REPLY TO SIEGEL ET AL. : ALCOHOL ADVERTISING IN MAGAZINES AND DISPROPORTIONATE EXPOSURE

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ABSTRACT

Nelson (2006) investigated advertising placements for a diverse sample of 28 magazines and concluded that targeting of underage youth by alcohol advertisers was not occurring. Siegel et al. claim that my results suffer from collinearity, but fail to present a comprehensive measure of multicollinearity. For my model, variance inflation factors are within acceptable limits and estimation using redefined variables does not alter my prior results or conclusion. Further, Siegel et al.'s empirical results are fragile and do not support a targeting outcome. I also discuss the limitations of estimates of magazine readerships and the shortcomings of the public health literature on advertising and youth alcohol behaviors. Neither the empirical results in Siegel et al. nor their literature citations support a public policy based on a simple rule of disproportionate exposure. (*JEL* L82, L66, M37)

I. INTRODUCTION

Siegel et al. (2007) offer four general comments on my previous paper (Nelson, 2006), which dealt with count data analysis of alcohol advertising in a sample of 28 magazines and possible "targeting" of underage youth. First, they report a technical problem in my data, which included overlapping estimates of 18-19 year olds in the "youth" and "adult" audience variables. This was an oversight on my part that I have corrected, but the changes do not alter my results or conclusions. Second, they claim that correlation between two of my variables, percent youth and adult median age, creates a multicollinearity problem in my empirical results. However, their main evidence for this claim is a simple correlation coefficient. This is insufficient in the context of a multivariate problem, and I report a comprehensive statistic, the variance inflation factor, that refutes their claim. Third, Siegel et al. provide an alternative set of regression estimates that substitutes a new variable for young adult readership in place of my regressor (adult median age). However, they limit their analysis to the proportion of readers between the ages of 21 and 34 years, which also is correlated with youth readership. The implicit claim is that their empirical model applies equally to magazines with diverse audience demographics, such as *Rolling Stone* and *Popular Mechanics*. I provide evidence that their empirical results are fragile, which supports my conclusion that targeting of underage youth is not occurring. Fourth, Siegel et al. claim that their results and other studies that they cite support a policy that would impose a rule of "disproportionate exposure" for alcohol advertising. Incredibly, Siegel et al. cite several public health studies that show that magazine advertisements have null or *negative* effects on youth drinking behaviors. In this reply, I will demonstrate that their results and citations do not support advertising policies based on a simple rule of "disproportionate exposure."

II. READERSHIP ESTIMATES AND AUDIENCE DEMOGRAPHICS

The print media industry distinguishes between a magazine's circulation and its audience or readership. Circulation is defined as the total number of copies sold through all channels of distribution (subscriptions, newsstands, bulk). Circulation numbers are relatively "hard" data and, among other things, are used in the form of minimum circulation guarantees for published advertising rates (SRDS, 2003). In contrast, audience or readership estimates are based on surveys conducted by research organizations, such as Mediamark Research Inc. (MRI). In MRI's adult survey, respondents (ages 18 and older) are shown a large set of magazine logos and asked if they have read or looked into any of the magazines within the last publication cycle (e.g., weekly magazines within the past seven days). The survey is conducted annually using a combination of in-home interviews and self-administered questionnaires, and the sample size is about 26,000. MRI expands the sample responses to obtain population-weighted readership estimates for each age cohort. However, sampling error can lead to a disclaimer that an estimate is unreliable. My use of a composite average age variable reduces sampling error, but focusing on a narrow age group is less likely to have this effect (e.g., number or percent of readers ages 21-34 as used by Siegel et al.).

Some media experts claim that readership numbers are largely a marketing myth and the number of true adult readers is unknown (Dobkin, 2007; Media Dynamics, 2003). Survey-based estimates for youth readers will be even less reliable. First, MRI uses a self-administered mail survey for teens (ages 12-19 years) that contains a simple listing of magazines. This is a less sophisticated procedure than the visual recall method used for adults (MRI, 2007). Second, in 2004, the teen sample size was 4419 (MRI, 2007), which is 250 respondents per age cohort or only half of the adult sampling rate. In 2000, the sample size was only 3140 respondents. Third,

many of the listed magazines are subscribed to by adults in the household, and not by the teenage respondent. This is clear from changes in readership counts for ages 18-20, when many youths leave home for college or work. It is unclear how Siegel et al. can claim that a teen reader of, say, *Popular Science*, is "disproportionately exposed" to alcohol advertising when the subscriber is a parent.[1] While the MRI youth data are the best available, they have obvious shortcomings. Nevertheless, these data have been used uncritically in several major reports by the Center on Alcohol Marketing and Youth (CAMY, 2002, 2005a, 2006a).

Reader age is one of several principal demographic characteristics that advertisers might want to reach or "target" (others are income, gender, race, religion, marital status, education level, occupation, etc.). Due to correlations over the life cycle, it is sometimes claimed that age and gender permit generalizations about other characteristics. Table 1 shows three-year averages by reader age groups for each of the 28 magazines in my sample. Youthful readers are estimated to be 30% or more of the audiences for only six magazines (*Allure*, *ESPN*, *Rolling Stone*, *Spin*, *The Source*, *Vibe*). Subscriptions by parents to these magazines are unknown. However, CAMY claims that *any* magazine with more than 15% underage readers is "youth-oriented" (CAMY, 2002, p. 1), and alcohol advertisements in any of these magazines will disproportionately "overexpose" youth to alcohol ads (CAMY, 2005a, p. 1). Using this questionable definition, only three of the 28 magazines are *not* "youth-oriented" (*Better Homes and Gardens*, *Newsweek*, *Time*). However, 25 of these magazines have an "older" adult readership (ages 25+) of 49% or more. Hence, Table 1 demonstrates the shortcomings of CAMY's studies using these data, the "disproportionate" rule, and the emphatic use of this term by Siegel et al.

