenes.

INDIRECT MEASURES

Indirect measures of movie exposure included an assessment of the media environment, for example, aspects of the home visual media environment. For instance, one could ask a child whether or not he or she has a television in his or her bedroom, which might allow for more unsupervised television viewing. We did not ask this question on our initial surveys, but television is the bedroom has been found to be associated with adolescent smoking over and above smoking in movies by other researchers (Jackson et al., 2007). If that television had a DVD player or was connected to cable, it could allow greater access to movies. In our surveys, adolescents were asked about their access to television programming—whether they had cable or satellite, movie channels, or MTV, all straightforward questions that adolescents were able to answer and that correlated with their behavior, as shown below. Thus, media environment measures are easy to administer and may be used to assess potential exposure. When used alone, however, these measures assess only broad categories of exposure and do not allow us to specify the amount of exposure or the precise content of that exposure. They are also correlated with parent education, with lower education groups generally having more access to movie channels.

Another indirect assessment that relates to behavioral outcomes is parental control of the media environment. There is one measure in particular that was included in this group's early work on media exposure, "How often do your parents let you watch movies that are rated "R"?" Responses to this question have been consistently and strongly related to adolescent risk behaviors (Dalton et al., 2002; Sargent et al., 2004; Dalton et al., 2006). As with media environment measures, one advantage of parental control measures is that they involve straightforward questions and procedures. The disadvantage is, again, they do not directly measure exposure to media content. In addition, there is the issue of confounding by other aspects of parenting so that other relevant aspects of parenting that might affect smoking uptake as well as movie exposure must be assessed and taken into account in the analysis.

DIRECT MEASURES

More direct assessments of exposure were also sought, including measures that assessed how much time adolescents spent viewing different types of visual media that might deliver movies. This method involved asking the adolescent to report how many hours they typically spend with a certain form of media each day, for example, how many hours of TV they watch each day. This type of measure was used extensively on two recent evaluations of media consumption in children and adolescents (Roberts et al., 1999; Roberts et al., 2005). These data are easy to collect using single item queries, but the disadvantage is that the method doesn't allow one to assess the content the viewer is exposed to. Another disadvantage with this type of measure is recall bias. Adolescent exposure to movies varies from day-to-day and week-to-week, and answering the question requires a complex cognitive process by which the adolescent estimates his daily exposure, estimates that may be biased. Shiffman (2005) and his colleagues documented this problem with ecological momentary assessments (EMA), in which subjects were prompted periodically to enter information into a palm device (O'Connell et al., 1998; Catley et al., 2000; Shiffman, 2005). When aggregated results of prospectively gathered data

on behavior or mood were compared with retrospective reports, the correlation was not strong. For example, when affect tends to vary widely from time-to-time (as it often does with adolescents), participants tend to give more weight to more recent than to earlier perceptions when asked to average mood. This overemphasis of recent experience may be true in recall assessments of media use as well, but to our knowledge no one has used EMA methodology to assess media exposure.

THE BEACH METHOD

Another procedure is described to assess exposure to movie smoking in two steps. The first involves the assessment of which movies adolescents have watched, and the second is to content code those movies to obtain an accurate assessment of the amount of smoking in each. From the perspective of the respondent, the measure only requires recognition of a movie title when it is presented and recall of whether or not it had been seen. Responses are combined with the results of an extensive content analysis of the movies in order to estimate exposure to portrayals of various risk behaviors. This approach is named the Beach method after the Dartmouth statistician who conceptualized the measure. In our experience, it works well with movies, in part because they are discrete bundles of media that one can ask about. Moreover, as demonstrated below, adolescents seem to be fairly adept at recognizing movies they have seen. Because the Beach method does not require adolescents to recall how much smoking they have seen in the movies they watched, it avoids confounding exposure and attention. This method may be more problematic with serialized entertainment found in television or cable programming, because the title of the program does not map to a discrete two-hour bundle of entertainment in most cases. However, a similar assessment was used by Ellickson to assess exposure to alcohol advertising on ESPN, other sports programs, and other entertainment, by determining what specific venues contained the greatest density of alcohol ads and asking adolescents how often they watched each of the venues, (Ellickson et al., 2005) and by Thomsen on exposure to U.S.-produced television programming and intentions to drink among Norwegian youth (Thomsen and Rekve, 2006). A similar approach was used to measure sexual content in other papers reported in this special issue (cf. Collins, 2008).

It would not be possible to ask every respondent about all available movies. The Beach method addresses this issue by content analyzing a parent sample, of 500–600 popular box office hits then asking each respondent about a randomly selected subsample of 50 movie titles. By randomly selecting movie titles from a larger sampling pool of popular box office hits, and creating a unique subset for each adolescent, it is possible to estimate population exposure to the full sample of box office hits rather than limiting exposure estimates to a specific subset of movies.

