

Adolescent Exposure to Cigarette Advertising in Magazines

An Evaluation of Brand-Specific Advertising in Relation to Youth Readership

Charles King III, JD, PhD; Michael Siegel, MD, MPH; Carolyn Celebucki, PhD; Gregory N. Connolly, DMD, MPH

Context.—Understanding the relationship between cigarette advertising and youth smoking is essential to develop effective interventions. Magazine advertising accounts for nearly half of all cigarette advertising expenditures.

Objective.—To investigate whether cigarette brands popular among adolescent smokers are more likely than adult brands to advertise in magazines with high adolescent readerships.

Design.—Cross-sectional analysis of 1994 data on (1) the presence of advertising by 12 cigarette brands in a sample of 39 popular US magazines; and (2) the youth (ages 12-17 years), young adult (ages 18-24 years), and total readership for each magazine.

Main Outcome Measures.—The presence or absence of advertising in each of the 39 magazines in 1994 for each of the 12 cigarette brands.

Results.—After controlling for total magazine readership, the percentage of young adult readers, advertising costs and expenditures, and magazine demographics, youth cigarette brands (those smoked by more than 2.5% of 10- to 15-year-old smokers in 1993) were more likely than adult brands to advertise in magazines with a higher percentage of youth readers. Holding all other variables constant at their sample means, the estimated probability of an adult brand advertising in a magazine decreased over the observed range of youth readership from 0.73 (95% confidence interval [CI], 0.50-0.96) for magazines with 4% youth readers to 0.18 (95% CI, 0.00-0.47) for magazines with 34% youth readers. In contrast, the estimated probability of a youth brand advertising in a magazine increased from 0.32 (95% CI, 0.00-0.65) at 4% youth readership to 0.92 (95% CI, 0.67-1.00) at 34% youth readership.

Conclusion.—Cigarette brands popular among young adolescents are more likely than adult brands to advertise in magazines with high youth readerships.

JAMA. 1998;279:516-520

AT THE HEART of the public health debate about interventions to reduce teenage smoking lies the question of whether cigarette advertising influences youth.¹ Of all the media by which cigarettes are advertised—newspapers, magazines, billboards, and mass tran-

sit—magazines receive the largest share of tobacco company expenditures.² In 1994, the tobacco industry spent \$252 million, or 46% of its total cigarette advertising expenditures, on magazine advertising.²

Although the Food and Drug Administration's tobacco regulations³ and the proposed global tobacco settlement⁴ address magazine advertising, the specific impact of cigarette advertising in magazines on youth smoking behavior has not been well studied. Previous studies have provided indirect evidence that cigarette advertising in magazines targets youth readers. This evidence derives primarily from studies of differences in the number or proportion of cigarette advertise-

ments in youth-oriented compared with adult-oriented magazines,⁵⁻¹² changes in the number of advertisements in youth-oriented magazines over time,^{5,7-9,13} demonstrations of the appeal of magazines' cigarette advertisement themes and images to youth,¹⁴⁻¹⁶ and differences in the themes and images used in cigarette advertisements in youth-oriented and adult-oriented magazines.^{7,8,12,17}

See also pp 511 and 550.

Two methodological problems limit the ability of the existing studies to draw definitive conclusions. First, since most youth-oriented magazines have many more adult than youth readers, these studies cannot exclude the possibility that cigarette advertisements in these magazines target adult, rather than youth, readers. Cigarette advertisements in these magazines may be targeting young adult readers (18- to 24-year-olds), rather than those younger than 18 years. The tobacco industry itself has defended its advertising practices on the grounds that its advertising is reaching young adults, rather than youths.¹⁸

Second, these studies only examined aggregate cigarette advertising. Youth tend to smoke only a few cigarette brands.³ By aggregating all brands, even those smoked almost exclusively by adults, previous analyses may have reduced their power to detect a significant association between cigarette advertising and youth readership.

In this study, we examine whether brands smoked by a significant number of adolescents are more likely to advertise in magazines with higher youth readerships than cigarette brands smoked almost exclusively by adults. The analysis addresses the major limitations of previous research by (1) using data on adult and youth magazine readership as con-

From the Graduate School of Business Administration, Harvard University, Boston, Mass (Dr King); Social and Behavioral Sciences Department, Boston University School of Public Health (Dr Siegel); and the Massachusetts Tobacco Control Program, Massachusetts Department of Public Health, Boston (Drs Celebucki and Connolly).