<INSERT TABLE 1 HERE>

Table 1 also illustrates the importance of reader cohorts who might be counted as "young adults." For example, the number of readers in the cohort 25-34 years is larger than the cohort

21-24 years for every magazine listed in Table 1, both numerically and proportionally. For the cohort 21 years and older, the average adult age of readers varies from 29.0 to 46.2 years, with a sample mean of 38.3 years. Tremblay and Tremblay (2005) report that beer is most popular among consumers ages 18-44 years. Although some liquors are popular among younger consumers, premium distilled spirits, such as heavily-advertised Scotch whiskey, are traditionally considered to be an over-45 beverage (Nelson, 2007). The model adopted by Siegel et al. ignores age demographics with the exception of those readers who are 34 years and younger. Their argument regarding young adults is unconvincing as a general model of the demand for advertising space in a diverse sample of magazines. I show below that the Siegel et al. model and empirical results do not provide an accurate summary of the alcohol ads placed in these 28 magazines, reflecting the importance of readers of all ages.

III. MULTICOLLINEARITY MEASURES

Siegel et al. claim that my econometric model is invalid because the percent youth variable is "highly correlated" with adult median age. However, the main evidence they offer in support of this claim is a simple correlation of -0.75. Based on this scant evidence, Siegel et al. repeatedly refer to the "multicollinearity problem" in my regression model. It is well known that collinearity is a sample-specific problem that does not bias coefficient estimates. It can increase estimates of parameter variance, yield high R^2 values in the face of low parameter significance, and result in parameters with implausible magnitudes or which are sensitive to minor perturbations in the model or data. Nevertheless, under certain conditions, it is possible for negative collinearity to decrease parameter variances or facilitate inferences (Mela and Kopalle, 2002; Theil, 1971). Detecting collinearity in a multivariate context requires a better statistic than

a simple correlation coefficient, such as the variance inflation factor (Fox and Monette, 1992). The VIF captures the essential correlation among a set of regressors and measures the extent to which a given parameter's variance is inflated.[2] For the jth regressor, $VIF_j = 1/(1 - R_j^2)$, where R_j^2 is the coefficient of multiple determination from an auxiliary regression of the jth explanatory variable on all other explanatory variables. Based on the nonlinear relationship between the parameter variance and the auxiliary R^2, various econometricians suggest VIF cutoff values in the range 5 to 10. For example, Belsley (1991) uses VIF cutoffs of 7 to 10 and Kennedy (2003) recommends a value of 10 as indicative of "harmful collinearity."

Table 2 shows VIF values for my original data (Nelson, 2006) and for the redefined data used in this reply. Except for readers per copy, VIF values are in the range 2 to 6, with slightly higher values for percent youth and adult average age. The VIF values for these variables are below the cutoffs proposed by Belsley and Kennedy. Based on a comprehensive statistic, a multicollinearity problem does not exist in my data that necessitates the inclusion of a new variable. Siegel et al. introduce a new variable, the *proportion* of readers in the age group 21-34 years, which also is strongly positively correlated with the percent youth variable (r = 0.64). However, in an initial draft of their comment, they claimed that a better variable would be the *number* of readers in the age group 21-24 years. The exact reason for this change is unclear, but I show that estimation of their models in either case leads to results that are highly sensitive to minor specification changes. I report empirical results for both the number and proportion of young adult readers, age 21-24 years and ages 21-34 years.

<INSERT TABLE 2 HERE>

IV. MODEL AND REDEFINED DATA

In order to respond to the comments by Siegel et al., I acquired yearly readership data from MRI's *TwelvePlus Report* for 2001-2003 for each magazine. These data were acquired for ten age groupings: 12-14 years, 15-17, 18-20, 21-24, 25-29, 30-34, 35-39, 40-49, 50-64, and 65 years and older. I calculated the percent of readers in the age groups 12-14 years, 15-17 years, and 18-20 years. I also calculated the mean age of adult readers, ages 21 years and older, and the mean number of adult readers per copy for each magazine. The redefined variables are highly correlated with my original values ($r = 0.92$ or higher).[3] The other explanatory variables are unchanged from my previous study: adult median real income, percent male readers, real CPM price of a P4C advertisement, and percent single-copy sales (newsstand sales).[4] Lastly, Siegel et al. report coefficient standard errors adjusted for clustering on each magazine, but the number of clusters (28) is large relative to the number of observations per cluster (only three). Most of the variation in advertising counts is cross-sectional and year-to-year variation for a given magazine is likely to contain a large random component. In this situation, Cameron and Trivedi (2005, p. 857) suggest that there is little efficiency loss from ignoring clustering and using a heteroscedastic robust estimator, which is what I employed in my previous paper. Because there may be unobserved fixed-effects for each magazine category (Nelson, 2006), I also provide robust standard errors with clustering on six magazine types, where the number of observations per cluster varies from nine for the men and black magazine categories to 27 observations for the general magazine category. Due to random temporal variation per magazine and the smaller number of clusters (6 compared to 28), defining clustering based on magazine type improves on the econometric procedures used by Siegel et al.

