Television and Magazine Alcohol Advertising: Exposure and Trends by Sex and Age

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ABSTRACT. Objective: The purpose of this study was to document exposure to alcohol advertising by sex, age, and the level and type of alcohol people consume. **Method:** We use unique marketing survey data that link the media individuals consume and advertising appearing in those media. Our sample of 306,451 men and women represents the population age 18 and older living in the 48 contiguous United States between 1996 and 2009. We measure advertising exposure not with the standard expenditure data but with counts of actual advertisements people likely saw. We relate advertising exposure across groups defined by age, gender, and the amount of beer, wine, and spirits consumed. **Results:** We found that drinkers, particularly young male drinkers, see

much more alcohol advertising. Men, especially younger men, see more advertisements for alcohol of all types than do women. Their higher exposure is largely explained by sex differences in the propensity to read sports and adult magazines and to watch sports and gambling television programs. **Conclusions:** The evidence highlights the need to recognize, and when possible, control for the fact that a selected group of individuals is more likely to see alcohol advertising. Firms successfully place advertising on programs and in magazines viewed by youth and drinkers. To estimate whether seeing advertising causes people to drink (more), researchers need to develop clever identification strategies. (*J. Stud. Alcohol Drugs*, 79, 881–892, 2018)

A LARGE EMPIRICAL LITERATURE links excessive alcohol consumption to social, economic, and health costs including 80,000 premature deaths, lost productivity, sexual assault, and other crimes (Bouchery et al., 2011; Centers for Disease Control and Prevention, 2012; Greenfeld, 1998). Recent literature reviews suggest that alcohol consumption is positively associated with exposure to advertising for all types of alcohol (Anderson et al., 2009; Hastings et al., 2005; Nunez-Smith et al., 2010) and brand-specific advertising (Ross et al., 2014a; Siegel et al., 2016). However, literature reviews have long noted that the literature has not yet established whether the association reflects an underlying causal relationship (Nelson, 2011; Smart, 1988). Nelson's (2011) more careful evaluation of the statistical nature of the estimated associations notes that most studies only estimate correlations. Nelson (2011) concludes that there is no consistent or robust evidence to causally link advertising and specific measures of drinking.

Existing studies use a variety of methods to characterize advertising that people (potentially) see. Despite obvious

potential for recall bias, researchers use a number of methods that rely on an individual's memory of being exposed to alcohol advertising (specific or general). For example, researchers ask survey respondents to report how many alcohol advertisements they remember having recently seen (Connolly et al., 1994; Fleming et al., 2004; Grenard et al., 2013; Jones & Magee, 2011; Snyder et al., 2006) or whether they can identify an alcohol advertisement they "like" (Austen et al., 2006; Casswell & Zhang, 1998; Casswell et al., 2002; Gordon et al., 2011; Henriksen et al., 2008; McClure et al., 2013). Researchers often ask if a respondent owns a product that displays an alcohol brand name (Fisher et al., 2007; Henriksen et al., 2008; McClure et al., 2006, 2013). The latter two measures suffer from selection bias. Other studies use data on market-level alcohol advertising expenditures (Jedidi et al., 1999; Mela et al., 1997; Saffer & Dave, 2006). These data reveal little about how advertising is targeted at specific populations and, when overall advertising costs rise, imperfectly measure how actual exposure changes. For example, in election years and in political markets with heavily contested seats, demand for limited advertising space drives up costs.

A more defensible method lessens potential recall bias by asking respondents to report not on alcohol advertising per se but on whether an individual consumes media in which alcohol (advertising) appears. These studies use data on the television programs people watch or the magazines they read and then count the alcohol advertising that appears on those programs and in those magazines. Research-

Received: August 22, 2017. Revision: August 14, 2018.

We gratefully acknowledge funding from the National Institute on Alcoholism and Alcohol Abuse (Award 1R01AA019777-01A1). The views expressed in this article are those of the authors and should not be interpreted as those of the Congressional Budget Office. No author has any conflicts of interest.