Reprints: Michael Siegel, MD, MPH, Boston University School of Public Health, Social and Behavioral Sciences Department, 715 Albany St, Boston, MA 02118 (e-mail: mbsiegel@bu.edu).

tinuous variables instead of classifying magazines as either adult or youth; (2) controlling for adult readership and young adult (ages 18-24 years) readership in the analysis; (3) using brand-specific, rather than aggregate, cigarette advertising data; and (4) comparing brands smoked by a substantial proportion of youths with those smoked almost exclusively by adults.

Although a finding that youth cigarette brands are more likely to advertise in magazines with more youth readers does not demonstrate an intent on the part of cigarette advertisers to expose adolescents to their advertising messages, such a finding would demonstrate that adolescents are more likely to be exposed to advertising by cigarette brands that are popular among youth smokers.

METHODS

Model of Advertising Behavior

Using a probit model, we analyze whether—controlling for the other factors that might affect a cigarette brand's magazine advertising—youth brands are more likely than adult brands to advertise in magazines with a high percentage of youth readers. We also compare the effect of different demographic readership characteristics on the likelihood that a cigarette brand advertises in a magazine.

Since only the outcome of the advertising decision is observed, the empirical specification uses a binary choice model of advertising behavior. The dependent variable is the presence or absence of advertising for a specific brand in a given magazine in 1994. The predictor variables in our model include the following: (1) the demographic characteristics of a magazine's readership, including the total number of readers (ages 12 years and older) and the percentage of readers in various demographic subgroups (youth [ages 12-17 years], young adults [ages 18-24 years], females, blacks, smokers, heavy smokers, and menthol smokers); (2) the cost per reader of placing an advertisement in a given magazine (the cost of a full-page, 4-color advertisement divided by the total number of magazine readers); (3) the number of annual magazine issues; (4) the total magazine advertising expenditures of a cigarette brand; (5) the popularity of the magazine (the percentage of readers who consider that magazine to be their favorite); and (6) the median income of magazine readers.

Regression Specification

For each cigarette brand, we determine whether that brand advertised in each of the 39 magazines in our sample.

We create a record for each of these brand-magazine pairs. Since there are 12 brands and 39 magazines, the data set comprises 468 records. For each record, the dependent variable is 1 if the cigarette brand advertised in that magazine and 0 if the brand did not advertise in that magazine.

To assess possible differences in the advertising behavior of adult and youth cigarette brands, we constructed an indicator variable, δ , that is 0 for adult brands and 1 for youth brands and created an additional series of regressors by multiplying each explanatory variable by δ . These interaction variables allowed us to estimate separate regression coefficients for youth and adult brands. For example, the interaction variable for youth readership is defined as $\delta \times (\% \text{ youth readers})$. This interaction variable enabled us to measure differences in the advertising patterns for adult and youth brands with respect to the level of youth readership in magazines in which they advertise.

In our complete probit model, the probability, P , that a given brand advertises in a particular magazine is $P = \Phi(y^*)$, where Φ is the cumulative distribution function for the standard normal and $y^* = A + A_i \delta + (B + B_i \delta) \times (\% \text{ Youth Readers}) + (C + C_i \delta) \times (\text{Total Number of Readers}) + (D + D_i \delta) \times (\text{Advertising Cost per Reader}) + (E + E_i \delta) \times (\text{Total Advertising Expenditures for Brand Among All 39 Magazines}) + (F + F_i \delta) \times (\text{Number of Annual Issues of Magazine}) + (G + G_i \delta) \times (\% \text{ Young Readers}) + (H + H_i \delta) \times (\% \text{ Female Readers}) + (I + I_i \delta) \times (\% \text{ Black Readers}) + (J + J_i \delta) \times (\% \text{ Hispanic Readers}) + (K + K_i \delta) \times (\% \text{ Smokers}) + (L + L_i \delta) \times (\% \text{ Heavy Smokers}) + (M + M_i \delta) \times (\% \text{ Menthol Smokers}) + (N + N_i \delta) \times (\% \text{ Favorite Magazine}) + (O + O_i \delta) \times (\text{Income}) + \text{Error}$.

Here $\delta = 1$ for youth brands and $\delta = 0$ for adult brands.