Figure 1 illustrates the procedure for a survey conducted in 2003 on a national sample of adolescents (Sargent et al., 2005). A parent pool of movies was selected based on year of release and box office success. These movies were all content analyzed for smoking. For each adolescent survey, a list of the movie titles was generated, stratified by MPAA rating to ensure a representative distribution by rating (because movie smoking is correlated with rating). Based on the movies the adolescent had seen, and the amount of smoking in each, exposure to smoking from the 50 movies was determined. This number was then adjusted to account for the fact that every list of 50 movies had a slightly different aggregate amount of smoking, by scaling the estimate so that it reflected total exposure to smoking in the larger sample of movies.

Thus, the Beach method provides a population-based assessment of exposure to a relatively large sample of movies, so that the results generalize to the characteristics of the larger sample, rather than to an individual survey sample of 50 movies. In addition, because of random assignment, all of the movie titles become integrated into the population survey with

approximately the same frequency; in the example illustrated in Figure 1, each movie title was asked of some 600 adolescents. Thus, the proportion of adolescents who have seen each movie can be determined, and this allows for an estimate of reach (Sargent et al., 2007). The main disadvantage to this procedure is that the implementation of the survey is unwieldy, especially for paper-and-pencil surveys. Despite this disadvantage, the method has been replicated by at a different laboratory using paper-and-pencil questionnaires (Hanewinkel & Sargent, 2007). In addition, the survey method can easily be implemented when surveys are administered by telephone, computer laptop or online surveys.

Content Coding

A team of two trained content coders coded the movies on an extensive list of variables in order to capture information about the movie in general, the characters and the tobacco use. This included information about the production of the movie, including the production company, distributors, producers, directors and cast, as well as information about the genre of the movie and its major themes. Characteristics of the major characters such as gender, age, race, socioeconomic status, and occupation (e.g., student, professional, criminal) were recorded as well as character type (e.g., villain, action hero, romantic lead).

Key to being able to quantify exposure to movie smoking, all tobacco use and imagery was coded in detail, including a count of all tobacco depictions, the amount of time tobacco use was shown, brand appearances, the type of tobacco used and characteristics of tobacco users. Each movie was viewed at least twice to thoroughly code the smoking content. The coders first watched the movie to identify key scenes with smoking, then a second time, counting the tobacco depictions on screen ("occurrences"). Tobacco occurrences were divided into "episodes," which included the handling or use of tobacco by a major or minor character, and "incidents," which included background use of tobacco in a scene such as background smoking by secondary characters, or the placement of tobacco products (e.g., a Marlboro display in the front of a store). Whenever there was any doubt or disagreement among coders as to whether tobacco appeared in a scene, they were instructed to be conservative and not count it. Coders also identified tobacco brands, including tobacco signs and displays, logos on clothing, identifiable cigarette packages and the mention of a brand by name. Coders were instructed to identify a brand only if they were reasonably certain of the brand name. Other information about the smoking scenes were recorded when appropriate, such as any time a character was portrayed as having a motivation for smoking or any time a character engaged in any of the following activities while using a tobacco product: socializing, thinking or passing time (including being pensive or taking a break), or celebrating (including helping someone else celebrate).

Reliability and Validity of the Beach Method

The reliability of the Beach method depends on reliability in two domains—the content analysis and the participants' reports of movies watched. We address each issue separately.

Content Analysis Reliability—Reliability of the content analysis was conducted by double coding a random sample consisting of 10% of the movies, assessing inter-rater reliability, and feeding this information back to the coders periodically. The reliability of character smoking was assessed in two ways. Each character's smoking status was recorded; inter-rater reliability (kappa) for this dichotomous variable was 0.97. In addition, the amount of time a character used tobacco was recorded. For each character that used tobacco, each coder's timing for tobacco use was compared by conducting a second-by-second evaluation. We calculated a kappa for each character that used tobacco, and the mean kappa was 0.81.

Test-Retest Reliability of Adolescents' Reports of Movie Exposure—Reliability and validity of adolescents' reports for the Beach method has been assessed in several ways. A test-retest reliability study was conducted on 75 adolescents, 11–12 years of age. They were asked whether or not they had seen some 30 movie titles, along with other questions about health, and were resurveyed 3 weeks later. The mean reliability coefficient for all movies was 0.70 (std dev 0.14). Concurrent reliability was also assessed as a result of a coding error in a 2007 telephone survey, which caused the name selected for the 20th movie title to be identical to the name selected for the 30th movie title in 440 adolescents. The survey asked the questions about movies in blocks of 10, so the 2 queries about the same movie title were separated by a block of questions on substance use and 9 other movie titles. Misclassification error direction was symmetrical, with 3.5% of adolescents saying "no" to the first query and "yes" to the second and 2.9% going the other direction. The Kappa reliability coefficient for answers to these queries was 0.88.

