Tobacco Promotion and Susceptibility to Tobacco Use among Adolescents Aged 12 through 17 Years in a Nationally Representative Sample

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ABSTRACT

Objectives. The purpose of this study was to examine whether youth participation in tobacco promotion campaigns is associated with susceptibility to tobacco use.

Methods. Data were collected from telephone interviews of a national random sample of 1047 adolescents 12 to 17 years of age.

Results. A proportional odds model was used to estimate the effects of age, gender, presence of a tobacco user in the household, awareness of tobacco promotions, knowledge of a young adult or adolescent friend owning a promotional item, participation in tobacco promotions, and receipt of free tobacco samples or direct mail from tobacco companies on susceptibility to tobacco use. All of the covariates, except for receiving direct mailings and knowing a young adult friend who owned a promotional item, were significantly associated with susceptibility.

Conclusions. There is a strong association between an awareness of and involvement with tobacco promotions and being susceptible to tobacco use or a user of tobacco products. (*Am J Public Health.* 1996; 86:1590–1593)

Introduction

In the United States, tobacco products are more heavily marketed than any consumer product other than automobiles.[1] In 1993, tobacco companies spent more than $6 billion on advertising and promotion.[2] Of this total, $756 million was spent on specialty item distribution (e.g., free samples of tobacco, tee shirts, lighters, hats, product catalogs) and $2.6 billion was spent on coupons and retail value added promotions at the point of purchase. Representatives of the tobacco industry have repeatedly stated that these items are not intended for anyone under 21 years of age. Concern about tobacco promotions has grown, prompted by the effective RJR Joe Camel Cash and Philip Morris Marlboro Adventure Team campaigns, both of which included widespread catalog distribution and specialty item promotions. For example, it was estimated that over approximately 1 year, 4 million people received 14 million promotional items (e.g., caps, lighters) in the Philip Morris Marlboro Adventure Team campaign.[3,4]

In 1993, approximately 19% of high school seniors reported daily smoking, an increase from 17.2% in the previous year.[5–7] The persistence of adolescent tobacco use,[1,8] combined with large tobacco industry marketing expenditures, highlights the importance of examining the relationship between youth susceptibility to tobacco use and participation in promotional campaigns.[9–12]

Methods

Sample and Design

Data were collected from telephone interviews of a random sample of US adolescents (12 to 17 years of age) and young adults (18 to 24 years of age). Since this paper is concerned with the effect of promotions on minors, only the results for the adolescent sample are reported here.

The list of telephone numbers was generated from a modified Mitofksy–Waksberg random-digit dial sampling method; the "Random B" sample was purchased from Survey Sampling Inc (Fairfield, Conn) for use in this study. All area codes in the United States were eligible for the sampling frame, and known business numbers were removed. Persons answering the telephone confirmed household eligibility criteria and the number of eligible persons. One eligible participant per household was selected randomly by computer to be interviewed. Except for age, the sole exclusion criterion was inability to speak English or Spanish. The consent of both the respondent and his or her parents was sought whenever a respondent less than 18 years of age was selected. Respondents were told that they had been selected randomly, their responses were confidential and anonymous, they would not be called again, and they would not receive any remuneration for participating. As a

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means of limiting response bias, parents were asked to allow the young person to respond to the questions in private. Parents who refused to provide such privacy were counted as refusals in response rate calculations. As a means of facilitating minors' privacy, all respondents were given a toll-free number to call if they preferred being interviewed at another time or place. The interview took approximately 12 minutes to administer.

Participant Accrual

Participant accrual procedures and telephone interviews were conducted by Freeman, Sullivan & Co in San Francisco, Calif. All interviewers (n = 23) were trained to administer the study questionnaire in English; 2 were trained to administer it in Spanish. Participant accrual began on July 9, 1993, and was completed on August 6, 1993. Interviews were conducted Monday through Friday from 8 AM to 9 PM, Saturday from 10 AM to 9 PM, and Sunday from 3 PM to 9 PM. All numbers were attempted at least five times at different periods over 3 days.