By including both a variable and its interaction term in the regression specification, we can determine whether differences in the probability that adult and youth brands advertise in a magazine are statistically significant for each independent variable in the model. For example, the coefficient B reflects the change in likelihood of advertising as youth readership increases for adult cigarette brands, and the coefficient $(B + B_i)$ reflects the change in likelihood of advertising as youth readership increases for youth brands. Under the null hypothesis—that the probability of a cigarette brand advertising in a magazine is unrelated to the magazine's youth readership—both the coefficients B and B_i would be 0. If adult brands, but not youth

brands, were more likely to advertise in magazines with higher youth readership, then the coefficient B would be positive and the coefficient $(B + B_i)$ would be 0 (B_i would be negative and equal in magnitude to B). If youth brands, but not adult brands, were more likely to advertise in magazines with higher youth readership, then the coefficient B would be 0, but the coefficient $(B + B_i)$ would be positive (B_i would be positive).

The statistical significance of the coefficient B_i allows us to assess the significance of any difference between adult and youth brands in the likelihood of advertising in magazines at varying levels of youth readership.

Magazine Sample Selection

To select a sample of magazines, we identified the 60 national magazines with the highest overall readership for 1994 using data from Simmons Market Research Bureau, Inc.¹⁹ Of these 60 magazines, we included in the sample only those for which 1994 information on adult and youth readership and brand-specific cigarette advertising was available. Ten magazines were excluded because these data were unavailable. An additional 10 magazines were excluded because, as a policy, they did not accept tobacco advertising in 1994. One magazine was excluded because it contained cigarette advertisements for only 1 brand in 1994, and the other magazines in which that brand advertised were not among the 60 in our study. The final sample consisted of 39 magazines (Table 1).

Data Sources

Magazine Advertising Expenditures.—From the *Leading National Advertisers Brand Detail Report* for 1994, we determined whether each cigarette brand advertised in each of the 39 magazines in 1994 and estimated each brand's total expenditures for advertising in the 39 magazines in 1994.²⁰ These estimates of advertising expenditures are based on the number of pages of advertising and the price per advertising page for the magazine, not on actual dollars negotiated with a publisher.

Cost of Advertising.—We used the *SRDS Consumer Magazine Advertising Source* to obtain the cost for a single, full-page, 4-color advertisement in each magazine in 1994 and the annual number of issues for each magazine.²¹

Adult Magazine Readership.—Data on the adult (ages 18 years and older) readership for each magazine were obtained from the 1994 *Study of Media and Markets*,^{19,22,23} produced by the Simmons Market Research Bureau, Inc. From the Simmons data, we also collected the following demographic information about

Table 1.—Readership Characteristics and Tobacco Advertising Expenditures in 39 Magazines*