Correlation with Box Office Success

As described above, a large pool of contemporary movies has been coded by our group and in our surveys, each adolescent is asked about a subset of 50 movie titles, drawn randomly from a larger pool. Because the movie lists are randomly assigned, the proportion of adolescents who have seen each movie, a measure of the popularity of the movie, can be determined. One way to evaluate the face validity of adolescent recall would be to correlate the popularity of a movie among our study samples with the box office success of the movie. Table 2 shows the correlation between box office rank and the proportion of adolescents who have seen the movie, derived from two surveys, a 1999 survey of more than 5,000 Northern New England adolescents (Sargent et al., 2001) and another 2003 survey of a representative sample of 6,522 U.S. adolescents (Sargent et al., 2005). The majority of participants in both samples were 10–14 years old. The correlation overall was strong, −0.73 for the 1999 survey and −0.59 for the 2003 survey. As shown in Table 2, correlation was stronger for G-rated movies than for others where the audience is composed of higher proportions of adults. Correlation with box office rank was also stronger for more recent releases because for those movies box office revenue is a more pure measure of success; after release to DVD (which occurs 6 months to a year after box office release), success is also measured by the popularity of the DVD release.

Recall Bias and False Reports

One obvious concern with the Beach measure is that adolescents might forget they have seen a movie. Another concern is that adolescents might overreport seeing movies they believe are popular or cool in order to be more like their peers. To examine these issues, a prospective study with 49 adolescents was conducted in 2001. Participants were called once a month for 12 months, and at each interview they were asked what movies they had seen in the past week. They were re-contacted one year after the final interview and asked whether or not they had seen a list of 50 movies. Each list contained up to 30 movie titles they reported having seen the previous year (average=19), 10 sham movie titles with real stars, 10 sham movie titles with false stars, and other real movie titles to complete a list of 50. As shown in Table 3, adolescents had excellent recognition of the movies they were known to have seen, correctly remembering they had seen them about 90% of the time. Moreover, they were unlikely to report seeing sham titles, reporting this only 3% of the time, even when the sham titles were associated with real actors. The view rate for other real movies was typical of the view rates obtained for box office hits from our population-based surveys.

Another opportunity to assess the possibility of false reporting occurred when two movies that had not yet been released in the United States were included in the 1999 survey. The movies were included in the sample because they featured popular actors and the investigators were unaware at the time of the survey that the movies were unavailable in the United States. For

these two titles, the roughly 600 adolescents who responded could not have seen the movies unless they had been in the country of release. In addition, a sham title *Handsome Jack* was added to the 2003 survey of U.S. adolescents and all of the 6,522 participating adolescents were asked if they had seen it. As shown in Table 4, no more than 2% of the adolescents in either survey responded they had seen these movies. This contrasts with rates approaching 30% for *Hannibal* and *Blade II,* two extremely violent movies that were very popular among adolescents in our study.

This raises two questions: Are the small proportion of adolescents who falsely report seeing a sham title just committing a recall error, or are they somehow different from the other adolescents, and maybe more likely to falsely report smoking as well? Second, could the responses of this group of adolescents affect the results for the association between the exposure and smoking behavior? To examine these issues, one must first considered an adolescent's "movie orientation," defined as the number of the 50 movies from his/her list that an adolescent has seen. As illustrated in Figure 2, the 50th percentile for the distribution of movie orientation for the 2003 study was about 11 movies, and the interquartile range (25th-75th percentiles) was about 7–17 movies. Moreover, there were very few adolescents who reported seeing more than 30 of the 50 movies (the 97th percentile for exposure was 37 movies).

Figure 3 plots the proportion of the adolescents who reported seeing *Handsome Jack*, the sham title, and the two popular R-rated films, *Hannibal* and *Blade II,* as a function of movie orientation. Very few adolescents who were below the 97th percentile for movie orientation (from Figure 2) reported seeing the sham title *Handsome Jack.* Above the 97th percentile, false reporting for *Handsome Jack* increased dramatically. This could mean that the 3% of adolescents with high movie orientation were false reporters on everything, or it could be that they had seen so many movies that they had trouble keeping track of what they had not seen. In contrast, the curves for *Hannibal* and *Blade II* show that the proportion of adolescents who reported seeing these two real movies climbed steadily as a function of movie orientation. The rise in proportion seen for these real movies was consistent throughout the distribution for movie orientation such that even adolescents with low movie orientation reported seeing them.

