BITS, BRIEFS AND APPLICATIONS

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What Am I Drinking? The Effects of Serving Facts Information on Alcohol Beverage Containers

Excessive alcohol consumption is associated with numerous adverse health conditions and is the third leading cause of preventable death in the United States. Unlike manufacturers of most other packaged food and beverage products, alcohol beverage producers are not required to disclose product nutrition information. This situation may soon change. On July 31, 2007, the Alcohol and Tobacco Tax and Trade Bureau proposed a rule that will require a Serving Facts panel containing a statement that includes levels of calories, carbohydrates, fat, and alcohol content on all alcohol beverage containers. The primary purpose of this research was to test predictions and provide insight regarding consumers' potential responses to the provision of Serving Facts information on alcohol beverage labels. Implications of the results for public policy makers and consumer welfare are offered.

Excessive alcohol consumption is the third leading cause of preventable death in the United States (Mokdad et al. 2004). The 29 percent of men and 17 percent of women who exceed the recommended weekly limit (fourteen drinks for men and seven drinks for women) face a greater risk of both short- and long-term health-related problems such as obesity, liver disease, heart disease, stroke, cancer, and diabetes than individuals who do not drink in excess (Edwards 2004). Given that obesity is the second leading cause of preventable death, the link between excessive alcohol consumption and

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obesity is disconcerting. While light-to-moderate alcohol consumption may have a beneficial effect in reducing weight, excessive consumption has the opposite effect (Arif and Rohrer 2005).

Unlike most packaged food products, alcohol beverage containers are not required to present a statement of alcohol, calorie, or nutrient content. Some argue that without this "Serving Facts" information, consumers have no idea how many calories, ounces of alcohol, or carbohydrate grams they consume when enjoying their favorite alcohol beverage (CSPI 2003; Edwards 2004). Excessive consumption and binge drinking are associated with many negative consequences (Wechsler et al. 1994, 1995), and research has shown that most consumers do not know that a 12 oz beer, a 5 oz glass of wine, and 1.5 oz of distilled liquor/spirits (e.g., rum, vodka, bourbon) all contain approximately equal amounts of alcohol. In addition, in a nationally representative survey of 550 Americans aged eighteen years or older, only 10 percent of the respondents correctly identified the approximate number of calories in a regular beer (CSPI 2003).

The Bureau of Alcohol, Tobacco, and Firearms first considered whether producers should be required to provide calorie and nutrient information on alcohol beverage containers in the early 1990s. In 1993, the Bureau of Alcohol, Tobacco, and Firearms concluded that there was insufficient consumer interest to require the provision of Serving Facts information on alcohol beverage containers. A decade later, the Center for Science in the Public Interest, the National Consumers League, and sixty-seven other organizations petitioned the Alcohol and Tobacco Tax and Trade Bureau (TTB) to require a Serving Facts panel on alcohol beverage containers that provides information about the calorie, nutrient, and, in some cases, alcohol content of the beverage (*Federal Register* 2007, 41860). Specifically, petitioners requested mandatory label information on alcohol beverages that would be regulated by the TTB and include specific information in standardized formats similar to the Nutrition Facts panel found on food and nonalcohol beverages. In April 2005, the TTB issued a request for public comment on a proposed regulation to require more informative labeling, and it received more than nineteen thousand comments. The purpose of the TTB's proposed regulation is to ensure that alcohol beverage labels provide consumers with adequate information about the product.

Specifically, the TTB's proposed regulation requires a Servings Facts panel on the label of alcohol beverages that provides a statement of alcohol content, serving size, and calorie and nutrient levels. The labeling is proposed as one way to help consumers make more informed choices about alcohol consumption (*Federal Register* 2007, 41868). That is, a Serving Facts panel on alcohol beverage containers may help some segments of

consumers to make more responsible consumption decisions, potentially reducing adverse health-related consequences associated with excessive alcohol consumption (*Federal Register* 2007, 41865).

After considering the diverse public comments and opinions received, the TTB proposed a revised rule on July 31, 2007. This rule (*Federal Register* 2007, 41860), which would go into effect three years from the date the final rule is published in the *Federal Register*, requires a Serving Facts panel on alcohol beverages to include the following information: (1) calorie content, (2) carbohydrates, (3) total fat, (4) protein content, (5) alcohol content, expressed as a percentage of alcohol by volume (which may be included either in Serving Facts panel or elsewhere on the container), and (6) single serving size and servings per container. Alcohol beverage producers may also choose to disclose the number of fluid ounces of pure alcohol (ethyl alcohol) per serving (as part of a statement that includes the percentage of alcohol by volume) on the proposed Serving Facts panel. The provision of this information is consistent with the Alcohol Administration Act, which grants the TTB the authority to issue regulations "to prevent deception of the consumer, to provide the consumer with 'adequate information' as to the identity and quality of the product, to prohibit false or misleading statements, and to provide information as to the alcohol content of the product" (*Federal Register* 2007, 41863).