| Magazine | Youth Readers, Millions | Young Adult and Adult Readers, Millions | Percentage of Youth Readers | Percentage of Young Adult Readers | Tobacco Advertising, \$ in Millions | Percentage Ratio of Tobacco Advertising Pages to Total Advertising Pages |
|---------------------------------|-------------------------|---|-----------------------------|-----------------------------------|-------------------------------------|--|
| <i>Better Homes and Gardens</i> | 2.0 | 35.1 | 5.5 | 6.2 | 7.0 | 2.4 |
| <i>Car and Driver</i> | 1.5 | 6.5 | 18.3 | 25.1 | 18.3 | 5.1 |
| <i>Cosmopolitan</i> | 2.3 | 15.5 | 12.8 | 25.2 | 9.4 | 5.5 |
| <i>Ebony</i> | 2.1 | 11.3 | 15.8 | 17.7 | 22.0 | 5.2 |
| <i>Elle</i> | 0.8 | 3.8 | 17.8 | 33.8 | 1.8 | 2.3 |
| <i>Entertainment Weekly</i> | 0.7 | 3.7 | 15.4 | 24.9 | 8.8 | 10.7 |
| <i>Essence</i> | 1.3 | 6.2 | 16.9 | 20.2 | 1.8 | 4.7 |
| <i>Family Circle</i> | 1.2 | 27.6 | 4.2 | 5.8 | 6.2 | 1.9 |
| <i>Field and Stream</i> | 1.8 | 14.1 | 11.1 | 15.0 | 6.3 | 11.2 |
| <i>Glamour</i> | 2.2 | 10.7 | 17.1 | 33.0 | 6.0 | 4.8 |
| <i>GQ</i> | 1.0 | 5.8 | 15.1 | 30.6 | 2.0 | 3.3 |
| <i>Harper's Bazaar</i> | 0.7 | 3.2 | 18.2 | 16.4 | 1.0 | 1.9 |
| <i>Hot Rod</i> | 2.3 | 5.8 | 28.2 | 32.1 | 2.5 | 11.2 |
| <i>Jet</i> | 1.7 | 8.6 | 16.7 | 20.4 | 1.3 | 6.4 |
| <i>Ladies Home Journal</i> | 0.8 | 18.2 | 4.4 | 4.9 | 5.1 | 2.4 |
| <i>Life</i> | 2.7 | 18.0 | 12.9 | 14.1 | 4.7 | 13.8 |
| <i>Mademoiselle</i> | 1.4 | 5.6 | 19.7 | 35.6 | 3.1 | 5.8 |
| <i>McCall's</i> | 1.3 | 17.7 | 6.7 | 8.2 | 5.0 | 3.7 |
| <i>Motor Trend</i> | 1.4 | 4.9 | 22.1 | 28.8 | 2.5 | 6.1 |
| <i>New Woman</i> | 0.7 | 4.2 | 14.0 | 12.2 | 3.3 | 9.6 |
| <i>Newsweek</i> | 1.9 | 22.0 | 8.0 | 11.0 | 7.3 | 2.1 |
| <i>Outdoor Life</i> | 1.6 | 7.2 | 18.0 | 18.4 | 3.9 | 9.8 |
| <i>People</i> | 3.0 | 35.7 | 7.8 | 13.8 | 29.6 | 6.2 |
| <i>Popular Mechanics</i> | 1.6 | 9.5 | 14.5 | 15.1 | 4.5 | 8.8 |
| <i>Popular Science</i> | 1.9 | 7.3 | 20.8 | 12.6 | 1.2 | 1.7 |
| <i>Redbook</i> | 1.2 | 13.6 | 7.8 | 11.2 | 5.2 | 4.6 |
| <i>Road and Track</i> | 1.2 | 4.8 | 20.6 | 28.8 | 3.2 | 4.9 |
| <i>Rolling Stone</i> | 1.9 | 8.2 | 18.5 | 38.0 | 5.9 | 6.4 |
| <i>Self</i> | 0.8 | 4.1 | 16.2 | 18.2 | 1.1 | 1.9 |
| <i>Soap Opera Digest</i> | 1.3 | 7.8 | 14.3 | 21.0 | 3.2 | 14.6 |
| <i>Sport</i> | 2.3 | 4.5 | 33.8 | 23.3 | 2.4 | 15.2 |
| <i>Sporting News</i> | 1.4 | 3.6 | 27.8 | 24.7 | 1.0 | 6.4 |
| <i>Sports Illustrated</i> | 5.2 | 23.7 | 18.0 | 21.4 | 30.2 | 7.7 |
| <i>Time</i> | 2.0 | 23.6 | 7.7 | 12.6 | 12.2 | 3.0 |
| <i>True Story</i> | 0.7 | 4.3 | 14.8 | 10.8 | 1.5 | 13.5 |
| <i>TV Guide</i> | 6.7 | 44.3 | 13.2 | 15.7 | 19.7 | 4.3 |
| <i>Us</i> | 0.8 | 5.1 | 13.8 | 21.9 | 3.6 | 13.6 |
| <i>Vogue</i> | 2.2 | 10.2 | 18.0 | 30.8 | 3.0 | 2.3 |
| <i>Woman's Day</i> | 1.2 | 23.8 | 4.8 | 5.9 | 9.0 | 4.2 |
| Total | 68.8 | 489.8 | ... | ... | 232.0 | ... |
| Average per magazine | 1.8 | 12.6 | 12.3 | 16.1 | 5.9 | 5.3 |

*Data are from Simmons Market Research Bureau, Inc.^{19,22-24} Mediamark Research Inc.,²⁵ and Leading National Advertisers.²⁰ Readers are defined as youth, ages 12 through 17 years; adult, ages 18 years and older; and young adult, ages 18 through 24 years. Ellipses indicate data not applicable.

adult readers for each magazine: median individual income; percentage of female, black, Hispanic, and young adult (ages 18-24 years) readers; percentage of readers who are smokers, heavy smokers (≥ 30 cigarettes per day), and smokers of menthol brands; and percentage of readers who reported a magazine to be their favorite.

Youth Magazine Readership.—Data on the number of youth (ages 12-17 years) readers for each magazine were obtained from the 1994 *Simmons Teen Age Research Study (STARS)*,²⁴ produced by the Simmons Market Research Bureau, Inc, and the *Mediamark Research Inc (MRI) Twelve Plus* report,²⁵ produced by MRI.

Data Collection

The data were extracted from the above publications and entered into an Excel spreadsheet. Data entry was 100% verified by comparing printouts of the spreadsheet with the data in each publication. After verification, a SAS data set was created by converting the Excel spreadsheet using DBMS/COPY.²⁶ We used SAS²⁷ and Stata²⁸ to conduct all analyses.

