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Early Exposure to Movie Smoking Predicts Established Smoking by Older Teens and Young Adults

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Abstract

OBJECTIVE—Movie smoking exposure is a strong predictor of smoking initiation by adolescents; however, we do not know whether it is a long-term predictor of established smoking. We conducted a prospective study to determine whether movie smoking exposure during early adolescence predicts established smoking in older teens and young adults.

DESIGN—We assessed movie smoking exposure and smoking status through a written school-based survey in 1999, when participants were 10 to 14 years of age. We enrolled 73% (*n* = 2603) of those who had never tried smoking in a follow-up study. In 2006–2007, we conducted telephone interviews with 69% (*n* = 1791) of the cohort to ascertain current smoking status. The primary outcome was established smoking, defined as having smoked >100 cigarettes. Mean age at follow-up was 18.7 years.

RESULTS—Thirteen percent (n = 235) progressed from never smoking to established smoking during the follow-up period. Eighty-nine percent (*n* = 209) of established smokers smoked during the 30 days before the survey. Even after controlling for a wide range of baseline characteristics, the relative risk for established smoking increased by one third with each successive quartile of movie smoking exposure. Those in the highest quartile for baseline movie smoking exposure were twice as likely to be established smokers at follow-up compared with those in the lowest quartile.

CONCLUSIONS—Movie smoking exposure significantly predicted progression to established smoking in long-term follow-up. We estimate that 34.9% of established smoking in this cohort can be attributed to movie smoking exposure.

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Drs Dalton, Beach, Sargent, and Heatherton designed and conducted the baseline survey and movie content analysis; Drs Dalton, Beach, Adachi-Mejia, Longacre, and Titus-Ernstoff designed and conducted the follow-up study; Drs Dalton, Beach, Adachi- Mejia, Longacre, and Titus-Ernstoff and Ms Matzkin provided input on the analysis and wrote the report. All authors reviewed the final manuscript.

Keywords

adolescent; adult; smoking; established smoking; tobacco; media; movies; films; epidemiology

Evidence suggests that visual media directly influence teenage smoking through observational learning and communication of messages that reinforce smoking.[1] Through a meta-analysis, Wellman et al[2] estimated that high exposure to smoking in media, including movies, television, videos, and tobacco advertising and promotions, can double the odds of smoking initiation among youth. With respect to movies, multiple cross-sectional studies have demonstrated a strong association between movie smoking exposure and adolescent smoking susceptibility[3–5] and initiation.[6–11] Several prospective studies have confirmed that movie smoking exposure is a strong predictor of smoking initiation among adolescents, even after controlling for other risk factors for smoking.[12–14] Both cross-sectional and prospective studies revealed a positive dose-response relationship between movie smoking exposure and smoking initiation. [7,10,12–14] Overall, studies indicate that 30% to 50% of smoking initiation among adolescents may be attributed to movie exposure.[5,15] Preliminary evidence suggests that the association between movie smoking exposure and smoking may be strongest for youth who would otherwise be at low risk for smoking, including those whose parents do not smoke[12] or who are low sensation seekers.[16]

Collectively, these studies unequivocally establish movie smoking exposure as a strong risk factor for smoking initiation. In fact, in a recently released monograph that summarized media's influence on tobacco use, the National Cancer Institute concluded that the weight of evidence supports a causal relationship between exposure to movie smoking and smoking initiation[17]; however, only one third of youth who initiate smoking progress to become regular smokers. Established smoking, defined as smoking >100 cigarettes in a lifetime,[18] has been associated with symptoms of smoking dependence among adolescents[16] and is commonly used to identify young smokers who are at high risk for nicotine dependence.[19] Although many social and environmental risk factors are associated with both smoking initiation and progression to established smoking, their contributions vary. For example, peer and sibling smoking may be more important predictors of initiation than established smoking.[20,21] To date, only 1 prospective study has examined adolescents' movie smoking exposure in relation to more advanced stages of smoking behavior. Although a positive association was seen, the follow-up period was relatively brief, limiting conclusions about enduring effects.[16] Consequently, little is known about the potential long-term impact of movie smoking exposure during adolescence on established smoking rates in older teens and young adults.