In my preferred model specification, counts of alcohol ads depend on the size of adult readership as measured by adult readers per copy, square of readers per copy, percent male

readers, adult median real income, real price of a standardized advertisement, percent newsstand sales, log of the number of issues, mean age of adult readers (ages 21 and older), and the percent of underage youth (ages 12-20) in the audience. Table 3 reports regression results for the negative binomial model, with and without clustering on the six magazine categories. The coefficients for youth readership are not statistically significant, which confirms my previous results. Using cluster-adjusted standard errors does not change this result, although many of the standard errors are larger with this adjustment. Hence, I conclude that my previous results are not invalidated by new definitions for several variables.

<INSERT TABLE 3 HERE>

The negative coefficients for mean age demonstrate that advertisers seek out younger audiences, but it does not follow that the target audience is confined to young adults ages 21-34 years as implied by Siegel et al. As shown in Table 1, the sample includes magazines with decidedly older average readers, such as *Better Homes and Gardens* (46 years), *Ebony* (41 years), *Newsweek* (46 years), *People* (43 years), *Popular Mechanics* (43 years), *Popular Science* (45 years), *Sports Illustrated* (40 years), and *Time* (45 years). Five of these eight magazines are labeled "youth-oriented" by CAMY. My empirical model, which uses average adult age as an explanatory variable, is better able to capture the demographic diversity in the sample.

V. FRAGILITY OF THE SIEGEL ET AL. MODEL

Siegel et al. propose an alternative econometric model of the placement of alcohol advertisements in magazines. The model is based on their claim that alcohol advertisers are attempting to influence the brand choices of young adults, defined as ages 21-34.[5] This begs the question of why an advertiser would ever choose to place an advertisement in *Popular Mechanics*, *Ebony*, and other magazines in the sample. They also claim that advertisers'

motivation with regard to young adults may lead them to "disproportionately expose" underage youth to alcohol ads. Specifically, they address the question: "Is the preferential advertising of alcohol products in magazines with higher youth readerships . . . explained by the young adult audience of these magazines?" As demonstrated above, their model is not well suited to addressing this particular question due to the importance of adult readers of all ages. I next show that the Siegel et al. results are not robust to minor changes in their model specification.

Table 4 shows my attempt to replicate the initial empirical results provided by Siegel et al. Their initial model included three size-related variables: number of young adult readers (ages 21-24); number of adult readers per copy (ages 21+); and the square of adult readers per copy. My attempt to obtain a statistically significant coefficient for their young adult variable was unsuccessful unless one of the three size-related variables was omitted. When I omit the squared variable, I am able to obtain a significantly positive coefficient for the number of young adult readers, but the percent youth variable is insignificant (regression 2). Results by beverage are comparable and are not reported. In an attempt to refine their model, I tried including the number of readers in the age group 21-34 years or the percent of youth, ages 15-20 years. Both of these model specifications also fail to yield significant coefficients for young adults or fail to yield a significant coefficient for percent youth (regressions 4 and 6). Thus, these specifications also fail to support the claim of "disproportionate exposure" of underage youth to alcohol ads.

<INSERT TABLE 4 HERE>

Further, it is problematic that none of the other explanatory variables (income, price, percent male, etc.) are statistically significant, except for the size-related variables and exposure variable (log of number of issues). It seems likely that the initial empirical findings provided by Siegel et al. reflect an outcome where two distinct sets of magazines drive their results: first, a few large readership magazines that also carry a larger number of alcohol ads (*Cosmopolitan*,

Maxim, *People*, *Sports Illustrated*); and, second, a few magazines with large percentages of youth readers that also carry a larger number of alcohol ads (*ESPN*, *Rolling Stone*, *Spin*, *Vibe*).

Table 5 shows my attempt to replicate the final model provided by Siegel et al. The key explanatory variables are the percent youth and the percent young adult readers. As shown above, these two explanatory variables also are strongly correlated. The empirical results in Table 5 fail to support the claims for this model made by Siegel et al. Their results are not robust, given several different specifications of the youth and young adult variables. In particular, the youth variable is always insignificant, regardless of the specification of this variable or the young adult variable. The young adult variables are always significant, regardless of the specification. Thus, my estimation of the Siegel et al. model serves to strengthen the conclusions in Nelson (2006).

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VI. DISCUSSION OF SUPPORTING EVIDENCE

Siegel et al. attempt to support their results and policy recommendation by citing a litany of survey studies from the public health literature on alcohol advertising and youth, but they fail to adequately inform the reader of the severe shortcomings of this literature. While I have previously commented on this literature (Nelson, 2001), Siegel et al. include several more recent studies. A basic problem is that conditions for demonstrating causality are unlikely to be satisfied, despite the use of longitudinal data (Geweke and Martin, 2002; Heckman et al., 2007). In particular, it is not clear if youth are attracted to alcohol ads and this affects alcohol expectancies and outcomes, or vice versa, i.e., youth who are predisposed to drink for other reasons also are attracted to alcohol ads. Wide variation also exists across survey studies for the set of control variables, such as omission of market-area variables in cross-sectional studies (prices, income, availability, local regulations) or omission of demographic variables (peers'

drinking, parents' drinking, religion, etc.). More important for the present paper is that these studies present a conflicting set of results, but are cited in an uncritical manner by Siegel et al. This as an endemic problem in the public health literature, where null or negative results are simply ignored in editorial and other policy discussions. This allows advocacy groups, such as CAMY, to advance a policy agenda as if the underlying empirical issues are settled (e.g., CAMY, 2005b, 2006b; Jernigan, 2006; Jernigan et al., 2005). I show that the studies cited by Siegel et al. do not support their results or provide a solid foundation for a "disproportionate exposure" policy. In particular, empirical results in several studies contradict their claims regarding the effects of magazine advertisements on underage youth, and indicate null or negative effects of advertising on youth alcohol expectancies and outcomes.