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ers also use recall data to measure broader industry efforts to “promote” alcohol through its portrayal in movies or television programming. Researchers combine counts of how often alcohol appears in each movie/program with survey data on whether a respondent watched the movie/program (Cin et al., 2009; Hanewinkel & Sargent, 2009; Koordeman et al., 2011; McClure et al., 2013; Sargent et al., 2006; Wills et al., 2009). Although not free of selection bias, these measures are plausibly better to the extent that people do not decide which media to consume because of the (unobserved) factors that lead them to drink (Avery et al., 2007; Nelson, 2011).

Studies differ in how precisely they measure media consumption. Some of the best studies use Nielsen (New York, NY) technology that remotely tracks the television station (program) that a person watches. In older studies, that technology only tracked whether the household’s television set was tuned to a particular station (Ban et al., 2011; Deighton et al., 1994; Pedrick & Zufryden, 1991; Tellis, 1988; Terui et al., 2011). More recently, Nielsen respondents have personal devices to track not household but individual viewing behavior. Other studies use surveys that ask respondents to identify programs they watch (Ellickson et al., 2005; Grenard et al., 2013; Molloy, 2016; Naimi et al., 2016; Ross et al., 2014a; Stacy et al., 2004) or magazines they read (Molloy, 2016; Ross et al., 2014c). The studies combine those data with data on the alcohol advertising that actually appeared in those media to approximate exposure. Most recently, researchers collect data using ecological momentary assessment devices that individuals are supposed to use to record any time they notice an alcohol advertisement. This method offers an interesting alternative exposure measure (Collins et al., 2016).

Here we follow the studies that use survey data on what programs individuals watch or magazines they read. As in the above-cited studies, we develop exposure measures using survey data on specific television programs individuals watched, specific magazines they read, and the advertising that appeared on those programs and in those magazines. Our measures complement existing evidence by covering a longer period (1996–2009) for a sample age 18 and older. We improve on the literature by using individual data on viewing of more than 4,000 television programs and 85 magazines. We estimate individuals’ exposure to beer, distilled spirits, and wine advertisements for men and women ages 18–20, 21–24, and 25 and over. For each age–sex category, we also describe advertising seen by people who drink no, some, or a large quantity of beer, distilled spirits, or wine.

Our results complement and improve on studies that estimate exposure to television advertising of individuals using the “Gross Ratings Points” (GRP) associated with particular television programs for particular demographic groups. Nielsen (New York, NY) calculates GRPs for groups defined by demographic characteristics. The GRP measures

the fraction of people in a particular demographic group who watch a particular show. An advertising GRP usually equals the number of advertising impressions that aired on a particular program divided by the population. We use individual television diary data on shows individuals watch. We also contribute by showing the extent to which exposure varies with easily observed factors firms can use to target particular groups (adult entertainment and sports magazines, sports and gambling television programs).

We next describe our data, our advertising exposure measures, and how we adjust them. In our results we describe exposure of several demographic groups to advertising of beer, wine, and distilled spirits. To conclude, we discuss the limitations of our study, what the patterns imply for studies of the effects of advertising, some of the challenges they highlight, and possible strategies for empirical studies.

Method

Data

Simmons National Consumer Survey. We use individual consumption and media viewing data from the 1996 to 2009 waves of the Simmons National Consumer Survey (NCS). Simmons administered one survey in 1996 and two surveys in every subsequent year. We do not use data from the fall 1998 survey because, in that one survey, it collected only limited alcohol consumption data. The NCS uses a multi-stage stratified probability sample that is drawn from random digit dial sampling frames that exclude Hawaii and Alaska. The exclusion of wireless-only area codes from the NCS sampling frame is a potential drawback of the survey and could bias our measures of advertising exposure if the viewing habits of these households are significantly different. Several studies have shown that excluding wireless-only households may bias measures of alcohol consumption (Collins et al., 2016; Gordon et al., 2011). The surveys collect a rich set of household characteristics and individual characteristics from adults age 18 and older living in a surveyed household.

The data measure consumption of a wide range of products, including alcohol, services, magazines, television, and other mass media. With sample weights, the NCS cross-sectional data represent the population of all adults (age 18 and older) living in households in the contiguous United States.