Assuming that reporting seeing the sham title *Handsome Jack* is a marker for the roughly 3% of adolescents who report seeing more movies than they actually do see, could false reporters have influenced findings with respect to the relation between seeing movie smoking and adolescent smoking? It is possible that these adolescents are overreporting on smoking as well, and leveraging or biasing the results in favor of finding a relationship. If so, one would expect these overre-porters to influence the dose-response curve by maintaining its linearity at higher exposure doses. On the other hand, if the overreporters were accurately reporting their smoking, one would expect a flattening of the dose-response curve at higher exposures. The observation that the dose-response is curvilinear has been noted previously, both for the relation between exposure to movie smoking and adolescent smoking (Sargent, 2005), and for the relation between exposure to movie alcohol use and adolescent drinking (Sargent et al., 2006). Figure 4 shows the relation between exposure to movie smoking, and lifetime and 30-day smoking in a cross-sectional study of more than 5,400 Northern New England adolescents from 15 middle schools (Sargent et al., 2001). The estimates of exposure to movie smoking, assessed from a pool of 601 popular contemporary movies, ranged from 48 to 5,655 smoking occurrences, with median exposure being 1,145 and the 95th percentile for exposure being 3,493. The overreporters who had a higher propensity to report seeing a sham title would be above the 95th percentile. As shown in Figure 4, the relation between exposure and both smoking outcomes was curvilinear, with the dose-response attenuating as exposure increased; a downward inflection for both curves was seen at about the 95th percentile of exposure. This downward inflection is what one would expect if adolescents who tended to over-estimate their exposure to movies accurately reported smoking. This supports the rationale for censoring or

truncating the movie smoking exposure variable at the 95th percentile when using it as a continuous measure of exposure (Sargent et al., 2006).

Using the sham title as a marker for false reporters, an analysis was conducted to determine if they were somehow different from other adolescents in a way that would independently predict smoking. This was examined in a multivariate logistic regression analysis using the cross-sectional U.S national sample of 6,522 adolescents (Sargent et al., 2005) by determining whether reporting seeing *Handsome Jack* was a risk factor for reporting smoking, independent of the effect of seeing smoking in movies. "Ever tried smoking" (present in about 10% of the sample) was the dependent variable. Movie smoking exposure was modeled according to the algorithm illustrated in Figure 1 and entered as a continuous variable, scaled so going from 0 to 1 raised exposure to movie smoking from the 0th to the 50th percentile for exposure, and seeing *Handsome Jack* was entered as a dichotomous variable. As shown in Table 5, reporting seeing *Handsome Jack* was associated with trying smoking (crude odds ratio = 1.77), but the association is not independent of exposure to smoking in movies (adjusted OR 0.79, p-value NS). This analysis suggests that falsely reporting a sham title does not result in a higher risk of (reporting) trying smoking, over and above risk conferred by seeing smoking in real movies.

Finally, the predictive validity for smoking initiation of the Beach method was examined by comparing the association between the four measures of movie exposure listed in Table 1 and smoking. The study sample for these comparisons is the 1999 survey of 5,475 Northern New England adolescents for whom data are depicted in Figure 4 (Sargent et al., 2001). The adolescents were in grades 5 through 8 in New Hampshire and Vermont middle schools; their mean age was 12.1 years (std dev 1.1 yr.), and they were primarily Caucasian, with approximately equal numbers of girls and boys. About 17% had tried smoking at the time of the survey. As can be seen in Table 6, the sample was distributed evenly across all the media variables, with one exception — few adolescents reported never going to the theater, and for that reason the highest category of theater-going was used as the reference in the multivariate model. The crude odds ratios indicate that all of the media exposure variables were associated with trying smoking, such that higher exposure was associated with higher risk of trying smoking. The association with trying smoking was weaker for the media environment and self-reported frequency of movie viewing than for parental restriction of R-rated movies and Beach method measures. In addition, there was a clearer dose-response for the parental restriction and Beach method measures compared with the others. For example, all lower exposure groups in the movie theater measure were at similarly lower risk compared to the reference group. Previous research has shown a close linkage between exposure to smoking in R-rated and PG-13 movies and the media restriction, (Dalton et al., 2002), which may explain its strong relationship with behavior.

In the multivariate model, self-report of video/DVDs per week was no longer associated with trying smoking, and self-reported theater attendance was no longer strongly associated with trying smoking. With respect to media environment, only adolescents reporting access to all four premium movie channels were at higher adjusted risk compared with those who had none. In contrast, parental restriction and higher exposure to movie smoking retained strong dose-related and statistically significant relations with trying smoking, suggesting that each of these has better predictive validity for studies of the relation between movie viewing and adolescent smoking. The same may be true for measures of exposure to use of other substances, sex, and violence in the movies.