Despite these proposed changes that will substantially modify the type and amount of information on alcohol beverage containers, research examining the possible effects of a Serving Facts panel on consumers' consumption patterns and product perceptions has been extremely limited. The primary purpose of this study was to provide initial findings that will help inform marketing and public policy decisions related to the potential influence on consumer perceptions of Serving Facts information on alcohol beverage containers. Of particular interest in this study is how a Serving Facts panel may potentially influence consumers' perceptions of the calorie, carbohydrate, and fat levels in alcohol beverages and modify their intentions to consume these beverages.

Previous Research on Nutrition Labels on Food and Nonalcohol Beverages

There has been considerable research on consumer response to nutrition information provision in Nutrition Facts panels on food and nonalcohol beverage products (e.g., Ford et al. 1996; Keller et al. 1997; Kemp et al. 2007; Levy, Fein, and Schucker 1996). Generally, these studies show that salient nutrient information in the Facts panel affects nutrition

perceptions and product evaluations, but information about less important nutrients may have little effect (Garretson and Burton 2000). For example, Creyer and her colleagues have reported that the provision of *trans* fat information on Nutrition Facts panels has little influence on consumers' disease risk perceptions in the absence of consumer knowledge regarding the negative health-related implications of *trans* fat consumption (Creyer, Burton, and Kozup in press; Kozup, Burton, and Creyer 2006). However, we are not aware of any prior academic research that has specifically addressed the influence of nutrition information on evaluations and perceptions of alcohol beverages. It is unclear whether the results of studies on the provision of nutrition information for consumer packaged foods and beverages generalize to alcohol beverages.

PILOT STUDY

Because of the dearth of prior academic research related to consumers' perceptions of nutrition and alcohol content, we conducted a pilot study to determine consumers' knowledge of nutrition and alcohol levels and assess potential measures for our main study. Participants estimated the absolute levels of calories, fat, carbohydrates, and alcohol for standard–drink size alcohol beverages (12 oz for beer, 5 oz for wine, and 1.5 oz for distilled liquor). They also estimated their level of confidence in the accuracy of each of these estimates using a 7-point scale (1 = not at all confident and 7 = extremely confident). Respondents also assessed subjective nutrition knowledge (three items, $\alpha = .85$) as well as alcohol beverage knowledge (three items, $\alpha = .82$) and answered questions about the types of alcohol beverages consumed in the past year and specific consumption frequency in the past week. Participants were fifty-eight undergraduate students enrolled in upper-division business courses. Student samples are often used in certain alcohol-related research (e.g., Creyer, Kozup, and Burton 2002; Garretson and Burton 1998; Wechsler et al. 1994, 1995); however, it is appropriate to recognize that specific results may not generalize to broader samples. Participants' ages ranged from twenty to thirty-three (mean = twenty-three) years, and 58 percent were female. Reported consumption in the prior week for drinkers ranged from zero to sixty-seven (mean = fourteen) drinks; 85 percent of the participants reported consuming alcohol in the past month.

Generally, in terms of actual objective values, distilled liquors (eighty proof) contain about ninety-seven calories per standard drink. Although the number of calories differs across varieties of wines, an average table

wine contains about 102 calories (USDA 2007). Regular beers have approximately 150 calories, and light beers have thirty to fifty calories less (*Federal Register* 2005). Generally, none of these alcohol beverages contain fat. Carbohydrate levels are very low for wine and distilled liquors (near 0 g), between 10 and 15 g for most regular beers, and several grams less for light beers. In contrast to these objective values, Table 1 shows the frequency distributions, means, standard deviations, and reported confidence in the respondents' estimates for the four types of alcohol beverages. As shown by the frequency distributions, means, and standard deviations, there were large differences in consumers' estimates. Repeated measures analyses across the beverages showed differences in means for calories ($F = 34.5, p < .01$), fat ($F = 11.7, p < .01$), and carbohydrates ($F = 20.6, p < .01$). Consumers' level of confidence in their estimates was very low as evidenced by the fact that means were consistently below the scale midpoint and less than 3 for all fat and carbohydrate estimates. Subjective alcohol beverage knowledge was generally positively correlated with the reported confidence in calorie and nutrient estimates ($r = .19$–$.42$), but nutrition knowledge was not (all correlations nonsignificant). These findings indicated the respondents' uncertainty regarding these calorie and nutrient levels.