The alcohol and media consumption data are quite detailed. NCS respondents report the type and number of drinks of several types of alcohol they consumed in the past 30 days and whether and how frequently they read magazines and watch television. The NCS surveys collected individual reading behavior of 229 popular consumer magazines, viewing behavior of 4,907 specific cable and network television programs, and when respondents

FIGURE 1. Magazine alcohol advertisements 1996–2009, by alcohol type. Source: Kantar Media.

typically watch network television (e.g., NBC) and specific cable networks.

To collect these data, the survey displays thumbnail pictures of cover pages of all the magazines and asks respondents to identify all titles they “read or looked into in the last six months.” On average, people read five unique titles. Then respondents indicate how many of the past four issues they read.

The survey follows a similar method to identify cable or premium television channels—showing respondents each channel’s logo. Respondents then fill out their viewing behavior over the past week. Viewing behavior includes whether, how long, and when (weekday/weekend and time period) they watched. The survey then presents a list of up to 10 programs for each cable/premium channel. Respondents indicate all they watched in the past month and past week, and how much attention they paid to the program. Similar lists show names of programs that air once per week or daily programs, news shows, special programs (e.g., Academy Awards), regular season sports, and sports events (e.g., World Series). For each program, respondents identify the frequency of viewing and/or intensity of viewing.

We use survey information and an algorithm described in Molloy (2016) to identify the Designated Marketing Area (DMA) where respondents live—a feature we use to calculate the spot market television advertising respondents saw. A DMA is a group of counties that share the same broadcast television stations, typically named for the largest city or cities in the area. Nielsen Media Research defines the boundaries of the 210 U.S. DMAs. Using the algorithm developed in Avery et al. (2007), we match 66% of NCS respondents to a DMA. Dropping observations with missing DMA, magazine reading, and television viewing data, our sample includes 306,451 adults; 12,235 of whom are ages 18–20 and 15,182 who are ages 21–24. On average, respondents whose DMA we could not identify live in DMAs that are rural, geographically dispersed, and smaller. Because we exclude these respondents, our measures will overstate exposure of an average U.S. resident if firms advertise in these spot markets less than they do in the DMAs we identify and will understate exposure if the reverse is true.

Kantar Media magazine and television advertising data. The magazine data measure, for each advertisement, the brand, firm, magazine, issue (date), and page size. Kantar’s television data track characteristics of each commercial that

FIGURE 2. Television alcohol advertisements 1996–2009, by alcohol type. Source: Kantar Media.

aired. They measure the brand, sponsor, program name, and when and where each commercial aired. These data include spot market advertising. If a spot aired locally, the data identify in which of 110 DMAs it aired. Note that Kantar does not measure local cable advertising and only measures cable advertising that aired on 44 popular, national cable networks. We track advertising in 85 magazine titles that appeared in every survey. We do not adjust for magazine circulation and only count nationally distributed advertisements.

Figure 1 and Figure 2 plot, respectively, the trend in the total number of magazine and television advertisements NCS respondents potentially saw (overall and by alcohol type). In Figure 2 we plot the sum of the national and local television advertisements for NCS respondents in the 110 DMAs we identify plus the national advertisements of the NCS respondents in the other DMAs we could not identify. Note that this figure understates television advertising exposure because we do not count local advertising potentially seen by respondents whose DMA we do not identify.

From 1996 to 2009, exposure to magazine and television alcohol advertising rose to a peak then fell. Starting from just under 1,500 advertisements seen in 1996, the magazine alcohol advertising NCS respondents saw rose 190%—above 4,100 advertisements seen in 2002. From that peak, exposure to overall magazine advertising declined about 50%—to 2,200 in 2009. The decline in the latter part of our sample

period occurs because firms shifted advertising, especially for distilled spirits, from magazines to television. These patterns are similar to those reported in earlier studies that include part of the period we studied (Centers for Disease Control and Prevention, 2007, 2013).