An issue related to confounding by other media measures involves the question of whether the Beach exposure measure actually examines exposure or some other aspect of the adolescent's personality, lifestyle, or family life that is associated with movie exposure and propensity to smoke. This concern is not addressed here but has been addressed in previously published work

that has demonstrated that the relation between movie smoking exposure, as determined by the Beach method, and smoking is independent of a number of confounders, including sociodemographics, parenting style, and personality characteristics (e.g., sensation seeking and rebelliousness) (Sargent et al., 2001; Dalton et al., 2003; Sargent et al., 2005; Hanewinkel & Sargent, 2007; Sargent et al., 2007; Hanewinkel & Sargent, 2008; Titus-Ernstoff et al., 2008). Moreover, interaction effects have consistently shown that adolescents at lower risk are more reactive to exposure to movie smoking. For example, those whose parents do not smoke are more responsive to movie smoking exposure (Dalton et al., 2003; Hanewinkel & Sargent, 2008), and those with low sensation seeking are also more responsive to movie smoking exposure (Sargent et al., 2007). This suggests that exposure does not predict smoking initiation merely because it is a general marker of high risk.

The limitations of the Beach exposure method include the additional complexity this method adds to survey design. It is fairly simple to program a random assignment when the survey is computer-aided, but this method can be onerous when paper surveys are employed. Another issue involves the fact that, just as in real life, risk behaviors cluster in the movies. As a result, it is not possible to control, for example, for exposure to movie alcohol use when examining the association between exposure to movie smoking and adolescent smoking, because these variables are collinear. Surprisingly, we have found that subsets of movie smoking are not always highly correlated. For example, we are revising a manuscript that assesses exposure to movie character smoking by whether the movie coders viewed the character portrayal as positive, negative, or mixed. These variables were correlated at the 0.4–0.5 level, which allowed for them to be successfully entered in a multivariate model.[2]

CONCLUSIONS

In order to determine its influence on adolescents, a novel method for estimating exposure to movie smoking was developed. The Beach measure of exposure to smoking in movies combines title recognition and content analysis and randomly assigns titles from a large pool of contemporary movies to produce a population-based assessment of the exposure. A strength of the measure is that it is content-specific; that is, it captures across-movie differences in exposure to smoking rather than assuming an invariant dose of exposure in each hour of viewing time. Clearly, adolescents may alter their dose of exposure through their media choices. If the content analysis includes an assessment of multiple domains, exposure to each one may be determined. Another strength of the measure is that it relies on recognition (not recall), and adolescents are able to reliably recognize a movie title they have seen in the past. The Beach method is easily implemented using telephone or web-based surveys, which are becoming the standard in field survey work. Finally this measure has excellent predictive validity for smoking initiation when compared with more traditional measures of exposure. In addition, although movies with a lot of smoking (e.g., R-rated movies) may affect behavior for a number of reasons (e.g., increases in sensation seeking), exposure to movie smoking predicts smoking controlling for other media consumption variables (e.g., how many movies they watch per week, where the adolescent watches the movie, and how often he or she views it with parents) (Sargent et al., 2007). This evidence suggests that the specific content has an effect on behavior that is independent of dose of movies in general or how and where the movie is watched, again suggesting a social influence effect of the actual movie depiction of smoking. We suggest that the Beach method of exposure assessment should be the standard when the media is delivered in discrete identifiable bundles.

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[2]Conference Proceedings from the 2nd Annual Minary Center Conference on Media: Modelling Movie Influence, Squam Lake, New Hampshire, August 14–16, 2006. Document available on request from Dr. Sargent.

Acknowledgements

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Select Parent Pool of Popular Movies

• Box office hits	**N**
Top 100 hits, 1998–2002	500
Hits making >$15mil, 2003	32

Generate Survey Movie Lists

• Randomly select 50 movies for each survey
• Use stratified sampling to ensure representative distribution by rating (R, PG 13, PG, G)

Movie Content Analysis

Survey Adolescents

• Questionnaire assesses which of the 50 movies the adolescent has ever seen

• Count the smoking depictions

Merge

Number movie smoking depictions seen (in the 50 movies)