A brief review demonstrates that the evidence on alcohol advertising and youth is mixed, contradictory, and inconclusive.[6] Austin, Chen, and Grube (2006) conducted a survey of alcohol use by youth ages 9-17 years, using respondents' self-reported TV viewing, TV sports viewing, and magazine readership.[7] There are no control variables for geographic areas (prices, income, availability). Using a structural model, they find that watching more TV has a *negative* association with alcohol consumption by males and desirability of ads; watching TV sports has a positive association with negative alcohol expectancies; and reading more magazines has a positive effect on skepticism about alcohol ads (which in turn positively affects negative alcohol expectancies). Austin et al. report that "youth who read magazines more often were *more skeptical* about advertising . . . [and] magazine readership was indirectly and *negatively* related to alcohol use . . . for females" (p. 381; emphasis added). They conclude that media exposure variables have a "relatively weak influence" (p. 382) on alcohol expectancies and outcomes. In a second study, Casswell and Zhang (1998) surveyed youth in New Zealand who drank beer at age 18 and who were re-surveyed at age 21 (the legal age was 20 years). They report that liking of

ads at age 18 had a positive association with drinking levels at age 21, but "liking of advertisements was not associated with volumes of alcohol consumed at the time it was measured" (p. 1215). However, this study includes only one control variable (gender). Another study of the same New Zealand youth was conducted by Connolly et al. (1994), and it included a larger number of control variables. Only five of 60 coefficients for advertising are significantly positive at the 5% level or better. Self-reported average and maximum beer consumption by 18-year-old males are unrelated to TV viewing at ages 13 and 15 years. The authors report that "the number of alcohol promotions recalled at age 13 years was *negatively* associated with frequency of women's beer consumption at age 18 years . . . [and] *none of the media variables* . . . were significantly associated with either the amount or frequency of wine and spirit consumption" (p. 1260; emphasis added). Ellickson et al. (2005) studied middle-school students in South Dakota using self-reported alcohol use by ninth-graders and self-reported exposure in seventh grade to beer ads in magazines, stadium concession stands, in-store displays, and on TV. For drinking onset between seventh and ninth grades, the results are *insignificant* for beer ads in magazines, TV beer ads, and beer concession stands. For drinking frequency in ninth grade, TV beer ads and in-store displays are insignificant and weekly TV viewing has a *negative* association. The authors find "no evidence that exposure to television beer advertising affects subsequent drinking" (p. 244). A second study of these South Dakota youth was conducted by Collins et al. (2007). They examine beer drinking and drinking intentions by seventh-graders. In their multivariate logistic model, the odds ratios for magazine reading are insignificantly different from unity for beer drinking and drinking intentions. They report that "some types of advertising appear to have *no effect*" (p. 533; emphasis added) on youth alcohol behaviors.

Fleming et al. (2004) conducted a nationwide telephone survey of youth (ages 15-20) and young adults (ages 21-29) using self-reported intentions to drink and self-reported frequency of

use. Except for city size, there are no market-area control variables in this study. Among many null findings, this study shows that liquor ads on billboards and in magazines are *unrelated* to positive alcohol expectancies, youths' intentions to drink, and alcohol consumption by young adults. TV beer ads have a significant *negative* association with youths' alcohol expectancies and radio advertising for liquor has a *negative* association with youths' intentions to drink as adults. Out of 40 variables measuring direct effects of advertising on alcohol expectancies, intentions, and consumption, none of these are significantly positive and three are negative. The authors conclude that "greater exposure to alcohol advertising . . . was not a determining factor that predicted 15-20 year olds intentions to drink and young adults' consumption" (p. 23). Grube and Wallack (1994) studied youths' intentions to drink as adults using a structural model, but only 5% of the youth (ages 10-13) surveyed had ever tasted alcohol. Following a specification search, several advertising variables are dropped because they are "unrelated to any of the endogenous variables" (p. 256) measuring youth alcohol behaviors, e.g., hours of weekend afternoon and hours of weekday TV viewing were *insignificant*. Saffer and Dave (2006) examine data from the 1996 and 1998 Monitoring the Future (MTF) surveys and the 1997 National Longitudinal Survey of Youth (NLSY). In the MTF regressions, a standardized measure of local advertising expenditures (spot TV, outdoor, newspapers, magazines) is significantly positive for whites and females, but *insignificant* for blacks and males. Hence, the positive results are dominated by white females, but this finding conflicts with results in several other survey studies. In the NLSY regressions, the log of advertising is positive for binge drinking, but *insignificant* for past month alcohol participation. The authors conclude that the effect of advertising on alcohol use by teens (ages 12-17 years) is "modest" (p. 634). Synder et al. (2006) is a longitudinal telephone survey of 588 individuals conducted in 24 media markets

(25 respondents per market). They use a measure of self-reported alcohol use, self-reported exposure to alcohol ads in the prior month, and market-wide alcohol advertising expenditures per capita (unstandardized by media). No controls are included for market-area differences, except for statewide alcohol case sales per capita (unweighted by beverage). At the market-level, advertising exposure and expenditures are positively related to alcohol use, but the authors report that "within-individual variation in advertising exposure was *not a statistically significant factor* in drinking" (p. 21; emphasis added). Lastly, Stacy et al. (2004) surveyed 2250 students in Los Angeles in seventh grade and again in eighth grade. Watching TV sports programs and self-reported exposure to advertising in all media are significant for beer consumption, but *insignificant* for binge drinking. These results contradict results in Saffer and Dave (2006). They conclude that the "great majority of the odds ratios were positive, even though most for wine and liquor consumption and 3-drink episodes were *not significant* . . . this is a somewhat mixed picture" (p. 506; emphasis added).