In this study, we examined the relationship between movie smoking exposure and established smoking in a cohort of adolescents who were followed since 1999. An interim report based on 1 to 2 years of follow-up demonstrated a positive association between movie smoking exposure and smoking initiation among these adolescents[12]; however, because of their young age and relatively brief follow-up, we were unable to assess the association between movie smoking exposure and established smoking at that time. Thus, the aim of this study was to determine whether movie smoking exposure, already shown to influence smoking initiation in this group, also predicts established smoking, which has much graver consequences for one's health.

METHODS

In 1999, we distributed a self-administered written survey to adolescents who were enrolled in grades 5 through 8 at 14 Vermont and New Hampshire schools. The purpose of this baseline survey was to assess movie smoking exposure and to evaluate its association with smoking attitudes and behavior among adolescents.[7] Between 2001 and 2002, we conducted follow-up

telephone surveys (wave 2) with 2603 participants, who were identified through the baseline survey as never smokers, to evaluate whether movie smoking exposure prospectively predicted smoking initiation.[12]

In 2006–2007, we successfully conducted telephone surveys (wave 3) with 69% (n = 1791) of the cohort to evaluate whether exposure to movie smoking before and during early adolescence predicts established smoking among older teens and young adults. The mean follow-up time between the baseline and the wave 3 surveys was 6.7 years (SD: 0.2 years). As in the previous phase, the follow-up telephone interviews were conducted by trained interviewers by using a computer-assisted telephone interview system.[12] The protocol for this study was approved by the Dartmouth Committee for the Protection of Human Subjects.

Measures

Lifetime smoking experience was assessed at baseline and follow-up by asking, "How many cigarettes have you smoked in your life?" to which respondents could answer, "None," "Just a few puffs," "One to 19 cigarettes," "Twenty to 100 cigarettes," or, "More than 100 cigarettes." Only students who answered "none" at baseline were eligible for follow-up. Participants who reported >100 cigarettes on any follow-up survey were classified as established smokers. All other measures were assessed through the 1999 baseline survey.

As previously described,[7,12] adolescents' baseline movie smoking exposure was assessed by using the Beach method,[22] whereby adolescents were asked to report whether they had seen specific movies sampled from a larger list of movies for which smoking content had been measured by trained coders.[23] Each student was asked about 50 movies, randomly sampled from a larger pool of 601 popular movies that were released between 1988 and 1999. We stratified the random selection of movies so that each list of 50 had the same distribution of ratings as the larger sample of top box-office hits: 45% were rated R, 31% were rated PG-13, 20% were rated PG, and 4% were rated G. Movie smoking exposure for each respondent was calculated by summing the number of smoking occurrences from each movie they had seen, expressing this as a proportion of the total number of smoking occurrences from movies included in their survey, and multiplying the proportion by the total number of occurrences in the full sample of 601 movies. Movie smoking exposure was then classified into quartiles on the basis of the distribution in the cohort of 2603 baseline never smokers, resulting in the following cutoffs: 0 to 531 occurrences for the first quartile, 532 to 960 for the second quartile, 961 to 1664 for the third quartile, and 1665 to 5308 for the fourth quartile.

We also measured baseline characteristics that could potentially confound the association between movie exposure and smoking behavior, including characteristics of the adolescent (gender, age, school, self-reported school performance [1 item], sensation seeking [6 items], rebelliousness [7 items], and self-esteem [8 items]; social influences [parent, sibling, and friend smoking; receptivity to tobacco promotions]) and parenting characteristics (parent education, 2 components of authoritative parenting,[24] and adolescents' perception of parental disapproval of smoking). Individual items that were used to measure adolescent personality and parenting characteristics were reported previously.[7] Participants used a 4-point response scale to indicate how well certain statements described themselves or their mothers (or primary caregiver if they did not live with their mother). Summary measures were created by adding their responses to the individual items in each scale so that higher scores signified more of each characteristic. The scores were then classified in quartiles on the basis of the distribution in the full cohort of baseline never smokers.