In terms of alcohol content, standard-size alcohol beverage drinks contain approximately the same amount of actual alcohol (0.6 oz). The percentages and means in the bottom portion of Table 1 show considerable confusion about alcohol content on the part of the participants (i.e., means substantially exceed objective alcohol levels), probably partially due to the large differences in the size of standard drinks (which range from 1.5 oz for distilled liquor to 12 oz for beer). Repeated measures analyses indicated significant differences in means for respondents' estimates of the amount of alcohol in a standard-size drink ($F = 10.2, p < .01$).

Note that consumers overestimated fat by a substantial amount (particularly for regular beer), and they were largely unaware that there are minimal levels of carbohydrates in distilled liquors and wine. Similarly, while light beers are somewhat lower in calories and carbohydrates than regular beers, respondents significantly overestimated the actual differences. Such differences suggest that exposure to objective calorie and nutrient information will lead to different effects across the four alcohol beverage types.

PILOT STUDY DISCUSSION AND MAIN STUDY HYPOTHESES

Results from the pilot study highlight consumers' lack of confidence in their ability to accurately estimate calorie and nutrient levels of alcohol

TABLE 1
Pilot Study: Estimates of Calories, Nutrients, and Amount of Alcohol Contained in Standard Alcohol Beverage Drink Sizes

Calories, Nutrients, and Alcohol Estimates	Light Beer (a)	Regular Beer (b)	Wine (c)	Distilled Liquor (d)
Calories				
Objective levels*	103	153	102	97
Consumers' estimates				
<50	7	3	10	19
50–74	9	3	9	21
75–99	23	3	12	16
100–125	31	18	31	17
126–150	12	14	9	10
151–199	3	5	7	—
200–299	12	40	19	12
300 or more	3	14	3	10
Total percentage	100	100	100	100
Mean (SD) calories†	120 (68)[b]	191 (89)[a,c,d]	127 (71)[b,d]	104 (80)[b,c]
Mean confidence level[a]	3.41 (1.8)	3.29 (1.7)	2.60 (1.36)	2.62 (1.58)
Fat (g)				
Objective levels*	0	0	0	0
Consumers' estimates				
0	12	9	12	21
1–2	17	9	12	18
3–5	23	19	35	25
6–10	28	24	14	12
11–25	10	22	17	18
26 or more	10	17	10	7
Total percentage (%)	100	100	100	100
Mean fat†	8.2 (10)[b]	13.2 (14)[a,c,d]	8.8 (10)[b]	7.2 (10)[b]
Mean confidence level	2.62 (1.3)	2.50 (1.3)	2.33 (1.3)	2.26 (1.2)
Carbohydrates (g)				
Objective levels*	5.8	12.6	0.8	0

Consumers' estimates				
0	3	0	3	10
1–4	9	3	7	14
5–9	10	7	7	7
10–19	33	19	31	24
20–39	21	31	31	22
40–60	17	21	12	14
61 or more	7	19	9	9
Total percentage (%)	100	100	100	100
Mean carbohydrates†	20.1 (19)[b]	33.2 (26)[a,c,d]	22.4 (20)[b,d]	19.4 (23)[b,c]
Mean confidence level	2.20 (1.4)	2.17 (1.3)	2.14 (1.5)	2.09 (1.4)
Alcohol (oz)				
Objective levels*	0.6	0.6	0.6	0.6
Consumers' estimates				
0–0.59	16	13	21	25
0.6–0.99	24	23	11	27
1–2.9	44	18	46	39
3–4.9	12	32	20	7
5 or more	4	14	2	2
Total percentage (%)	100	100	100	100
Mean (SD) alcohol level†	1.46 (1.08)[b,d]	1.69 (1.27)[a,c,d]	1.36 (1.02)[b,d]	0.94 (0.7)[a,b,c]
Mean confidence level[a]	3.25 (1.4)	3.36 (1.5)	2.94 (1.5)	3.28 (1.7)

Note: Superscript letters indicate significant differences in follow-up mean pair-wise comparisons ($p < .05$ or better, two-tailed tests). For example, respondents' mean estimates of the calories in regular beer were greater than for all other alcohol beverages (a, c, and d); for light beer, estimates of calories were significantly less than for regular beer (b) but did not differ from wine or distilled liquor.

*While individual brands differ somewhat in calorie, nutrient, and alcohol levels, the objective values shown are based on those reported in the USDA National Nutrient Database for standard drink sizes (12 oz for regular and light beer, 5 oz for table wine, and 1.5 oz for distilled liquor).