Siegel et al. fail to inform the reader of this mixed picture. They simply ignore the many contradictory survey results, and instead argue that "our results indicate that youths are disproportionately exposed to alcohol advertising and that reducing youth exposure to alcohol advertising remains an important public policy concern." They fail to explain why this policy proposal is not invalidated by null or negative effects of advertising on youth alcohol behaviors as reported in the survey literature. Further, Siegel et al. make no attempt to evaluate or discuss the cost-effectiveness of advertising restrictions compared to other alcohol policies (see, e.g., Barbor et al., 2003).[8] Thus, a critical review of the literature cited by Siegel et al. serves to support and strengthen the policy conclusion in Nelson (2006).

VII. CONCLUSIONS

In Nelson (2006), I proposed a general model of advertising placements and applied it empirically to a diverse sample of 28 magazines, ranging from *Rolling Stone* to *Popular Mechanics*. I concluded that targeting of underage youth by alcohol advertisers was not occurring and suggested that public policy should focus on non-advertising strategies for dealing with youthful drinking. Siegel et al. claim that my empirical results suffer from collinearity between the percent youth readers and adult average age variables, but they fail to present a comprehensive measure of multicollinearity. For my model, variance inflation factors are within acceptable limits, and estimation of the model using redefined variables does not alter my previous results or conclusion. Siegel et al. also claim that advertisers target young adults, but confine their attention to the age group 21-34 years. This begs the question of why an alcohol ad would ever be placed in a magazine such as *Popular Mechanics*, where the average age of adult readers exceeds 40 years. Nevertheless, *Popular Mechanics* is on CAMY's list of "youth-oriented" magazines, since the estimated proportion of underage readers is greater than 15%. Using redefined variables, I estimated the Siegel et al. model and demonstrated that it is not robust to minor changes in the specification. Using several alternative specifications, I showed that their model fails to demonstrate a robust positive relationship between the proportion of youth readers and alcohol ads. I also discussed the limitations of readership estimates for magazines, especially youth readers. Finally, the public health literature on advertising and youth alcohol behaviors fails to demonstrate a robust positive relationship for magazine or TV advertising of alcohol beverages. Neither the empirical results in Siegel et al. nor their literature citations support a public policy based on the simplistic notion that alcohol advertisements should not be placed in media outlets if the estimated youth audience exceeds 15% of the total audience of all ages.

FOOTNOTES

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1. In a First Amendment case involving advertisements for contraceptives, the Supreme Court held that the government may not "reduce the adult population . . . to reading only what is fit for children," *Bolger, et al. v. Youngs Drug Products Corp*., 463 U.S. 60, at 73 (1983). Subsequently, the Court eliminated any "vice" advertising distinction and now requires equal treatment of all truthful, non-deceptive advertising for lawful products and services; see, e.g., *Robert Rubin, Secretary of the Treasury v. Coors Brewing Co.*, 514 U.S. 476 (1995).

2. The variance of a parameter can be written as $\text{Var}(\beta_j) = \sigma^2[1/\text{SST}_j\,(1 - R_j^2)]$, where σ^2 is the error variance, SST_j is the total sample variation of the jth variable, and $1/(1 - R_j^2)$ is the VIF_j; see Theil (1971, p. 166) for a derivation.

3. For percent youth, r = 0.92 (ages 12-19 years and 12-20 years). For adult average age, r = 0.98 (ages 18+ and 21+). For adult readers per copy, r = 0.92 (ages 18+ and 21+).

4. I did not redefine the price variable using alternative procedures described in Siegel et al. Readership estimates vary with each issue, but minimum circulation guarantees are known numbers. Advertising placements also are planned in advance of the appearance of an ad, so readership estimates used in advertising decisions cannot be known with certainty as assumed by Siegel et al.

5. Siegel et al. initially defined "young adults" as ages 21-24 years. I show below that narrowing the definition of young adults or youth further invalidates the Siegel et al. findings and conclusions, regardless of whether the measure is the proportion or number

of young adults. This comparison is warranted given the importance and scope of the on going policy debate over a disproportionate rule.

6. A longer summary is available upon request. In the interest of space, I have not included the references, which are contained in Siegel et al. Austin, Chen, and Grube (2006) is the published version of Chen and Grube (2004) and Collins et al. (2007) also is a published version. Two of the studies cited by Siegel et al. are brief literature reviews, Grube (1995) and Martin et al. (2002), and these are omitted here. I have added one additional study of interest, Fleming et al. (2004).

7. Austin et al. (2006) report reduced-form coefficients for their structural model, which are generally small. It is unlikely that the advertising coefficients in this and other survey studies would satisfy a test of economic significance; see McCloskey (1985); Nelson (2001); and Ziliak and McCloskey (2004).