Classification of Youth and Adult Brands

In classifying adult and youth cigarette brands, we used data from the national Teenage Attitudes and Practices

Survey-II (TAPS-II).^{18,29} Using data obtained from 70 smokers in a cross-sectional, probability sample of 4992 youths between the ages of 10 and 15 years, we divided cigarette brands into 2 groups: those smoked almost exclusively by adults ("adult" brands) and those smoked by a substantial proportion of adolescent smokers ("youth" brands). Although there were only 70 smokers in our sample, the classification of adult and youth cigarette brands was identical to that obtained using the full sample of 438 smokers aged 12 through 17 years.

Because the TAPS-II survey did not record the name of every cigarette brand, the usual brand smoked for 2.5% of 10- to 15-year-old smokers was reported as "other." We therefore defined youth brands as those smoked by at least 2.5% of smokers aged 10 to 15 years in TAPS-II and adult brands as the usual brand smoked by less than 2.5% of 10- to 15-year-old smokers in TAPS-II. Based on these criteria, we classified 7 brands as adult brands (Salem [smoked by 0.6% of youth smokers], Virginia Slims [$< 2.5\%$], Benson & Hedges [$< 2.5\%$], Parliament [$< 2.5\%$], Merit [$< 2.5\%$], Capri [$< 2.5\%$], and Kent [$< 2.5\%$]) and 5 brands as youth brands (Marlboro [42.9%], Newport [24.6%], Camel [13.2%], KOOL [4.1%], and Winston [2.8%]). Two generic brands (Basic and Doral) were classified as unknown and were excluded from analyses that compared adult and youth brands because we could not determine whether they were smoked by 2.5% or more of 10- to 15-year-old smokers (TAPS-II did not record the specific names of generic cigarette brands).

Since 1994 youth market share data were not available, the brand market share data were obtained from a 1993 survey. It is unlikely that changes in brand use among youth smokers from 1993 to 1994 would have been large enough to change the classification of brands as adult or youth brands in this study. Moreover, using 1993 youth market shares and then examining brand advertising behavior in 1994 alleviates the potential problem of advertising simultaneously affecting youth market share.

RESULTS

Descriptive Analysis

The 39 magazines in this study accepted \$4.1 billion in total advertising in 1994, of which tobacco advertisements accounted for \$232.0 million (5.7%) (Table 1) and cigarette advertisements accounted for \$207.1 million (5.1%). There were 51 579 pages of total advertising in these magazines, of which 2737 (5.3%) were cigarette advertisements. These

Table 2.—Results From Probit Regression Model: The Effect of Magazine Readership Characteristics on the Probability of a Cigarette Brand Advertising in a Magazine

| Independent Variable* | Coefficient (SE) |
|-----------------------------|------------------|
| Youth readers, % | -0.051 (0.031)† |
| δ × (% youth readers) | 0.113 (0.052)‡ |
| Young adult readers, % | 0.004 (0.022) |
| δ × (% young adult readers) | 0.025 (0.037) |
| Female readers, % | 0.007 (0.008) |
| δ × (% female readers) | -0.009 (0.013) |
| Black readers, % | 0.002 (0.016) |
| δ × (% black readers) | -0.009 (0.026) |
| Hispanic readers, % | 0.047 (0.046) |
| δ × (% Hispanic readers) | -0.080 (0.073) |

*δ is 0 for adult cigarette brands and 1 for youth cigarette brands.

†Coefficient is significant at the 90% level ($P < .10$).

‡Coefficient is significant at the 95% level ($P < .05$).

cigarette advertisements represented 2085 separate insertions.

Youth readership ranged from 674 000 (*Entertainment Weekly*) to 6.7 million (*TV Guide*), and the proportion of total readership made up of youths ranged from 4.2% (*Family Circle*) to 33.8% (*Sport*) (Table 1).

Probit Regression Analysis

Four variables—the total advertising expenditures of a brand, the annual number of magazine issues, the percentage of readers who consider a magazine their favorite, and the percentage of youth readers—were found to affect significantly the probability that a cigarette brand would advertise in a given magazine. Of all the demographic magazine readership variables examined, only the percentage of youth readers was a significant predictor of whether or not cigarette brands were advertised in a given magazine (Table 2).