Statistical Analysis

We used χ^2 tests and unadjusted logistic regression to evaluate potential differences in demographics, social influences, personality characteristics, parent characteristics, or movie smoking exposure between participants who completed all 3 survey waves and those who were lost to follow-up after wave 2. A χ^2 test was also used to test the association between smoking initiation before wave 2 and established smoking at wave 3. Generalized linear models with a log link and Poisson errors were used to estimate relative risks (RRs) and 95% confidence intervals (CIs) for becoming an established smoker by wave 3. Multivariate models were adjusted minimally (age and gender) and fully (age; gender; parent, sibling, and friend smoking; receptivity to tobacco advertising; personality characteristics; school performance; parenting style; parent education; and parental disapproval of smoking) for potential confounders with adjustment for clustering by school. Adjusting for multiple comparisons, we tested for potential interactions between movie smoking exposure, parent smoking, and all other covariates. A covariate-adjusted attributable risk was estimated by calculating the reduced probability of established smoking realized by decreasing each child's movie smoking exposure from its reported level to the first quartile. [25,26] CIs were computed by using bootstrap simulation. The impact of loss to follow-up on estimates of relative and attributable risk was assessed by multiple imputation methods.[27]

Sample

The final sample of 1791 young adults was primarily non-Hispanic white (*n* = 1629; 91%) and included slightly more females (*n* = 970; 54%) than males (*n* = 821; 46%). The mean age at baseline was 12.0 years (SD: 1.1). At wave 3, participants' ages ranged from 16 to 21, with a mean of 18.7 years (SD: 1.1 years). Eighty-five percent (*n* = 1519) of the participants were enrolled in school at wave 3: 22.2% in high school, 60.8% in college, and 1.6% in other educational programs. Participants who were lost to follow-up were similar to the final sample of participants who completed all 3 surveys with regard to self-esteem, maternal demandingness, maternal responsiveness, and parental disapproval of smoking (Table 1). In general, a higher proportion of those who were lost to follow-up had risk factors for smoking at baseline, including a greater number of friends and family members who smoked, poorer school performance, higher sensation seeking and rebelliousness, higher exposure to movie smoking, and parents with less education (Table 1). Sixty percent (*n* = 154) of the 259 participants who had initiated smoking by wave 2 completed a wave 3 survey, versus 69.8% (*n* = 1637) of the wave 2 never smokers (*P* = .001). Reasons for nonparticipation included refusal to participate in follow-up interview (*n* = 220), loss to follow-up because of change of address and/or telephone number (*n* = 346), or inability to reach participants even after repeated call attempts (*n* = 246).

RESULTS

At wave 3, 47.2% (*n* = 846) of the study participants reported that they had tried smoking. Of these, 221 (26.1%) had smoked <1 cigarette, 390 (46.1%) had smoked 1 to 99 cigarettes, and 235 (27.8%) had smoked >100 cigarettes (established smoking). The majority (*n* = 209; 88.9%) of the established smokers reported that they had smoked during the 30 days before the survey, and all but 2 had smoked in the past year. Three fourths (*n* = 176) of the established smokers began smoking between waves 2 and 3; however, those who had initiated smoking by wave 2 were more likely to be established smokers by wave 3 compared with those who had not initiated smoking by the second survey (38.3% vs 10.7%, respectively; *P* < .001).

Analyses adjusted for age, gender, and clustering by school showed that almost all of the baseline characteristics significantly predicted established smoking at wave 3 (Table 2). Being older; being male; and having friends, siblings, or parents who smoked at baseline was

associated with a higher likelihood of becoming an established smoker. Receptivity to tobacco promotions, poorer school performance, high sensation seeking, rebelliousness, and having parents with lower education levels also were associated with a higher risk for established smoking. High self-esteem and having responsive mothers both were associated with a lower risk for becoming an established smoker by wave 3.