8. Critics of alcohol advertising understand that pursuing this issue in the courts is unlikely to be successful, and therefore have chosen a political route using Congress and the FTC; see, e.g., *44 Liquormart, Inc., et al. v. Rhode Island and Rhode Island Liquor Stores Assoc*., 517 U.S. 484 (1996); *Pennsylvania State Police v. Hospitality Investments of Philadelphia, Inc.,* 689 A.2d 213 (Pa. 1997); *Lorillard Tobacco Co., et al. v. Thomas F. Reilly, Attorney General of Massachusetts, et al.*, 533 U.S. 525 (2001); *The Pitt News v. Gerald J. Pappert, Attorney General of the Commonwealth of Pennsylvania, et al.*, 379 F.3d 96 (2004). Several of these cases and related First Amendment issues are discussed in Nelson (2001, 2004).

ABBREVIATIONS

CAMY: Center on Alcohol Marketing and Youth

CPM: Cost per Thousand Circulation

FTC: Federal Trade Commission

MRI: Mediamark Research, Inc.

MTF: Monitoring the Future

NLYS: National Longitudinal Survey of Youth

P4C: Full-Page Four-Color Ad

SRDS: Standard Rate and Data Service

VIF: Variance Inflation Factor

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TABLE 1
Magazine Audience Demographics, 2001-2003

Magazine	Average No. Readers (000)	Readers, ages 12-14 (%)	Readers, ages 15-20 (%)	Readers, ages 21-24 (%)	Readers, ages 25-34 (%)	Readers, ages 35+ (%)	Mean Adult Age
Allure	5316	337 (6.33)	1588 (29.9)	783 (14.7)	1098 (20.6)	1509 (28.4)	35.6
Better Homes Gardens	38285	627 (1.64)	1789 (4.67)	1753 (4.58)	6225 (16.3)	27891 (72.8)	46.2
Car & Driver	10904	624 (5.73)	2306 (21.2)	1248 (11.4)	2444 (22.4)	4283 (39.3)	38.2
Cosmopolitan	18888	586 (3.10)	3959 (21.0)	2559 (13.6)	4621 (24.5)	7163 (37.9)	36.9
ESPN The Magazine	11122	1130 (10.2)	2511 (22.6)	1484 (13.3)	2552 (23.0)	3445 (31.0)	35.6
Ebony	12603	666 (5.28)	1688 (13.4)	1122 (8.90)	2542 (20.2)	6586 (52.3)	41.0
Entertainment Weekly	9735	403 (4.14)	1766 (18.1)	1280 (13.2)	2381(24.4)	3904 (40.1)	37.7
Fitness	6234	267 (4.28)	939 (15.1)	639 (10.2)	1449 (23.2)	2939 (47.1)	39.1
Glamour	13288	653 (4.91)	2718 (20.4)	1725 (13.0)	3257 (24.5)	4934 (37.1)	36.7
Hot Rod	8303	627 (7.55)	1816 (21.9)	909 (11.0)	1793 (21.6)	3158 (38.0)	37.4
In Style	7972	489 (6.13)	1470 (18.4)	936 (11.7)	2127 (26.7)	2952 (37.0)	36.7
Jet	9916	598 (6.03)	1363 (13.8)	976 (9.84)	1979 (20.0)	4999 (50.4)	40.4
Maxim	11420	221 (1.93)	2876 (25.2)	2674 (23.4)	3606 (31.6)	2044 (17.9)	30.5
Motor Trend	8227	490 (5.95)	1653 (20.1)	926 (11.3)	1652 (20.1)	3505 (42.6)	39.4
Newsweek	21184	464 (2.19)	1700 (8.02)	1276 (6.02)	3277 (15.5)	14468 (68.3)	45.6
People	38968	1465 (3.76)	4435 (11.4)	2997 (7.69)	7418 (19.0)	22653 (58.1)	42.7
Popular Mechanics	10272	482 (4.69)	1294 (12.6)	909 (8.85)	1833 (17.8)	5756 (56.0)	43.1
Popular Science	8159	620 (7.60)	1178 (14.4)	568 (6.97)	1172 (14.4)	4621 (56.6)	44.6
Road & Track	6258	312 (4.98)	1004 (16.0)	571 (9.13)	1435 (22.9)	2935 (46.9)	39.5
Rolling Stone	11670	593 (5.08)	3243 (27.8)	1953 (16.7)	2684 (23.0)	3196 (27.4)	34.0
Self	5461	262 (4.80)	842 (15.4)	528 (9.67)	1416 (25.9)	2412 (44.2)	37.9
Shape	6049	198 (3.28)	926 (15.3)	754 (12.5)	1819 (30.0)	2352 (38.9)	35.8
Spin	3346	201 (6.02)	950 (28.4)	648 (19.4)	906 (27.1)	641 (19.2)	31.4
Sports Illustrated	24354	1650 (6.77)	4083 (16.8)	2230 (9.16)	4834 (19.8)	11558 (47.5)	40.5
The Source	7848	712 (9.07)	2996 (38.2)	1593 (20.3)	1755 (22.4)	795 (10.1)	29.0
Time	24132	611 (2.53)	2084 (8.64)	1566 (6.49)	3917 (16.2)	15953 (66.1)	45.2
Vibe	8209	722 (8.79)	2538 (30.9)	1380 (16.8)	1950 (23.8)	1620 (19.7)	32.1
Vogue	11041	483 (4.37)	2062 (18.7)	1181 (10.7)	2577 (23.3)	4740 (42.9)	39.2

Source: Mediamark Research Inc. TwelvePlus audience data (weighted); a "reader" is defined by an affirmative response to the survey question: "Did you read or look into the publication within the last publication period?" Yearly data acquired by the author under a contract with MRI. Average adult age (ages 21+) obtained by assigning a value of 65 years to the age group 65 years and older. Reader numbers in thousands, with audience percentage values reported in parentheses.