The coefficient for the youth readership interaction variable was statistically significant, indicating that the relationship between advertising and youth readership differed for youth and adult brands (Table 2). The probability of advertising in a magazine decreased with the percentage of youth readers for adult brands but increased significantly with the percentage of youth readers for youth brands. In other words, adult brands were increasingly less likely to advertise in magazines as the percentage of youth readers increased, and youth brands were increasingly more likely to advertise in magazines as the percentage of youth readers increased.

Holding all other variables constant at their sample means, the probability of an adult brand advertising in a magazine decreased from 0.73 (95% confidence interval [CI], 0.50-0.96) at a youth readership level of 4% (the lowest level in the sample magazines) to 0.58 (95% CI, 0.48-0.68) at a youth readership of 12% (the mean level for all magazines) to 0.18 (95% CI, 0.00-0.47) at a youth readership level of 34%

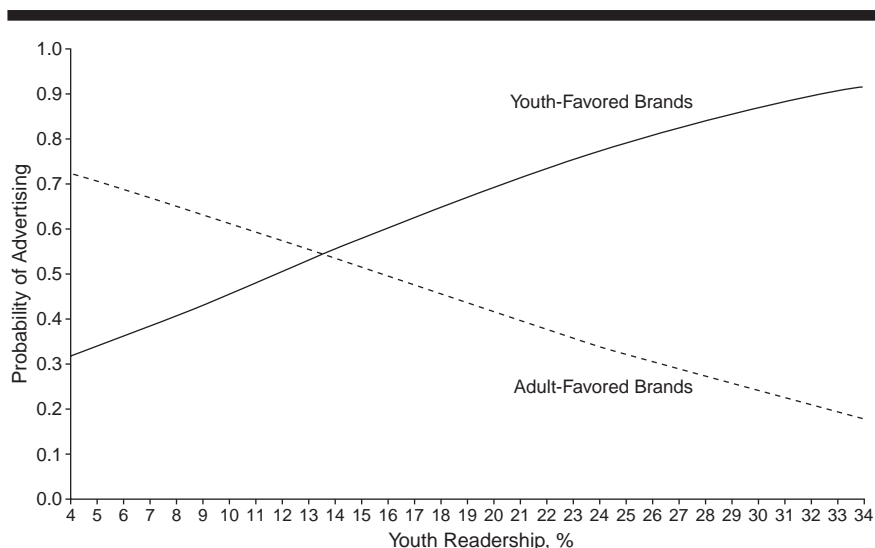


Figure 1.—Probability that a cigarette brand is advertised in a magazine as a function of the magazine's percentage of youth readers, holding all other variables fixed at their mean values in the sample: adult vs youth cigarette brands.

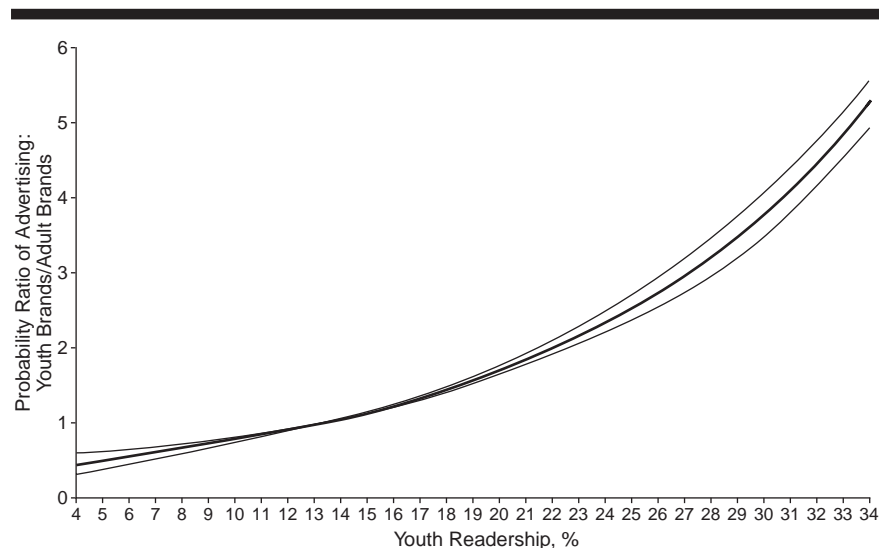


Figure 2.—Ratio of the probability that a youth cigarette brand is advertised in a magazine to the probability that an adult brand is advertised in that magazine as a function of the magazine's percentage of youth readers, holding all other variables fixed at their mean values in the sample (95% confidence intervals shown).

(the highest level in the sample magazines) (Figure 1). In contrast, the probability of a youth brand advertising in a magazine increased from 0.32 (95% CI, 0.00-0.65) at a youth readership level of 4% to 0.51 (95% CI, 0.38-0.63) at a youth readership level of 12% to 0.92 (95% CI, 0.67-1.00) at a youth readership level of 34%.