Response Rates

Survey Sampling Inc produced 51 000 random-digit phone numbers. Business, unassigned, and nonworking numbers were removed, leaving a net total of 45 274 numbers. From this list, 30 147 telephone calls were made to meet the predetermined quota. Of these calls, 2155 (7.1%) reached households with respondents determined to be eligible. Interviews were completed with 1337 of these eligible respondents (1047 adolescents and 290 young adults). This represented a refusal rate of 38.0% of households known to have an eligible respondent. Of the 818 refusals among eligible households, 331 (40.5%) were from parents refusing to allow interviewers to speak with their children. The remaining 487 (59.9%) came from eligible respondents themselves. An additional 3938 calls resulted in a refusal to participate before household eligibility could be determined.

Measures

Explanatory variables. The hypothesized explanatory variables were age in years, gender, presence of a tobacco user in the household, awareness of tobacco promotions (i.e., awareness of the Camel Cash, Marlboro Adventure Team, Winston Cup Point Challenge, Virginia Slims Wear, Winston Weekends, and Parliament Getaways promotions), knowledge of a young adult or adolescent friend owning a promotional item, participation in tobacco promotions (i.e., the respondent had ever owned a promotional item; saved proof of purchase coupons, UPC codes, or "Camel Cash" or "Marlboro Mile" coupons; or had a copy of a promotional catalog), receipt of mail from a tobacco company, and receipt of a free tobacco sample.

TABLE 1—Descriptive Data on the Tobacco Susceptibility Index among Youth 12 to 17 Years of Age (n = 1047)

	Not Susceptible (n = 718)	Susceptible, Not Current User (n = 156)	Susceptible, Current User (n = 173)
Mean age, y	14.1	14.9	15.5
Male, %	46.9	55.8	57.8
Tobacco user in household, %	38.9	55.1	65.3
Ever heard of any promotional campaign, %	78.8	91.0	96.0
Ever participated in promotional campaign, %	24.5	46.2	68.2
Adolescent friend owns promotional item, %	40.5	53.8	66.7
Young adult friend owns promotional item, %	42.7	28.9	26.5
Ever received mail from a tobacco company, %	3.8	3.3	11.0
Ever received free tobacco sample, %	2.7	3.9	11.0

Dependent variable. Susceptibility to tobacco use was the dependent variable. This three-category ordered variable involved coding of respondents as nontobacco users, as susceptible to tobacco use, or as current users of tobacco products. Tobacco use included both cigarettes and chewing tobacco. Previous research has shown this susceptibility measure to be a valid predictor of subsequent tobacco use.[10–13] Respondents were coded as susceptible if they met one or more of the following criteria: (1) never puffed on a cigarette and responded "yes" to the question "Do you think you will try a cigarette soon?" (2) responded "yes" when asked, "Do you think you will try a cigarette soon?" (3) had never puffed on a cigarette and did not respond "definitely not" when asked, "If one of your best friends were to offer you a cigarette, would you smoke it?" (4) had puffed on a cigarette and did not respond "definitely not" when asked, "At any time during the next year, do you think that you will smoke a cigarette?" and (5) smoked in the previous month (coded as current user). History of chewing tobacco use was probed with the same items as cigarette smoking, except that the phrase "snuff or chewing tobacco" was used. Susceptibility to use of chewing tobacco was determined in the same manner as smoking.

Data Analysis

The data were analyzed with a proportional odds model.[14,15] This model is used when there is an ordered categorical dependent variable. The model can be simply stated. Let Y be an ordered response variable with k ordered categories (the susceptibility index has three categories), and let $\mathbf{x}$ be a vector of covariates. The proportional odds model can be written as follows:

$$\ln\left[\frac{p_j}{1-p_j}\right] = \alpha_j + \boldsymbol{\beta}'\mathbf{x}, j = 1, \ldots, k-1,$$

where p_j is the probability of falling into one of the $k-j$ categories above category j (i.e., $p_j = P(Y > j \mid X = x)$, $\boldsymbol{\beta}$ is a vector of logistic coefficients, and $\mathbf{x}$ is a vector of independent variables. The intercept terms, α_j, vary across categories, and $\alpha_1 \geq \ldots \geq \alpha_{k-1}$. Note that the intercept terms must be ordered because the number of cases in the numerator is decreasing as j increases, so the log odds must also be decreasing. For the simple case in which there is one binary covariate (coded 0 or 1), α_j is the log odds of falling above the jth cut point for the zero coded category of the covariate. Note that although the intercept terms (i.e., the α_j's) vary across the $k-1$ equations, the assumption is made that the "slope" parameters are constant across equations. The validity of this assumption was tested by means of a score statistic.[16,17] The model's goodness of fit was also examined.[18]

Results

Table 1 provides descriptive data illustrating the relationship between the susceptibility index and the covariates.