Scale the Variable

$$\frac{\text{Smoking Depictions Seen (50 movies)}}{\text{Smoking Depictions Available (50 movies)}} \times \text{Smoking Depictions (532 movies)}$$
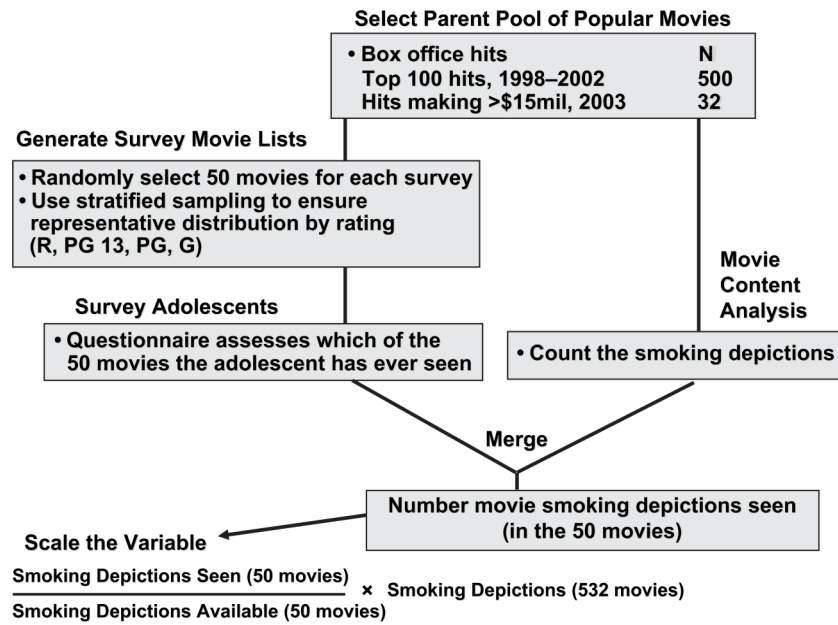
FIGURE 1.
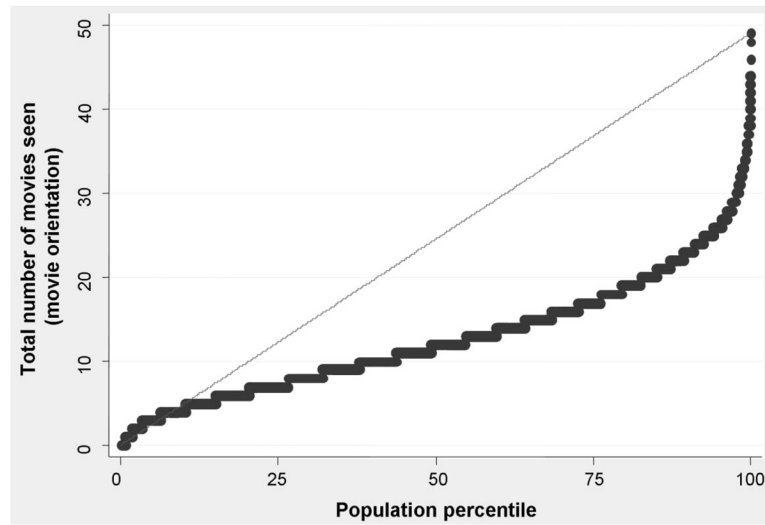Schematic for Dartmouth Media Exposure Assessment.