In the minimally adjusted model, movie smoking exposure significantly predicted the risk for becoming an established smoker with a dose-response association. Relative to the lowest quartile of movie smoking exposure, the risk for becoming an established smoker increased with each successive quartile of exposure: 1.53 (95% CI: 1.07–2.21) for the second quartile, 2.17 (95% CI: 1.53–3.05) for the third quartile, and 2.88 (95% CI: 2.08–3.98) for the fourth quartile (Table 2). A significant dose-response relationship was also seen in the fully adjusted model, although the RRs were attenuated. Relative to the lowest quartile of movie smoking exposure, the risk for established smoking increased by approximately one third with each successive quartile of movie smoking exposure: 1.36 (95% CI: 0.95–1.94) for the second quartile, 1.68 (95% CI: 1.15–2.44) for the third quartile, and 1.98 (95% CI: 1.35–2.90) for the fourth quartile (Table 2). Baseline age, gender, friend and parent smoking, school performance, and the highest quartile of rebelliousness also remained significant predictors of established smoking in the fully adjusted model. In our previously published wave 2 analysis, we found that the association between movie smoking exposure and smoking initiation was stronger among children of non-smoking parents[12]; however, we found no indication that such an interaction existed in relation to established smoking at wave 3 ($P = .18$). Neither was there a significant interaction between movie smoking exposure and any of the other covariates after adjusting for multiple comparisons.

After controlling for all other covariates, we estimated that 34.9% (95% CI: 13.8%–55.9%) of established smoking in this cohort can be attributed to movie smoking exposure. For example, by reducing baseline movie smoking exposure for all participants to the lowest quartile, the percentage of established smokers at follow-up would decrease from 13.1% to 8.5%. The attributable risk was similar when recalculated in the full cohort of 2603 participants, in which the final outcome was imputed for those who did not complete the wave 3 survey, suggesting a minimal impact of loss to follow-up.

DISCUSSION

This study demonstrates that movie smoking exposure before and during early adolescence significantly raises the risk for becoming an established smoker during later teen and young adult years, even after controlling for other known risk factors. Thus, movie smoking exposure is a significant predictor of more advanced stages of smoking behavior that are likely to have long-term adverse health consequences. Our attributable risk calculation suggests that reducing movie smoking exposure during childhood to levels experienced by those in the lowest quartile could reduce by more than one third the number of young adults who ultimately become established smokers.

Our data indicated a twofold increased risk for established smoking for those with the highest level of movie smoking exposure during early adolescence, relative to those with the lowest exposure. The magnitude of this effect is consistent with a recent national study of adolescents that demonstrated a twofold increase in risk for established smoking when comparing the 95th with the 5th percentile for movie smoking exposure in a relatively brief 24-month follow-up.[16] In our study, the increased risk for established smoking observed at wave 3 is slightly lower than the RR for smoking initiation seen at wave 2 (RR: 2.71 [95% CI: 1.73–4.25]).[12] This attenuation may indicate that movie smoking has a somewhat stronger influence on smoking initiation than on more advanced stages of smoking behavior. Those who had initiated

smoking by the wave 2 survey (mean age: 13.8 years [SD: 1.0 years]) were at higher risk for progression to established smoking. This may simply indicate that wave 2 initiators had more time to progress than those who initiated later. Alternatively, movie smoking exposure may be associated, in part, with established smoking because it promotes early smoking initiation, which is known to increase risk for regular smoking[28,29]; however, most of the adolescents who were established smokers by wave 3 had not initiated smoking by wave 2. Thus, the results of our study also suggest an enduring influence of movie smoking exposure that occurred before and during early adolescence. This finding is consistent with our previous longitudinal study of elementary school students, which indicated that movie smoking exposure that occurred during early childhood was as influential as exposure that occurred more proximal to the time of smoking initiation.[13] Nonetheless, we recognize that early exposure to movie smoking may correlate with movie exposure throughout adolescence and that subsequent exposures may also contribute to the observed relationship. Additional research is needed to understand fully the impact of exposures that occur at different ages and developmental stages.

The RR for being in the 2 highest quartiles of movie smoking exposure were greater than the RRs for having parents who smoked (RR: 1.36 [95% CI: 1.05–1.76]) or friends who smoked (RR: 1.51 [95% CI: 1.06–2.16]) compared with those who did not report these social influence exposures at baseline. Peer and parent smoking are typically thought to be the most powerful social influences on smoking behavior[30–34]; however, our findings indicate that movie smoking exposure may be a stronger predictor of established smoking. The implications of this finding are highly significant for prevention, because movie smoking exposure may be easier to eliminate through a combination of policy changes and parenting behavior than peer or parent smoking.