TABLE 2
Auxiliary Regressions and Variance Inflation Factors

Specification & Dependent Variable (mean & s.d.)	**No. Significant Regressors**	**Auxiliary R^2: Spec. (1), (2)**	**Variance Inflation: Spec. (1), (2)**
Nelson specification: (1) original data, (2) redefined variables			
Percent youth (24.1, 8.9)	4, 5	0.7264, 0.8444	3.65, 6.43
Average adult age (38.3, 4.5)	8, 5	0.7256, 0.8177	3.64, 5.49
Adult real income (54.8, 8.9)	9, 8	0.7287, 0.7236	3.69, 3.62
Percent male readers (49.8, 29.2)	2, 4	0.5910, 0.6107	2.44, 2.57
Real CPM price (63.1, 18.5)	7, 6	0.7737, 0.7271	4.42, 3.66
Percent single-copy (23.4, 19.3)	6, 6	0.7791, 0.7635	4.53, 4.23
Adult readers per copy (5.6, 1.7)	8, 7	0.9742, 0.9874	38.8, 79.4
Sq. readers per copy (33.9, 21.8)	7, 5	0.9681, 0.9855	31.3, 69.0
Log no. of issues (21.3, 16.0)	6, 5	0.5611, 0.5423	2.28, 2.18

Notes: Number of significant regressors based on heteroscedastic robust standard errors, 95% confidence level, two-tailed test. Total number of regressors is nine, including the constant term. The redefined variables are percent youth, average adult age, readers per copy, and square of readers per copy. See Nelson (2006) for definitions of other variables.

TABLE 3
Nelson Specification with Redefined Variables: Negative Binomial Regressions

	All Beverages		Beer		Spirits	
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	-1.814	-1.814	-5.757	-5.757	0.965	0.965
	(2.621)	(2.863)	(2.686)*	(3.930)	(2.091)	(1.745)
Percent youth, ages 12-20	0.030	0.030	0.008	0.008	0.033	0.033
	(0.039)	(0.059)	(0.049)	(0.061)	(0.030)	(0.041)
Adult mean age, ages 21+	-0.193	-0.193	-0.218	-0.218	-0.185	-0.185
	(0.044)*	(0.067)*	(0.075)*	(0.101)*	(0.039)*	(0.036)*
Median real income	0.025	0.025	0.045	0.045	0.019	0.019
	(0.023)	(0.028)	(0.020)*	(0.021)*	(0.019)	(0.029)
Percent male readers	0.004	0.004	0.022	0.022	0.006	0.006
	(0.006)	(0.014)	(0.005)*	(0.004)*	(0.006)	(0.011)
Real CPM price of P4C ad	-0.025	-0.025	0.016	0.016	-0.029	-0.029
	(0.014)	(0.021)	(0.016)	(0.024)	(0.010)*	(0.019)
Percent single-copy sales	0.025	0.025	0.033	0.033	0.019	0.019
	(0.012)*	(0.018)	(0.013)*	(0.020)**	(0.011)**	(0.015)
Adult readers per copy, ages 21+	2.704	2.704	2.050	2.050	2.049	2.049
	(0.506)*	(0.329)*	(0.564)*	(0.882)*	(0.531)*	(0.476)*
Square of adult readers per copy	-0.225	-0.225	-0.177	-0.177	-0.169	-0.169
	(0.039)*	(0.032)*	(0.043)*	(0.057)*	(0.043)*	(0.042)*
Log of annual no. of issues	1.304	1.304	1.639	1.639	1.035	1.035
	(0.241)*	(0.308)*	(0.318)*	(0.495)*	(0.190)*	(0.192)*
Cluster robust s.e.	No	Yes	No	Yes	No	Yes
Log likelihood	-361.2	-361.2	-179.2	-179.2	-328.4	-328.4
Alpha dispersion parameter (s.e.)	1.029	1.029	0.132	0.132	0.420	0.420
	(0.226)*	(0.262)*	(0.542)	(0.994)	(0.208)*	(0.312)

Notes: Dependent variable is count of alcohol advertisements in each of 28 magazines for 2001, 2002, and 2003. Estimates obtained using Stata 9.2. Robust standard errors in parentheses, with and without clustering by six magazine categories; one and two asterisks indicate that the z-statistic is equal to or greater than 1.96 and 1.64, respectively. Beer and spirits regressions estimated using a zero-inflated negative binomial model, with inflation on the constant term.