That change is apparent in Figure 2. In 1996, NCS respondents saw around 44,200 television beer advertisements. This exposure increased about 74% to a peak of 76,739 in 2003 and then, from 2003 to 2009, fell 48% to 39,948 potential advertisements seen. Note that the 2009 total is less than the figure for the 2009 cable alcohol advertisements reported in the Center on Alcohol Marketing and Youth (CAMY, 2010) report. The figures do not match for several reasons. First, the CAMY report counts advertisements that aired, not advertisements people saw. When one compares our exposure measures to the CAMY on gross ratings points for people age 21 and older, our estimated exposure follows the same general trend but is greater than the CAMY GRPs.

Although it is not easy to tell because of the scale, exposure to television advertising of distilled spirits increased dramatically. In 1996, NCS respondents saw only 2,793 television advertisements for distilled spirits (a number that was only 6% of the number of television beer advertisements seen). In 1996, spirits producers ended a broadcast advertising ban they had voluntarily maintained since 1948. Exposure to

distilled spirits on television increased 150% in 1997 (7,002 advertisements) and 355% in 1998 (12,735 advertisements) before returning to “normal” levels associated with the ban period from 1999 through 2000. Starting in 2001, firms began to aggressively advertise distilled spirits on television. Relative to 1996 (when firms still observed the voluntary ban), in 2009 NCS respondents saw 420% more advertisements for distilled spirits on television (14,536 advertisements).

Measuring individual exposure to alcohol advertising. We adapt a method from previous research (Avery et al., 2007; Ross et al., 2014b) that uses percentage of magazine titles read or recurring television programs watched (plus viewing of special television programs) and the number of advertisements appearing in those media. We adjust those data for individual differences in the number of magazines a person reads and hours of television he or she watches. It is important to emphasize that we only measure the advertising people potentially saw. Hereafter, “exposure” means potential exposure. Our advertising measure is the average exposure after controlling for those behaviors. We generate those estimates within groups defined by sex, age, and consumption of beer, distilled spirits, and wine.

To estimate magazine alcohol advertising exposure, we following the method described in Avery et al. (2007). Briefly, we convert the data on the number of past four magazine issues a person read into a fraction (denoted by $read_{imt}$). We assume a person’s reading habits are stable over the past 6 months. We then multiply the fraction of issues read by the advertisements appearing in each magazine over the previous 6 months (denoted by ad_{mt}). We measure advertising in the 6 months before the first month of the NCS’s 4-month fielding period because empirical evidence on advertising depreciation suggests that the correlation between advertising and outcomes persists for 6 to 9 months (Leone, 1995). Formally, we measure respondent i ’s total exposure to magazine alcohol advertisements in period t as:

$$ad_{it}^{mag} = \sum_{m=0}^{85} read_{imt} \cdot ad_{mt} \quad (1)$$

where the subscripts denote respondent i , magazine m , and 6-month period (survey wave) t . An individual’s (potential) exposure to magazine alcohol advertising is the sum of exposure across the 85 magazines that are common across all of the NCS surveys. In 2004, these 85 magazines accounted for 40% of all issues sold in the United States. A list of titles is available on request.

We similarly estimate television alcohol advertising exposure using the frequency data on viewing of recurring (e.g., weekly) television programs as a weight (denoted by $view_{imt}$). We multiply the fraction of weekly airings of each regular program watched (assuming a fraction of one for special programs) by the number of commercials that aired on the program in the past 6 months. We then sum exposure across all shows. Finally, to control for seasonal differences

across the two halves of each year, to smooth the data, and because Simmons only administered one survey in 1996, we average magazine and television advertising exposure by calendar year.

Controlling for media viewing habits

Because individuals who read more magazines are more likely to be exposed to magazine alcohol advertising than individuals who read fewer magazines, we create a variable, $dmread_i$, to control for the number of magazines a person read relative to the number of magazines read by the average respondent. It is given by:

$$dmread_i = \sum_{m=0}^{85} M_i - \left(\sum_{j=1}^N \sum_{m=0}^{85} M_j \right) \frac{1}{N}$$

where $M_i (M_j) = 1$ if person i (j) (where $i \neq j$) read at least one of the last four issues of magazine m and 0 otherwise.