In our previous study, we found that the association between movie smoking exposure and smoking initiation was stronger among children of nonsmoking parents[12]; however, this interaction was not evident in relation to established smoking in this analysis. Overall, the influence of parental smoking on adolescent smoking was also reduced, perhaps reflecting the different nature of established smoking compared with smoking initiation or the older age of study participants.

The generalizability of our findings may be limited by the demographic characteristics of our sample, which includes predominantly white, northern New England residents. The prevalence of established smoking in our cohort, most of whom were enrolled in school, is similar to rates observed among college-educated young adults,[35] which suggests that our findings are applicable to a population that is overall at lower risk for smoking. If lower risk individuals are more susceptible to movie influences, then our estimate of movie smoking influence may be slightly higher than what it would be in the general population.

CONCLUSIONS

This study, the first long-term follow-up of adolescent movie smoking exposure in relation to smoking behavior, showed a twofold increased risk for established smoking for those with the highest levels of exposure compared with the lowest. Our findings, based on almost 7 years of follow-up, also support an enduring influence of exposure to movie smoking that occurs during early adolescence. To the extent that our results are generalizable, estimates of attributable risk indicate that movie smoking exposure may account for one third of established smoking by older adolescents and young adults. Thus, our results suggest that high exposure to movie smoking at a young age not only is associated with smoking initiation but also may promote progression to more advanced stages of smoking behavior. Reducing children's exposure to movie smoking may be a key factor in preventing long-term adverse health consequences as a result of smoking.

What's Known on This Subject

Exposure to smoking in movies is a strong predictor of early smoking experimentation among adolescents; however, we do not know whether movie smoking exposure predicts advanced stages of smoking behavior later in life.

What This Study Adds

Movie smoking exposure significantly predicts progression to established smoking in long-term follow-up. Eliminating exposure to movie smoking during childhood could reduce by more than one third the number of young adults who ultimately become addicted smokers.

Abbreviations

RR, relative risk; CI, confidence interval.

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TABLE 1

Comparison of Baseline Characteristics Among Those Who Completed All 3 Surveys Versus Those Who Were Lost to Follow-up After Wave 2

Characteristic	Completed All 3 Surveys (*n* = 1791; 68.8%)		Lost to Follow-up After Wave 2 (*n* = 812; 31.2%)		*P*	OR (95% CI) for Being Lost to Follow-up
	n	Col%	*n*	Col%		
Movie smoking exposure					<.0001	
First quartile	502	28.0	149	18.4		1.00
Second quartile	472	26.3	179	22.0		1.28 (0.99–1.64)
Third quartile	431	24.1	220	27.1		1.72 (1.35–2.20)
Fourth quartile	386	21.6	264	32.5		2.30 (1.81–2.93)
Sociodemographics						
Age, y					.0037	
10–11	593	33.1	231	28.5		1.00
12	561	31.3	238	29.3		1.09 (0.88–1.35)
13–14	637	35.6	343	42.2		1.38 (1.13–1.69)
Gender					.0174	
Male	821	45.8	413	50.9		1.00
Female	970	54.2	399	49.1		0.82 (0.69–0.97)
Social influences						
Either parent smokes					<.0001	
No	1335	74.5	495	61.0		1.00
Yes	456	25.5	317	39.0		1.88 (1.57–2.24)
Any friends smoke					<.0001	
No	1393	77.8	539	66.4		1.00
Yes	398	22.2	273	33.6		1.77 (1.48–2.13)
Any siblings smoke					<.0001	
No	1639	91.5	697	85.8		1.00
Yes	152	8.5	115	14.2		1.78 (1.38–2.30)
Receptive to tobacco promotions					<.0001	
No	1534	85.6	627	77.2		1.00
Yes	257	14.4	185	23.8		1.76 (1.43–2.17)