†F values from a repeated measures analysis indicated significant differences in means ($p < .01$); standard deviations are given in parentheses.

beverages and show that the accuracy of their estimates varies across beverage types. Given these findings, as well as results from prior research that explored the processes associated with the formation and revision of consumers' nutrition expectations (Burton et al. 2006), specific predictions for the main study were offered regarding how disclosure of objective information in a Serving Facts panel on alcohol beverages is likely to influence consumers' product perceptions. As noted by van Raaij (1991, 403), consumers are constantly "constructing, testing, and revising hypotheses about what is being perceived and what may be expected." If actual attribute levels are more favorable (unfavorable) than prior expectations, then consumer perceptions will be positively (negatively) influenced by that objective information (van Raaij 1991).

For example, in the pilot study, almost two-thirds of consumers overestimated the calorie levels for regular beer and wine. This suggests that exposure to objective information will have a more positive influence on consumers' evaluations of beer and wine than on their evaluations of liquor and light beer. Also, given that carbohydrate levels for wine and liquor are essentially zero, but that consumers *believe* there are carbohydrates in these products, exposure to the Serving Facts information should reduce consumers' estimates of the carbohydrate content more for these beverages than for beer and light beer. Since respondents in the pilot study perceived regular beer to have the highest fat content among the beverages (although none contain fat), exposure to objective levels should have the greatest effect on consumer perceptions of regular beer. In sum, this rationale, which is drawn from foundations of how consumers form and revise expectations, suggests that the effect of Serving Facts information should vary across alcohol beverage types in a predictable manner. We also propose that more accurate perceptions of the relative levels of calories, carbohydrates, and fat in alcohol beverages will influence relative intended consumption levels across beverage types.

> H1: The alcohol beverage type will interact with the provision of objective nutrition and alcohol information in a Serving Facts panel on evaluations of the relative (a) calorie, (b) fat, and (c) carbohydrate content and (d) intended consumption levels.

The high percentage (65 percent) of adult Americans who are overweight or obese is one major impetus for the provision of a Serving Facts panel on alcohol beverage containers (*Federal Register* 2007, 41867). Some suggest that the lack of easily accessible calorie and nutrient information for alcohol beverages may decrease consumers' awareness of the calories associated with their alcohol consumption (CSPI 2003). That is,

consumers may ignore or substantially underestimate the number of calories associated with their alcohol consumption, and when provided with objective information, consumers' estimates of calorie content should be higher and more accurate. In addition, when considering alcohol consumption over longer time frames, the absolute number of "uncounted" calories is potentially quite substantial. In sum, this suggests that consumers will increase their estimate of their total calorie intake from their alcohol consumption when Serving Facts information is provided. Based on this rationale, H2 proposes the following:

> H2: Compared to consumers shown no Serving Facts information, the provision of objective calorie information in a panel will increase consumers' perceptions of (a) mean calories per average drink they consumed and (b) total calories from their total alcohol beverage consumption.

METHOD

Overview of Study and Independent Variables

All participants were exposed to professional reproductions of bottles of four types of alcohol beverages: light beer, "regular" beer, wine, and distilled liquor. Participants were exposed to either a control condition (no Serving Facts panel, i.e., the current *status quo* for alcohol beverages) or a Servings Facts present condition that included information on alcohol content, calories, carbohydrates, fat, and serving sizes. The Facts information used was based on the proposed labels published in the *Federal Register* (2005), and examples are provided in Appendix 1. The experiment was a 4×2 mixed design with the four types of alcohol beverages as a within-subjects factor and the presence (absence) of the Serving Facts panel serving as a between-subjects factor.

Sample, Procedures, and Dependent Measures

Consistent with much of the previous alcohol research (Christie et al. 2001; Wechsler et al. 1995), participants were 230 upper-level students (mean age = twenty-five years; range = twenty to thirty-six years) from two different universities (one in the eastern and one in the southern United States). Participants were exposed to the bottle stimuli and simply instructed to respond to the "questions about the alcohol beverages shown." To protect the anonymity of participants, names were not included in the data files or survey instruments in either the pilot or the main study.

Primary dependent variables to test H1 included 9-point scales with endpoints of "very low" and "very high" used to evaluate perceptions of relative calorie, carbohydrate, and fat content. For each of the four alcohol beverage types in the stimuli, respondents were instructed to "please rate the nutrient levels. A '1' indicates that you think the level of the nutrient is very low and a '9' indicates that the level is very high." Similarly, consumption intentions were assessed by asking "Given the information shown on the front and the back of the mock bottle, would the available information increase or decrease the amount you would drink, that is, your consumption level?" (endpoints of "would decrease consumption level" [1] and "would increase consumption level" [9]).