With data on the daypart times a person watched television, we construct a similar variable, $dmview_i$, given by:

$$dmview_i = TVHrs_i - \left(\sum_{j=1}^N TVHrs_j \right) \frac{1}{N}$$

where $TVHrs_i$ measures the hours person i watched television each week and the second term measures hours of television the average NCS respondent watches each week. Our reference person reads magazines and watches television like the average respondent. When we control for $dmread_i$ and $dmview_i$, but no other types of individual media consumption, we label estimated exposure as “unconditional” exposure.

We construct a second set of exposure measures that additionally controls for reading of particular magazines (*Sporting News*, *Sports Illustrated*, *Golf Digest*, *Golf*, *Playboy*, *Penthouse*) and watching of particular television programs (regular and special sports, boxing, auto racing, poker). We could not include other popular sports magazines, such as *ESPN: The Magazine*, because NCS did not include them in all years of our sample period. Our exposure measure will understate true exposure if firms advertised more in the excluded magazines and if the average respondent read both the magazines we include and the magazines we exclude.

Alcohol consumption

We categorize people by how much they drink. We classify people as “abstainers,” “light drinkers,” and “heavy drinkers” if, over the past 30 days, they drank 0, 1 to 32, and 33 or more drinks respectively of beer, wine, or distilled spirits. To measure consumption consistently over time, we count only alcohol types included on every survey. For example, we exclude products such as “flavored malt beverages” that only appear on later surveys. Molloy (2016) vali-

TABLE 1. Exposure measures of men and women, without/with controls for sex-specific media consumption

Exposure type	Men	Women
Magazine		
Unconditional	$\hat{\alpha}_0 + \hat{\alpha}_4 \overline{sprthead}_{men} + \hat{\alpha}_6 \overline{gmread}_{men}$	$(\hat{\alpha}_0 + \hat{\alpha}_1) + (\hat{\alpha}_4 + \hat{\alpha}_5) \overline{sprthead}_{fem} + (\hat{\alpha}_6 + \hat{\alpha}_7) \overline{gmread}_{fem}$
Conditional	$\hat{\alpha}_0$	$\hat{\alpha}_0 + \hat{\alpha}_1$
Television		
Unconditional	$\hat{\beta}_0 + \hat{\beta}_4 \overline{rsview}_{men} + \hat{\beta}_6 \overline{ssview}_{men} + \hat{\beta}_8 \overline{otview}_{men}$	$(\hat{\beta}_0 + \hat{\beta}_1) + (\hat{\beta}_4 + \hat{\beta}_5) \overline{rsview}_{fem} + (\hat{\beta}_6 + \hat{\beta}_7) \overline{ssview}_{fem} + (\hat{\beta}_8 + \hat{\beta}_9) \overline{otview}_{fem}$
Conditional	$\hat{\beta}_0$	$\hat{\beta}_0 + \hat{\beta}_1$

dates the NCS alcohol consumption data against data from the National Survey on Drug Use and Health.

Empirical strategy

We separately describe average exposure for people ages 18–20, 21–24, and 25 and older. To do so, on each sample we estimate by ordinary least squares the model given by:

$$ad_{ik}^{mag} = \gamma_0 + \gamma_1 dmread_i + v_{ik} \quad (4)$$

Where $dmread_i$ measures the number of unique magazine titles person i reads and v_{ik} is a person-specific error term. Our focus is on the intercept term, γ_0 , because it measures the number of magazine advertisements that the average person in age group g saw for alcohol type k (i.e., beer, distilled spirits, or wine), holding constant each person's magazine reading habits relative to the average person. For television advertising exposure we estimate a similar model controlling for hours of television viewing relative to the average person. We estimate this model separately by age group.