Characteristic	Completed All 3 Surveys (*n* = 1791; 68.8%)		Lost to Follow-up After Wave 2 (*n* = 812; 31.2%)		*P*	OR (95% CI) for Being Lost to Follow-up
	n	Col%	*n*	Col%		
Child characteristics						
School performance					<.0001	
Excellent	831	46.4	282	34.7		1.00
Good	677	37.8	329	40.5		1.43 (1.19–1.73)
Average/below average	283	15.8	201	24.8		2.09 (1.67–2.62)
Sensation seeking					<.0001	
First quartile	593	33.1	199	24.5		1.00
Second quartile	492	27.5	217	26.7		1.31 (1.05–1.65)
Third quartile	312	17.4	172	21.2		1.64 (1.29–2.10)
Fourth quartile	394	22.0	224	27.6		1.69 (1.35–2.13)
Rebelliousness					<.0001	
First quartile	564	31.5	207	25.5		1.00
Second quartile	402	22.4	147	18.1		1.00 (0.78–1.28)
Third quartile	449	25.1	219	27.0		1.33 (1.06–1.67)
Fourth quartile	376	21.0	239	29.4		1.73 (1.38–2.17)
Self-esteem					.1714	
First quartile	456	25.5	220	27.1		1.00
Second quartile	506	28.2	241	29.7		0.99 (0.79–1.23)
Third quartile	521	29.1	239	29.4		0.95 (0.76–1.19)
Fourth quartile	308	17.2	112	13.8		0.75 (0.58–0.99)
Parent characteristics						
Maternal demandingness					.2419	
First quartile	410	22.9	207	25.5		1.00
Second quartile	454	25.4	212	26.1		0.93 (0.73–1.17)
Third quartile	521	29.1	234	28.8		0.89 (0.71–1.12)
Fourth quartile	406	22.7	159	19.6		0.78 (0.61–0.99)
Maternal responsiveness					.0951	
First quartile	344	19.2	182	22.4		1.00

Characteristic	Completed All 3 Surveys (*n* = 1791; 68.8%)		Lost to Follow-up After Wave 2 (*n* = 812; 31.2%)		*P*	OR (95% CI) for Being Lost to Follow-up
	n	Col%	*n*	Col%		
Second quartile	384	21.4	187	23.0		0.92 (0.72–1.18)
Third quartile	472	26.4	207	25.5		0.83 (0.65–1.06)
Fourth quartile	591	33.0	236	29.1		0.76 (0.60–0.95)
Parent education					.0003	
Both completed high school	1560	87.1	663	81.7		1.00
Neither or one completed high school	231	12.9	149	18.3		1.52 (1.21–1.90)
Parental disapproval of smoking					.5098	
Both disapprove	1490	83.2	667	82.1		1.00
Neither or mixed disapprove	301	16.8	145	17.9		1.08 (0.87–1.34)

TABLE 2

Association Between Baseline Characteristics and Becoming an Established Smoker by Wave 3