TABLE 2—Proportional Odds Model of Susceptibility among Youth 12 to 17 Years of Age

Covariate	$\hat{\beta}$	SE	*P*	Exponential $\hat{\beta}$	95% Confidence Interval
Awareness	0.69	0.276	.012	2.00	1.17, 3.44
Adolescent friend owns item	0.52	0.152	.001	1.69	1.25, 2.27
Participation	1.02	0.155	.000	2.77	2.04, 3.75
Received free tobacco	0.85	0.352	.016	2.34	1.17, 4.66
Tobacco user in home	0.85	0.152	.000	2.34	1.74, 3.15
Female	−0.35	0.149	.018	0.70	0.52, 0.94
Age, y	0.40	0.048	.000	1.49	1.36, 1.64
Intercept 1	−8.18	0.759	...	...	...
Intercept 2	−9.20	0.773	...	...	...

These data illustrate the positive association between susceptibility and tobacco promotions.

A proportional odds model was used to estimate the effects of the covariates (i.e., age, gender, presence of a tobacco user in the household other than the respondent, awareness of tobacco promotions, knowledge of a young adult or an adolescent friend owning a promotional item, participation in tobacco promotions, receipt of a direct mailing from tobacco companies, and receipt of free tobacco samples) on the susceptibility index. An initial analysis using all of the covariates just listed resulted in all coefficients being statistically significant, except for those associated with receiving direct mailings from tobacco companies and knowing a young adult friend who owned a promotional item. Because 56 respondents had missing data on the two items for which the coefficients were not significant, the model was refit without these two covariates to increase the sample size and thereby somewhat reduce the standard errors. The nonsignificant results of the score test supported the assumption of equality of slopes ($\chi^2 = 6.16$, $df = 7$, $P = .52$). Similarly, the goodness of fit test indicated that the model fit the data ($\chi^2 = 8.28$, $df = 4$, $P = .08$). Table 2 presents the estimated coefficients for the refit model ($\hat{\beta}$), as well as the asymptotic standard errors, the *P* value associated with each coefficient, the exponential value of the coefficient, and the 95% confidence interval.

The results shown in Table 2 indicate that girls were less likely to be either susceptible to tobacco use or current tobacco users. Susceptibility to tobacco use and actual tobacco use increased with age. The coefficients for the promotional items indicate that these items increased the probability of being susceptible to tobacco use or being a current tobacco user. For example, as shown in Table 2, when a child was aware of tobacco promotions, the odds of being a user or being susceptible were about 2 times greater than when a child was unaware of tobacco promotions (assuming fixed values for age, gender, and presence of a tobacco user in the household). When a child was both aware of tobacco promotions and had an adolescent friend who owned a promotional item, the predicted odds of being a user or being susceptible were 3.4 times greater than the odds for a child who was unaware of tobacco promotions and had no friends who owned promotional items. The odds of being susceptible or of being a tobacco user for a child who was aware, had a friend who owned an item, and had personally participated in tobacco promotions were predicted to be 9.3 times greater than the odds for a child who did not have these characteristics. Finally, the odds of being a user or being susceptible were 21.8 times greater when all promotional covariates were present (i.e., awareness of tobacco promotions, knowledge of an adolescent friend owning a promotional item, participation in tobacco promotions, and receiving free tobacco samples) than when all of the promotional covariates were absent. Thus, there was a strong association between an awareness of and involvement with tobacco promotions and being susceptible to tobacco use or being a user of tobacco products.

Discussion

This study is the first national representative survey of youth that has examined the relationship between experience with tobacco promotions and susceptibility to use tobacco. Our data provide evidence that experience with tobacco promotions, as measured by awareness, knowledge of others owning items, and firsthand experience with promotions, is strongly associated with susceptibility to tobacco use. This finding is important because there is evidence of a dose–response relationship between the susceptibility index and subsequent tobacco use[10–13] and other evidence that youth are highly involved in tobacco promotion campaigns.[9] These findings should be interpreted in light of the modestly large nonparticipation rate and the potential for the true nonparticipation rate to be higher as a result of calls for which the eligibility of households could not be determined.