To investigate the sex differences in exposure, we add a female indicator variable, a count of the number of sports ($sprthead_i$) and adult entertainment ($gmread_i$) magazines each person reads, and the interaction between the female dummy and all magazine readership variables. Formally, we estimate:

$$ad_{ik}^{mag} = \alpha_0 + \alpha_1 female_i + \alpha_2 dmread_i + \alpha_3 female_i dmread_i + \alpha_4 sprthead_i + \alpha_5 female_i sprthead_i + \alpha_6 gmread_i + \alpha_7 female_i gmread_i + \varepsilon_i \quad (5)$$

We specify a similar model for television advertising that controls for a count of how many times per week a person watched regular sports ($rsview_i$), special sports ($ssview_i$), and other selected sports shows on cable viewed ($otview_i$), plus the female dummy and the interaction between the program type and the female dummy. We estimate:

$$ad_{ik}^{tv} = \beta_0 + \beta_1 female_i + \beta_2 dmview_i + \beta_3 female_i dmview_i + \beta_4 rsview_i + \beta_5 female_i rsview_i + \beta_6 ssview_i + \beta_7 female_i ssview_i + \beta_8 otview_i + \beta_9 female_i otview_i + \omega_i \quad (6)$$

In all cases we use sample weights. Results do not change when we do not use sample weights.

Table 1 lists the coefficient estimates from (5) and (6) that we combine to compute the average advertising exposure of men and women with and without controls for sex-specific media consumption.

The subscripts *men/fem* refer to men and women, respectively, and the overstrike denotes a sample average. To compute the “unconditional” exposure measures we could also have estimated models that consisted of only the first line of (5) and (6) plus the error terms.

Results

Advertising exposure, by age and level of consumption

Figure 3 plots the exposure to magazine and television beer, spirits, and wine advertisements for the average person ages 18–20, 21–24, and 25 and older.

People age 18–20 see about the same number of advertisements as people age 21–24 even though people in the younger group may not legally buy alcohol. Apparently youth of these ages read and/or firms advertise in media that are equally consumed by people who can and cannot legally drink. More generally, there is a pronounced negative gradient between exposure and age. The average person ages 18–24 sees almost twice as many magazine distilled spirits advertisements and roughly one third more television distilled spirits advertisements than do people ages 25 and older. Across all age groups, people see a similar number of television wine commercials.

FIGURE 3. Exposure to beer, distilled spirits, and wine advertising in magazines and on television, by age. Source: National Consumer Survey, 1996–2009, and Kantar Media.

Although other published estimates typically include more youth, these estimates of advertising exposure compare well with other published data. For example CAMY (2010) reports Nielsen (New York, NY) estimates exposure of youth ages 12–20 to television advertising in the average year from 2001 to 2009 of 273.6 advertisements per year (assuming an average reach of 90%). A recent study using ecological momentary assessment estimates that, in one year, 11- to 14-year-old youth in Los Angeles see 292 television advertisements for alcohol of all types (Collins et al., 2016). That figure is 43% of the total number of television alcohol advertisements we estimated youth to have seen in the average year from 1996 to 2009. Adjusting our numbers for the lower exposure of very young people included in the CAMY estimates, our estimated exposure more closely matches the Nielsen (New York, NY) numbers from CAMY (2010). It remains higher in part because we assume people saw all advertising present in a given magazine or appearing on a given television program (see our discussion below).

Figure 4 plots, for people who drink a particular alcohol type, the relative exposure of drinkers and nondrinkers to magazine and television advertising for that alcohol type. (A “nondrinker” might still drink one of the other two alcohol types.) Because all ratios exceed one, people who drink a particular type of alcohol always see more type-specific alcohol advertising than people who do not drink that type of alcohol. This association is stronger for type-specific advertising in magazines rather than on television. This difference may arise because magazines often have a narrow topical focus that selects readers of a particular type. When

firms advertise in magazines, they get access to groups of readers who either already consume their products or who a firm would like to bring in as new consumers. For example, firms selling wine probably advertise more often in cooking magazines because the firms know that readers of cooking magazines are more likely to be interested in wine. Across all 85 magazines in our sample, the average wine drinker saw 93% more magazine wine advertisements and 17% more television wine commercials than people who drank no wine in the past month.