Baseline Characteristics (*N* = 1791)	Established Smokers by Wave 3 (*N* = 235; 13.1%)		Minimally Adjusted RR (95% CI)[a]	Fully Adjusted RR (95% CI)[b]
	n	Row%		
Movie smoking exposure[c]				
First quartile	502	6.6	1.00	1.00
Second quartile	472	10.8	1.54 (1.07–2.21)[d]	1.36 (0.95–1.94)
Third quartile	431	15.6	2.17 (1.54–3.05)[e]	1.68 (1.15–2.44)[f]
Fourth quartile	386	21.8	2.88 (2.08–3.98)[e,g,h]	1.98 (1.35–2.90)[e]
Sociodemographics				
Age, y				
10–11	593	8.8	1.00	1.00
12	561	14.6	1.68 (1.19–2.37)	1.56 (1.17–2.08)
13–14	637	15.9	1.80 (1.34–2.42)	1.40 (1.08–1.83)
Gender				
Male	821	15.8	1.00	1.00
Female	970	10.8	0.68 (0.61–0.77)	0.86 (0.74–1.00)
Social influences				
Either parent smokes				
No	1335	10.8	1.00	1.00
Yes	456	20.0	1.91 (1.58–2.31)	1.36 (1.05–1.76)
Any friends smoke				
No	1393	10.3	1.00	1.00
Yes	398	23.1	2.14 (1.63–2.80)	1.51 (1.06–2.16)
Any siblings smoke				
No	1639	12.0	1.00	1.00
Yes	152	25.7	2.12 (1.50–2.98)	1.27 (0.90–1.78)
Receptive to tobacco promotions				
No	1534	11.7	1.00	1.00
Yes	257	21.8	1.69 (1.27–2.25)	0.89 (0.64–1.23)
Child characteristics				
School performance				
Excellent	831	8.7	1.00	1.00
Good	677	12.3	1.33 (0.88–2.03)	1.05 (0.70–1.59)
Average/below average	283	28.3	2.99 (2.23–4.02)	1.84 (1.29–2.61)
Sensation seeking				
First quartile	593	6.9	1.00	1.00
Second quartile	492	12.2	1.70 (1.10–2.64)	1.34 (0.83–2.16)
Third quartile	312	17.0	2.29 (1.64–3.20)	1.50 (1.00–2.25)
Fourth quartile	394	20.6	2.68 (1.69–4.25)	1.46 (0.81–2.60)
Rebelliousness				

Baseline Characteristics (*N* = 1791)	Established Smokers by Wave 3 (*N* = 235; 13.1%)		Minimally Adjusted RR (95% CI)[a]	Fully Adjusted RR (95% CI)[b]
	n	Row%		
First quartile	564	6.9	1.00	1.00
Second quartile	402	11.2	1.56 (1.05–2.34)	1.39 (0.88–2.19)
Third quartile	449	14.3	1.90 (1.40–2.59)	1.38 (0.95–2.00)
Fourth quartile	376	23.1	3.06 (2.19–4.27)	1.66 (1.03–2.65)
Self-esteem				
First quartile	456	19.3	1.00	1.00
Second quartile	506	10.1	0.53 (0.40–0.69)	0.75 (0.56–0.98)
Third quartile	521	11.1	0.57 (0.43–0.77)	0.91 (0.66–1.26)
Fourth quartile	308	12.3	0.64 (0.44–0.93)	1.28 (0.91–1.80)
Parent characteristics				
Maternal demandingness				
First quartile	410	16.6	1.00	1.00
Second quartile	454	12.6	0.77 (0.59–0.99)	0.93 (0.75–1.14)
Third quartile	521	11.1	0.67 (0.54–0.84)	0.82 (0.64–1.05)
Fourth quartile	406	12.8	0.80 (0.61–1.04)	1.03 (0.77–1.39)
Maternal responsiveness				
First quartile	344	18.0	1.00	1.00
Second quartile	384	14.3	0.76 (0.58–1.00)	1.00 (0.78–1.29)
Third quartile	472	10.4	0.58 (0.41–0.83)	0.87 (0.61–1.24)
Fourth quartile	591	11.7	0.68 (0.52–0.88)	1.04 (0.75–1.43)
Parent education				
Both completed high school	1560	11.9	1.00	1.00
Neither or 1 completed high school	231	21.2	1.96 (1.39–2.74)	1.32 (0.94–1.85)
Parental disapproval of smoking				
Both disapprove	1490	12.5	1.00	1.00
Neither or mixed disapprove	301	16.3	1.30 (0.95–1.78)	0.97 (0.71–1.34)

[a] RR for age at baseline adjusted for gender and school. RR for gender adjusted for age and school. All other RRs adjusted for age at baseline, gender, and school.

[b] RR adjusted for school and all other variables in the table.

[c] First quartile, 0 to 531 occurrences of smoking; second quartile, 532 to 960 occurrences; third quartile 961 to 1664 occurrences; and fourth quartile, 1665 to 5308 occurrences.

[d] $P<.05$ versus first quartile.

[e] $P<.001$ versus first quartile.

[f] $P<.01$ versus first quartile.

[g] $P<.01$ versus second quartile.

[h] $P<.05$ versus third quartile.