Although tobacco companies have stated their opposition to minors participating in tobacco promotion campaigns, our data indicate that company efforts to prevent this from happening have failed. Stronger regulation of tobacco company practices is the only realistic means of ensuring that children and adolescents are protected. Regulations might include prohibiting free samples and specialty item distribution, requiring that warning labels appear on all promotional items, increasing the enforcement of laws regarding the distribution of tobacco and tobacco promotions to minors, and more tightly regulating the methods of distributing promotional items, including the use of the mail for tobacco product marketing.[19] Most of these suggestions are included in the Food and Drug Administration's proposal to regulate cigarettes and smokeless tobacco products.[20]

Our data justify the concern expressed by public health professionals that tobacco promotions are reaching minors.[21] Perhaps most important, these data illustrate that exposure to tobacco promotions is associated with use of tobacco, although longitudinal studies are needed to examine this relationship prospectively. □

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References

1. *Preventing Tobacco Use among Young People: A Report of the Surgeon General.* Atlanta, Ga: Centers for Disease Control and Prevention; 1994.

2. *Report to Congress for 1993 Pursuant to the Federal Cigarette Labeling and Advertising Act.* Washington, DC: US Federal Trade Commission; 1995.
3. Shapiro E. Cigarette makers outfit smokers in icons, eluding warnings and enraging activists. *Wall Street Journal.* September 27, 1993:B1.
4. Telnowitz I. Marlboro 'team' corralled. *Advertising Age.* December 20, 1993:3.
5. Giovino GA, Schooley MW, Zhu BP, et al. Surveillance for selected tobacco-use behaviors—United States, 1900–1994. *MMWR Morb Mortal Wkly Rep.* 1994;43(SS-3):1–43.
6. McGinnis JM, Lee PR. Healthy people 2000 at mid decade. *JAMA.* 1995;273:1123–1129.
7. Johnston LD, O'Malley PM, Bachman JG. *National Trends in Drug Use and Related Factors among American High School Students and Young Adults, 1975–1993.* Rockville, Md: US Dept of Health and Human Services; 1994.
8. Lynch BS, Bonnie RJ. *Growing Up Tobacco Free: Preventing Nicotine Addiction in Children and Youths.* Washington, DC: National Academy Press; 1994.
9. Bezilla R. *Teenage Attitudes and Behavior Concerning Tobacco: Report of the Findings.* Princeton, NJ: George H. Gallup International Institute; 1992.
10. Pierce JP, Evans N, Farkas A. *Tobacco Use in California: An Evaluation of the Tobacco Control Program, 1989–1993.* San Diego, Calif: University of California; 1994.
11. Pierce JP, Farkas A, Evans N. *Tobacco Use in California 1992: A Focus on Preventing Uptake in Adolescents.* Sacramento, Calif: California Department of Health Services; 1993.
12. Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Merritt RK, Giovino G. *Validation of Susceptibility as a Predictor of Who Takes Up Smoking in the United States.* San Diego, Calif: University of California; 1995.
13. Evans N, Farkas A, Gilpin E, Berry C, Pierce JP. Influence of tobacco marketing and exposure to smokers on adolescent susceptibility to smoking. *JNCI.* 1995;87:1538–1545.
14. Agresti A. *Categorical Data Analysis.* New York, NY: John Wiley & Sons Inc; 1990.
15. McCullagh P. Regression models for ordinal data (with discussion). *J Royal Stat Soc, Ser B.* 1980;42:109–142.
16. Koch GG, Amara IA, Singer JM. A two-stage procedure for the analysis of ordinal categorical data. In: Sen PK, ed. *Biostatistics: Statistics in Biomedical, Public Health and Environmental Sciences.* New York, NY: Elsevier Science Publishers; 1985:357–387.
17. Peterson B, Harrell FE Jr. Partial proportional odds models for ordinal response variables. *Appl Statistics.* 1990;39:205–217.
18. Ashby D, Pocock SJ, Shaper AG. Ordered polytomous regression: an example relating serum biochemistry and haematology to alcohol consumption. *Appl Statistics.* 1986;35:289–301.
19. Slade J. Camel flip flops. *Tobacco Control.* 1992;1:207.
20. Regulations restricting the sale and distribution of cigarettes and smokeless tobacco to protect children and adolescents; final rule (21 CFR 801). *Federal Register.* August 28, 1996;61:44396.
21. Coeytaux R, Altman DG, Slade J. Tobacco promotions in the hands of youth. *Tobacco Control.* 1995;4:253–257.