Table 2 presents average magazine and television exposure of people who, over a 30-day period, drank more than 32 drinks of a particular type of alcohol versus those who drank none. To draw the sharpest contrast in exposure, we exclude people who drank 1 to 32 drinks. For expository purposes we label these groups as “heavy drinkers” and “abstainers” even though the abstainers might drink other types of alcohol. We report exposure to advertising by alcohol type and age. Note that the standard errors are all much less than .5 advertisements.

Regardless of type, heavy drinkers see more advertising than abstainers. There is no obvious pattern across age groups in relative exposure to television advertising. For example, heavy beer drinkers of all ages see between 63% and 65% more television commercials than people who drank no beer. By contrast, firms effectively use television to expose people in the 21- to 24-year-old age group to distilled spirits advertising. Heavy drinkers of distilled spirits in that group see 84% more television distilled spirits commercials than do similarly aged abstainers. Note also that firms success-

FIGURE 4. Relative advertising exposure of drinkers versus abstainers. Source: National Consumer Survey, 1996–2009, and Kantar Media.

fully target underage drinkers ages 18–20. That group sees substantially more advertising for the type of alcohol they (illegally) drink than do underage abstainers.

The data suggest that firms use magazine advertising to target consumers in older age groups. Exposure of heavy drinkers relative to abstainers in the 18–20 age group versus the relative exposure in the 25 and older age group was 90% versus 201%, 15% versus 49%, and 49% versus 108% for beer, distilled spirits, and wine, respectively.

Relative exposure of men and women

Figures 5 and 6 present the exposure of men relative to women for beer, distilled spirits, and wine advertised on television and in magazines, respectively. The bars on the left and right present unadjusted and adjusted relative exposure, respectively.

Figure 5 shows that sex differences in media consumption explain much of the sex difference in television advertising exposure. In unadjusted data, men see almost twice as many beer commercials and 1.2 times more commercials for distilled spirits than women see. Adjusted for sex differences in viewing of sports, car racing, and gambling programs, men and women see almost the same number of television beer commercials (ratio of 1.1) and women actually see more television distilled spirits commercials than men (ratio of 0.6). Relative exposure to wine advertising does not change as much when one accounts for sex-specific differences in

viewing of these programs (unadjusted and adjusted ratios are .95 and .85, respectively). It is possible that the sex-difference in exposure to wine advertising could be explained if we controlled for reading of magazines targeted at women. We leave that for future work.

Figure 6 shows that sex differences in reading of sports and adult entertainment magazines only account for a small fraction of sex differences in exposure to magazine advertising of beer, distilled spirits, and wine. Unadjusted, men see 2.5 and 1.7 times more beer and distilled spirits advertisements, respectively, than women. In the adjusted data, men see 1.9 times more beer advertisements and 1.4 times more distilled spirits advertisements than women. Adjusted and unadjusted exposure measures of magazine wine advertising favor women and sex differences in magazine reading habits (reading of “men’s” magazines) do not explain much of the sex differences. Unadjusted and adjusted measures of exposure were similar at 0.8 and 0.9, respectively.

Discussion

Using unique data, we develop measures of exposure to advertising that vary across individuals, time, and geographic space. We use the measures to describe patterns in exposure to alcohol advertising of various types, by people of particular ages (18–20, 21–24, and 25 and older), sex, and alcohol consumption. Our results demonstrate that people who drink more not only see more advertising but they also see more

TABLE 2. Advertising exposure and percent difference in exposure of heavy drinkers versus abstainers, by age and type of advertising

Advertising of:	Age 18–20			Age 21–24			Age ≥ 25		
	Abstainers	Heavy drinkers	% Diff.	Abstainers	Heavy drinkers	% Diff.	Abstainers	Heavy drinkers	% Diff.
Beer									
TV	385.6	628.7	63.0%	339.0	560.1	65.2%	254.7	421.4	65.4%
Magazine	14.3	27.2	90.1%	11.4	25.9	127.7%	6.7	20.2	200.8%
<i>n</i>	8,597	653		7,549	1,233		160,326	9,723	
Distilled spirits									
TV	182.0	257.4	41.4%	176.5	324.1	83.7%	128.8	182.3	41.5%
Magazine	75.7	87.0	14.9%	65.6	91.2	39.1%	44.9	66.9	49.2%
<i>n</i>	8,674	336		8,177	519		166,069	5,113	
Wine									
TV	50.4	110.4	119.0%	50.9	78.1	53.4%	52.9	73.3	38.6%
Magazine	4.9	7.3	49.3%	4.6	7.1	52.9%	5.5	11.4	108.2%
<i>n</i>	10,543	69		11,290	62		172,758	2,360	