FIGURE 2.
Quantile distribution of the number of movies (out of 50 possible) seen by the adolescent respondent on a survey of U.S adolescents, 2003.
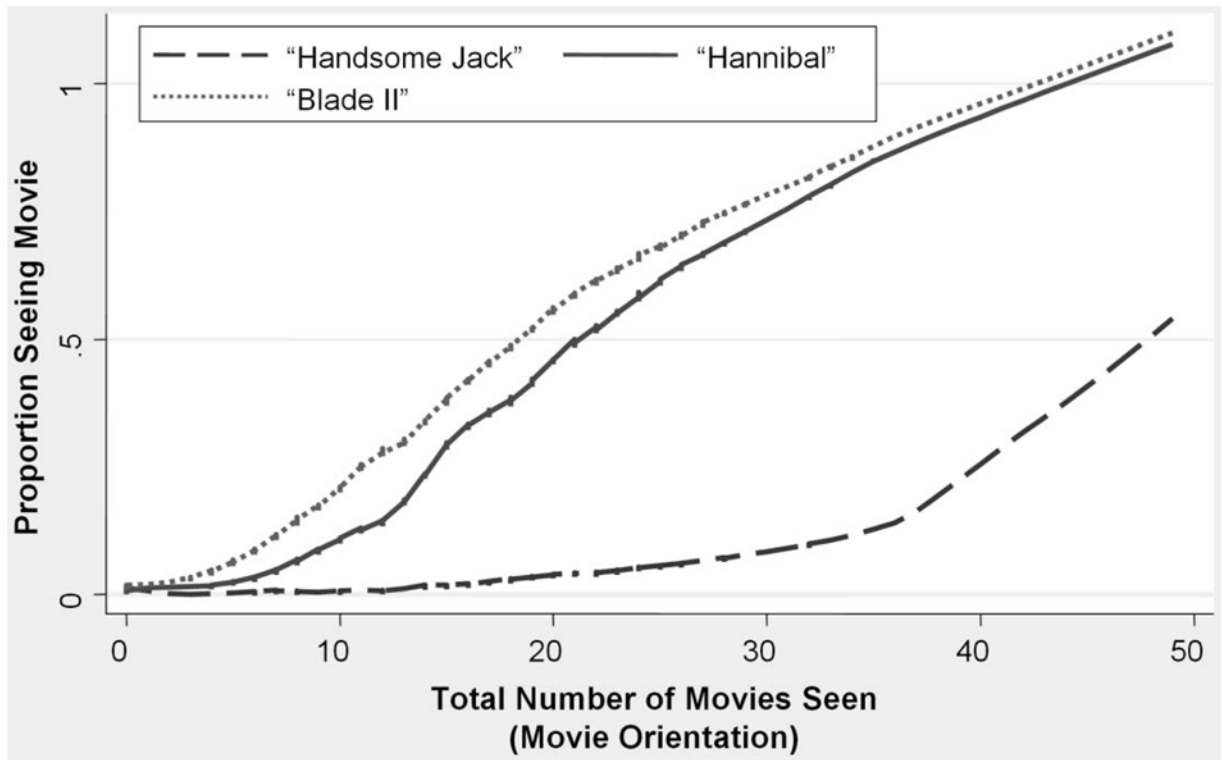
FIGURE 3.
Relation between the number of movies (out of 50 possible) an adolescent reports seeing and the popularity of the movie among the adolescent respondents (U.S. random digit dial sample of adolescents, 2003)
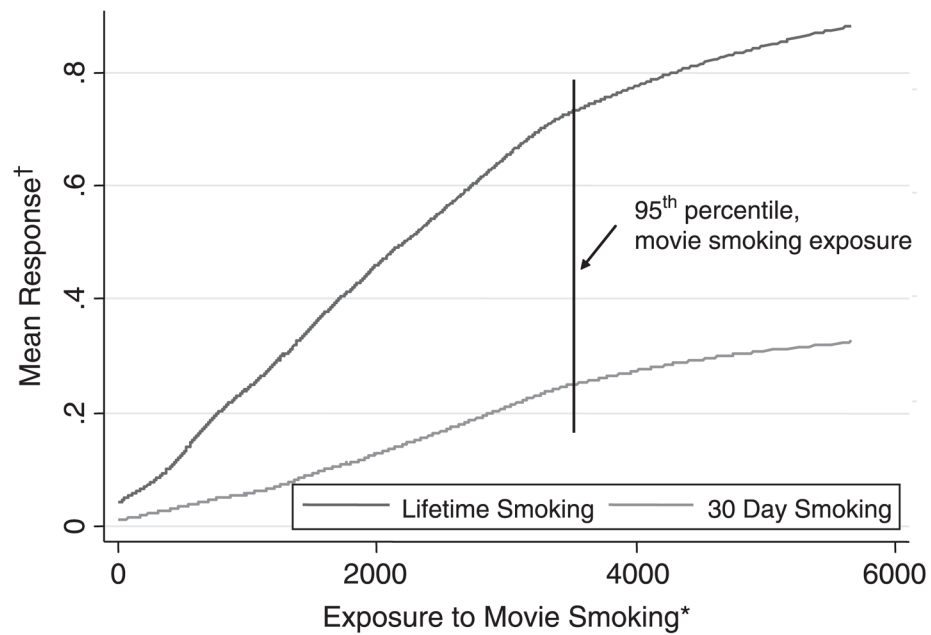
*Number of smoking occurrences seen from a sample of 601 popular contemporary movies
†For lifetime smoking: 0 = none, 1 = just a few puffs, 2 = 19cigs, 3 = 20–100cigs, 4 = >100cigs
For 30d smoking: 0 = none, 1 = <1 cig, 2 = −10cigs, 3 = >10cigs

FIGURE 4.
Cross-sectional relation between lifetime and 30-day smoking means and exposure to movie
smoking from a Northern New England sample of middle school adolescents, 1999.

TABLE 1

Assessing Exposure to Movie Smoking

INDIRECT MEASURES

Description of the media environment

"Do you have any special channels at home? Check all that you have." (responses included Cinemax, HBO, Showtime, The Movie Channel), coded 0–4, one point for each additional channel.

    Advantages:

        Easy to capture

        Frequently used

        Broadly assesses access to content

        For example, "Do you get HBO?"

    Disadvantages

        Unable to quantify exposure time or actual content; also confounded by parental influence, SES, etc.