The ratio of the probability of advertising for a youth brand compared to an adult brand increased with increasing youth readership (Figure 2). At a youth readership level of 14% with all other variables evaluated at their mean values, the ratio of advertising probabilities was 1.04 (95% CI, 1.03-1.04), indicating that youth and adult brands were about equally likely to advertise in these

magazines. At a youth readership level of 4%, the ratio of probabilities was 0.43 (95% CI, 0.29-0.58), indicating that youth brands were about half as likely to advertise in these magazines. At a youth readership level of 34%, the ratio was 5.21 (95% CI, 4.87-5.54), indicating that youth brands were about 5 times more likely to advertise in such magazines.

COMMENT

To the best of our knowledge, this article is the first to examine systematically the relationship between cigarette brand-specific advertising and youth readership among a large, nearly complete, sample of the most highly read magazines over a full year. This is also

the first study, to our knowledge, of cigarette advertising in magazines that compares advertising patterns for brands smoked by young adolescents with those smoked almost exclusively by adults. We found that youth brands were more likely than adult brands to advertise in magazines with a higher percentage of youth (ages 12-17 years) readers.

Although young adult readership is a potential confounder of the observed relationship between advertising and youth readership in previous studies, our analysis controlled for the effects of young adult readership on the likelihood of cigarette brand advertising in magazines. Both adult and youth brands were more likely (although not significantly) to advertise in magazines as young adult readership increased, but even after controlling for this effect, youth brands were still significantly more likely than adult brands to advertise in magazines with higher youth readership. The magnitude of the effect of youth readership was also greater than that observed for young adult readership. The percentage of youth magazine readers was the only demographic variable that was significantly related to cigarette advertising in magazines.

There are several important limitations to this study. First, although it is unlikely that our findings are explained entirely by the hypothesis that cigarette brand advertising is related to young adult, rather than adolescent, readership, it is probable that some of the observed effect of youth readership may arise from an overlapping effect of young adult readership. The presence of minor multicollinearity is suggested by the simple, pair-wise correlation of youth readers and young adult readers ($r = + 0.68$). A potential consequence of such multicollinearity would be to diminish the precision with which the coefficients are estimated.

Nevertheless, in the presence of this multicollinearity, our finding that cigarette advertising was significantly related to youth, but not young adult, readership strengthens our conclusion. If the tobacco industry, as it claims, were only attempting to reach 18- to 24-year-olds, one would expect the relationship between advertising and young adult readership to be stronger than that for advertising and youth readership.

Second, the study does not allow us to make inferences regarding the potential role of cigarette advertising in maga-

zines on smoking behavior, including smoking initiation, among adolescents. Third, it is impossible to demonstrate an intent to target youth from an analytic study such as this one, even though the data indicate a brand-specific relationship between advertising and youth readership.

Despite these limitations, our findings provide new evidence that cigarette advertising in magazines is correlated with youth readership, and that this relationship is different for youth and adult cigarette brands. Youths are more heavily exposed to magazine cigarette advertisements for brands that are popular among youth smokers than for brands smoked almost exclusively by adults.

This finding has important public health policy implications. By adding to the evidence that cigarette advertising in magazines is related to youth readership, the results of this study strengthen the justification for regulating cigarette advertising in magazines. Based on the documentation in this and other studies⁵⁻¹⁷ of widespread and heavy exposure of youths to cigarette advertising in magazines, public health considerations argue that cigarette advertising in all magazines should be eliminated.