Notes: Exposure measured for people who drink the advertised alcohol. Difference in exposure as percentage of advertising seen by people who do not drink the advertised type of alcohol. For brevity, we refer to this group as “abstainers.” Source: National Consumer Survey, 1996–2009. Diff. = difference.

FIGURE 5. Ratio of male/female exposure to TV advertising, by alcohol type. Source: National Consumer Survey, 1996–2009, and Kantar Media.

advertising for the particular type of alcohol they drink. Youth (18–24) see more magazine advertising for beer and distilled spirits than older adults (25 and older). Exposure to wine advertising increases with age. Underage youth (18–20) see almost the same amount of all three types of alcohol advertising as do youth who can legally drink (21–24). Men ages 18–24 see significantly more advertisements for beer and distilled spirits than do similarly aged women. Some of the difference is linked to sex differences in media consumption. When we control for men’s higher propensity to read sports and adult entertainment magazines and watch

sports and gambling television programs, sex differences in exposure fall.

It is interesting that exposure to television advertising for beer and distilled spirits is largely similar for underage youth (18–20) and for youth ages 21–24 and that both groups see more such advertising than do people age 25 and older. By contrast, exposure to television advertising of wine is almost the same across the age distribution. This interesting finding hints again at a role for targeting by firms and for differences across age groups in the programs people watch. Because youth predominantly start drinking with beer rather than

FIGURE 6. Ratio of male/female exposure to magazine advertising, by alcohol type. Source: National Consumer Survey, 1996–2009, and Kantar Media.

wine, further exploration is warranted (Yu & Perrine, 1997). Further attention is also warranted because, although youth start with beer, distilled spirits appear to be their preferred alcohol type by the time they reach high school, followed by alcopops and beer in that order (Mosher, 2012). As noted before, we do not separately measure advertising for alcopops because Simmons did not ask about alcopop consumption until partway through our sample period.

Our study is limited in several ways. Some of these are pretty standard limitations that apply to almost all studies. For example, because we do not have longitudinal data, we cannot know if people began drinking a particular type of alcohol because they saw more advertising, if they see more advertising because firms successfully target advertising at particular demographic groups, or if the people who drink consume the media where firms advertise. In addition, we share the limitation of sampling bias present in all studies that use survey data.

Our measures are undoubtedly contaminated with measurement errors and potential bias that are mostly present in every published study. For example, we assume that people accurately recall, not whether they saw advertising but whether (when, how often) they read specific magazines or watched particular television programs. We also assume that people saw all advertising if they said they read a magazine or who watched a television program. This assumption likely leads to upward bias in our estimated exposure.

With these limitations in mind, our results show that firms concentrate alcohol advertising in particular magazines and

on particular programs consumed by men, especially young men. Many of the sex differences in exposure to beer advertising can be explained by sex differences in the viewing of sports programs and in readership of a very small number of magazines. Some of these differences arise because firms target advertising at particular groups. If alcohol advertising could actually induce people to drink (who were otherwise not so inclined), one would expect a profit-maximizing firm to advertise in a wider variety of media read by different consumers than the ones who consume the media firms currently use. The latter point is important because, among groups not exposed to any advertising, marginal effects of advertising would theoretically be large. However, with our data, we cannot determine how much of these “explained” sex differences arise because men consume different media, firms target the media men consume, or both. Overall, the results establish basic patterns in estimated exposure based on reported media consumption as opposed to expenditures. The results provide strong cautionary evidence that researchers need to control for particular types of media that people differentially consume.

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