Assessment of parental control of the media environment

"How often do your parents let you watch movies or videos that are rated "R"? (never, once in a while, sometimes, all the time)

    Advantages

        Easy to capture

        Broadly assesses access to content

    Disadvantages

        Confounded by other aspects of parenting

        Parental responses don't often relate well to exposure

        Social desirability bias

DIRECT MEASURES

Self-report of time spent viewing movies

"How many movies/DVDs do you watch each week?" (none, one or two, three or four, five or six, seven or more)

"How often do you go out to a movie theater to watch movies?" (never, less than once a month, once a month, more than once a month)

    Advantages:

        Easy to capture

        Frequently used

    Disadvantages:

        Recall bias

        Requires the respondent to average use over time

        Does not capture media content well

Title recognition and content (Beach Method)

    Example: "Have you seen the movie 'Blade?'"

    Advantages

        Assesses recognition, not recall

        People are better at recognizing something presented

        Can be used to assess exposure to content

        Especially when combined with content analysis

    Disadvantages

        Unwieldy from a survey implementation perspective

        One can't ask about each of the thousands of possible movies

        Content analysis of movies not widely available

TABLE 2

Correlation Between Box Office Success and the Proportion of Adolescents Seeing Movie

Survey year	Number of Movies	Correlation
Y=1999	601	−0.73
Y=2003		
Overall	534	−0.59
By rating		
G	28	−0.81
PG	71	−0.60
PG-13	220	−0.64
R	215	−0.56
By year		
1998	100	−0.58
1999	100	−0.57
2000	100	−0.63
2001	100	−0.63
2002	100	−0.62
2003	32	−0.72

TABLE 3

Validity of Movie Title Recognition

Movie Category	Have you seen this movie? (ascertained one year later)		
	Yes	**No**	**Don't know**
Reported seeing movie in 1999	87.2%	12.6%	0.6%
Sham movie title, real actor name	2.7%	96.7%	0.5%
Sham movie title, sham actor name	3.0%	96.4%	0.6%
Other real movies	41.1%	54.2%	4.6%

TABLE 4

Further Validation Against False Reports

Survey	Sham title	Percent of adolescents saying they saw the movie
Y=1999	"Hoogsie Tijd"	1.3%
	"Le Nouveau Monde"	1.1%
Y=2003	"Handsome Jack"	2.0%
	"Hannibal"	22.7%
	"Blade II"	30.8%

TABLE 5

Association with Smoking: Effect of Over-Reporting Movies

	Odds Ratio	
Risk Factor	Crude (z)	Adjusted (z)
Saw sham title	1.77 (2.4)	0.79 (−0.9)
Exposure to movie smoking*	1.68 (18.2)	1.69 (18.0)
N = 6515		

Entered as a continuous variable with the measure scaled so that 1 = median value.

TABLE 6

Distributions for the Media Variables and their Association with Ever Smoking

		Odds Ratios (z)	
Variable	Sample %	Crude	Adjusted
INDIRECT MEASURES			
Movie Environment			
Number of movie channels			
0	49.5	Ref	Ref
1	15.7	1.0 (0.1)	0.9 (0.3)
2	9.5	1.4 (2.7)	1.1 (0.3)
3	9.1	1.4 (2.7)	1.0 (0.9)
4	16.2	2.7 (10.70)	1.5 (4.1)
Parental Movie Restrictions			
Able to watch R-movies			
Never	15.8	Ref	Ref
Once in a while	24.6	2.8 (4.4)	2.3 (3.4)
Sometimes	28.1	6.7 (8.7)	4.5 (6.3)
All the time	31.5	18.6 (13.7)	10.7 (10.0)
DIRECT MEASURES			
Viewing frequency			
Video/DVD's per week			
None	12.4	Ref	Ref
1 to 2	60.1	1.1 (1.0)	0.8 (−1.7)
3 to 4	17.5	1.5 (3.2)	0.8 (−1.7)
5 to 6	4.9	1.7 (3.0)	0.8 (−1.0)
> = 7	5.1	2.3 (4.8)	0.8 (−0.9)
Trips to movie theater			
Never	6.4	0.5 (−3.9)	1.0 (0.1)
< 1x/month	43.9	0.4 (−10.1)	0.8 (−2.5)
1x/month	25.4	0.6 (−5.7)	0.8 (−1.7)
>1x/month	24.3	Ref	Ref
Beach Method			
Exposure to movie smoking			
Quartile 1	27.1	Ref	Ref
Quartile 2	29.0	2.7 (7.5)	1.7 (3.8)
Quartile 3	19.0	4.8 (11.6)	2.4 (5.8)
Quartile 4	24.9	7.7 (16.1)	2.7 (6.9)