References

1. US Dept of Health and Human Services. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, Ga: US Dept of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1994.
2. Federal Trade Commission. *Federal Trade Commission Report to Congress for 1994: Pursuant to the Federal Cigarette Labeling and Advertising Act*. Washington, DC: Federal Trade Commission; 1996.
3. Regulations restricting the sale and distribution of cigarettes and smokeless tobacco to protect children and adolescents: final rule. *Federal Register* 44396-45313 (1996) (codified at 21 CFR §801, 803, 804, 807, 820, 897).
4. Fox BJ, Lightwood JM, Glantz SA. *Analysis of the Proposed Resolution of the United States Tobacco Litigation*. San Francisco: University of California, San Francisco, Institute for Health Policy Studies; 1997.
5. Albright CL, Altman DG, Slater MD, Maccoby N. Cigarette advertisements in magazines: evidence for a differential focus on women's and youth magazines. *Health Educ Q*. 1988;15:225-233.
6. Krupka LR, Vener AM, Richmond G. Tobacco advertising in gender-oriented popular magazines. *J Drug Educ*. 1990;20:15-29.
7. Altman DG, Slater MD, Albright CL, Maccoby N. How an unhealthy product is sold: cigarette advertising in magazines, 1960-1985. *J Commun*. 1987;37:95-106.
8. Basil MD, Schooler C, Altman DG, Slater M, Albright CL, Maccoby N. How cigarettes are advertised in magazines: special messages for special markets. *Health Commun*. 1991;5:75-91.
9. Freeman H, Delgado J, Douglas CE. Minority issues. In: Houston TP, ed. *Tobacco Use: An American Crisis*. Washington, DC: American Medical Association; 1993:32-42.
10. Warner KE. *Selling Smoke: Cigarette Advertising and Public Health*. Washington, DC: American Public Health Association; 1986.
11. Hutchings R. A review of the nature and extent of cigarette advertising in the United States. In: *Proceedings of the National Conference on Smoking and Health: Developing a Blueprint for Action*. New York, NY: American Cancer Society; 1981:249-262.
12. King KW, Reid LN, Moon YS, Ringold DJ. Changes in the visual imagery of cigarette ads, 1954-1986. *J Public Policy Marketing*. 1991;10:63-80.
13. Warner KE, Goldenhar LM. Targeting of cigarette advertising in US magazines, 1959-1986. *Tob Control*. 1992;1:25-30.
14. Huang PP, Burton D, Howe HL, Sosin DM. Black-white differences in appeal of cigarette advertisements among adolescents. *Tob Control*. 1992;1:249-255.
15. Lynch BS, Bonnie RJ, eds, Committee on Preventing Nicotine Addiction in Children and Youths, Division of Biobehavioral Sciences and Mental Disorders, Institute of Medicine. *Growing Up Tobacco Free: Preventing Nicotine Addiction in Children and Youths*. Washington, DC: National Academy Press; 1994.
16. Pollay RW, Lavack AM. The targeting of youths by cigarette marketers: archival evidence on trial. In: McAlister L, Rothschild ML, eds. *Advances in Consumer Research*: 20. Provo, Utah: Association for Consumer Research; 1993:266-271.
17. Warner KE. Tobacco industry response to public health concern: a content analysis of cigarette ads. *Health Educ Q*. 1985;12:115-127.
18. R. J. Reynolds Tobacco Co. We don't advertise to children. *Time Magazine*. April 9, 1984;123:91.
19. Simmons Market Research Bureau Inc. *Simmons Study of Media and Markets: Multi-Media Audiences: Adults (M4)*. New York, NY: Simmons Market Research Bureau Inc; 1994.
20. Leading National Advertisers. *1994 Brand Detail Report*. New York, NY: Leading National Advertisers, Publishers Information Bureau Inc; 1994.
21. SRDS (Standard Rate and Data Service). *SRDS Consumer Magazine Advertising Source*. Des Plaines, Ill: SRDS; 1997.
22. Simmons Market Research Bureau Inc. *Simmons Study of Media and Markets: Publications: Total Audiences (M1)*. New York, NY: Simmons Market Research Bureau Inc; 1994.
23. Simmons Market Research Bureau Inc. *Simmons Study of Media and Markets: Distilled Spirits, Mixed Drinks, Malt Beverages, Wine & Tobacco Products (P14)*. New York, NY: Simmons Market Research Bureau Inc; 1994.
24. Simmons Market Research Bureau Inc. *Simmons Teen Age Research Study (STARS)*. New York, NY: Simmons Market Research Bureau Inc; 1994.
25. Mediamark Research Inc. *Mediamark Research Inc (MRI) Teenmark/ Twelve Plus*. New York, NY: Mediamark Research Inc; 1994.
26. Conceptual Software, Inc. *DBMS/COPY: The Tool for Software Connectivity, Combined Manual for Windows and DOS, Version 5.0*. Houston, Tex: Conceptual Software Inc; 1994.
27. SAS Institute Inc. *SAS/STAT Software: Changes and Enhancements, Release 6.10*. Cary, NC: SAS Institute Inc; 1994.
28. Stata Corp. *STATA Statistical Software: Release 5.0*. College Station, Tex: Stata Corp; 1997.
29. Pollay RW, Siddarth S, Siegel M, et al. The last straw? cigarette advertising and realized market shares among youths and adults, 1979-1993. *J Marketing*. 1996;60:1-16.