TABLE 4
Siegel et al. Preliminary Specification: Negative Binomial Regressions for All Beverages

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-7.3052 (2.437)*	-0.3925 (5.005)	-7.8060 (2.260)*	-0.6900 (5.025)	-8.5619 (1.882)*	-0.6237 (4.591)
Percent youth, ages 12-20	0.0905 (0.046)*	0.0745 (0.065)	0.0976 (0.046)*	0.0837 (0.064)	---	---
Percent youth, ages 15-20	---	---	---	---	0.1236 (0.052)*	0.0977 (0.068)
No. of readers, 21-24 years (millions)	0.4655 (0.312)	0.5852 (0.335)**	---	---	---	--
No. of readers, 21-34 years (millions)	---	---	0.1139 (0.115)	0.1537 (0.125)	0.0592 (0.123)	0.1105 (0.140)
Median real income	-0.0002 (0.034)	-0.0191 (0.038)	-0.0018 (0.034)	-0.0232 (0.039)	0.0063 (0.038)	-0.0217 (0.035)
Percent male readers	0.0020 (0.015)	0.0014 (0.022)	0.0053 (0.015)	0.0050 (0.021)	0.0052 (0.015)	0.0058 (0.022)
Real CPM price of P4C ad	-0.0106 (0.021)	-0.0007 (0.029)	-0.0119 (0.023)	-0.0013 (0.031)	-0.0165 (0.021)	-0.0030 (0.028)
Percent single-copy sales	0.0289 (0.024)	0.0195 (0.031)	0.0348 (0.025)	0.0255 (0.030)	0.0317 (0.026)	0.0244 (0.032)
Adult readers per copy (ages 21+)	1.8109 (0.257)*	-0.2309 (0.373)	1.8714 (0.268)*	-0.2457 (0.391)	2.0687 (0.218)*	-0.2293 (0.362)
Square of adult readers per copy	-0.1687 (0.021)*	---	-0.1751 (0.027)*	---	-0.1869 (0.020)*	---
Log of annual no. of issues	1.1832 (0.235)*	1.0718 (0.303)*	1.2717 (0.273)*	1.1710 (0.364)*	1.3499 (0.208)*	1.2411 (0.369)*
Log likelihood	-364.2	-369.3	-365.3	-370.6	-364.7	-370.8
Alpha dispersion parameter (s.e.)	1.1147 (0.262)*	1.2649 (0.307)*	1.1469 (0.263)*	1.3059 (0.320)*	1.1303 (0.267)*	1.3135 (0.306)*

Notes: Dependent variable is count of alcohol advertisements in each of 28 magazines for 2001, 2002, and 2003. Estimates obtained using Stata 9.2. Robust standard errors in parentheses, with clustering by six magazine categories; one and two asterisks indicate that the z-statistic is equal to or greater than 1.96 and 1.64, respectively.

TABLE 5
Siegel et al. Final Specification: Negative Binomial Regressions for All Beverages

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-12.838 (1.358)*	-12.899 (1.294)*	-11.447 (1.237)*	-11.525 (1.099)*	-10.908 (1.633)*	-9.9011 (1.535)*
Percent youth, ages 12-20	0.0647 (0.044)	0.0627 (0.046)	---	---	0.0553 (0.051)	---
Percent youth, ages 15-20	---	---	0.0453 (0.054)	0.0430 (0.056)	---	0.0342 (0.068)
Percent young adults, 21-24 years	---	---	---	---	0.1354 (0.050)*	0.1330 (0.068)*
Percent young adults, 21-34 years	0.0893 (0.022)*	0.0926 (0.023)*	0.0840 (0.025)*	0.0882 (0.028)*	---	---
Median real income	0.0247 (0.023)	0.0260 (0.022)	0.0061 (0.022)	0.0080 (0.020)	0.0194 (0.029)	0.0029 (0.029)
Percent male readers	0.0018 (0.013)	0.0013 (0.012)	0.0042 (0.014)	0.0035 (0.013)	-0.0007 (0.014)	0.0013 (0.015)
Real CPM price of P4C ad	-0.0253 (0.018)	-0.0252 (0.018)	-0.0153 (0.019)	-0.0155 (0.019)	-0.0180 (0.018)	-0.0090 (0.018)
Percent single-copy sales	0.0200 (0.015)	0.0181 (0.015)	0.0268 (0.017)	0.0244 (0.016)	0.0275 (0.017)	0.0335 (0.019)**
Adult readers per copy, ages 21+	2.6922 (0.258)*	2.7455 (0.225)*	2.5087 (0.235)*	2.5656 (0.181)*	2.5112 (0.355)*	2.3931 (0.326)*
Square of adult readers per copy	-0.2221 (0.025)*	-0.2250 (0.022)*	-0.2144 (0.024)*	-0.2172 (0.019)*	-0.2138 (0.034)*	-0.2103 (0.032)*
Log of annual no. of issues	1.3073 (0.302)*	1.2759 (0.292)*	1.4435 (0.294)*	1.4027 (0.300)*	1.4008 (0.321)*	1.5292 (0.316)*
2002 year dummy	---	-0.1199 (0.199)	---	-0.1512 (0.203)	---	---
2003 year dummy	---	-0.2333 (0.205)	---	-0.2620 (0.207)	---	---
Log likelihood	-358.5	-358.2	-360.1	-359.6	-361.0	-362.1
Alpha dispersion parameter (s.e.)	0.9555 (0.252)*	0.9457 (0.254)*	0.9965 (0.262)*	0.9844 (0.266)*	1.0285 (0.239)*	1.0581 (0.245)*

Notes: Dependent variable is count of alcohol advertisements in each of 28 magazines for 2001, 2002, and 2003. Estimates obtained using Stata 9.2. Robust standard errors in parentheses, with clustering by six magazine categories; one and two asterisks indicate that the z-statistic is equal to or greater than 1.96 and 1.64, respectively. Results for beer and spirits using zero-inflated negative binomial regressions are similar, and do not alter the conclusions.