Last, respondents were asked to estimate their own personal consumption for the past seven days in standard drink sizes for (1) regular beer (12 oz), (2) light beer (12 oz), (3) wine (5 oz glass), and (4) distilled liquor (1.5 oz) as a shot or in a mixed drink. After reporting these consumption estimates, participants were then asked "to estimate the total calories consumed in the past week for each of the following types of drinks," which included the four types of alcohol beverages and an "other" category. Based on the calorie levels provided in response to this question, to assess H2a and H2b, we computed (1) an average calorie per drink level and (2) a summed score for total calories consumed for the week.

RESULTS

Within-subjects analyses of variance were conducted to assess the effects of the four different types of alcohol (within-subjects factor) and the presence/absence of a Serving Facts panel (a between-subjects factor).

TABLE 2
Study 2: Effects of Alcohol Beverage Type and Serving Facts Condition on Calories, Fat, Carbohydrates, and Consumption Intention Perceptions

	F Values			
Independent Variables	Calories	Fat	Carbohydrates	Consumption Intentions
Main effects				
Alcohol type (A)	58.25[a]	63.70[a]	149.92[a]	0.00
Facts condition (C)	0.67	12.30[b]	15.44[a]	3.92[b]
Interaction effects				
A × C	6.89[a]	3.37[b]	13.26[a]	7.71[a]

[a]$p < .001$.
[b]$p < .05$.

See Table 2 for an overview regarding how the dependent measures were influenced by alcohol type, Facts condition, and their interaction.

Calorie and Nutrient Evaluation

Calorie Evaluation

Consistent with H1a, the analysis yielded an alcohol type × Serving Facts information interaction, $F(3, 687) = 6.89$, $p < .001$. As shown in

FIGURE 1
Study 2: Effects of Alcohol Beverage Type and Serving Facts Condition on Evaluations of Calorie, Carbohydrates, and Fat

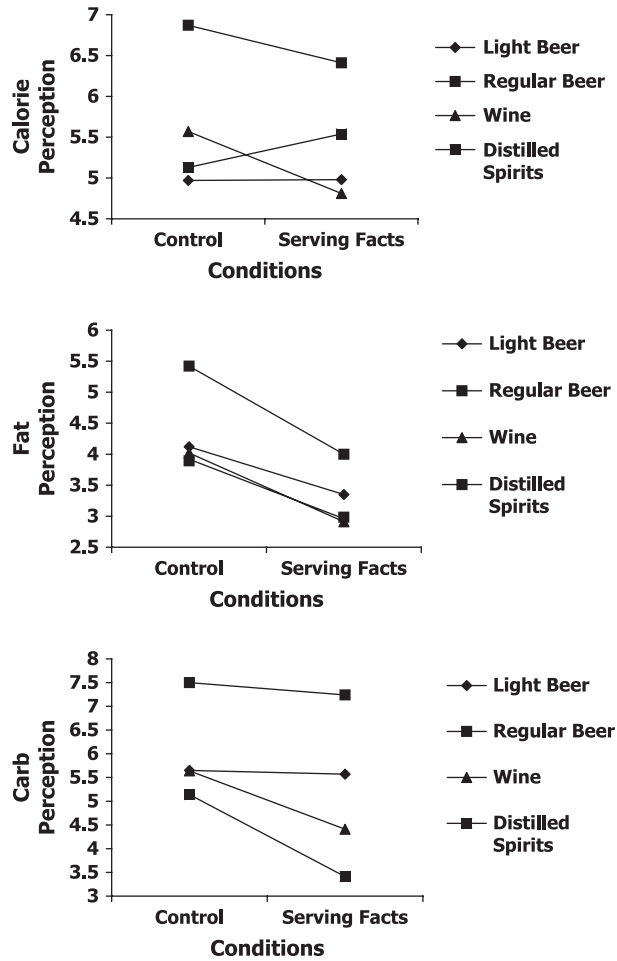


Figure 1, the disclosure of the Serving Facts information resulted in differences in calorie evaluations across beverage type. Those exposed to the Serving Facts panel estimated a significantly lower calorie content for wine, $F(1, 230) = 8.84$, $p < .05$, than those in the control group. There was no effect on calorie perceptions for light beer, distilled spirits, or regular beer when nutrition information was present. As could be anticipated from the pilot test, there was a main significant effect for alcohol type, $F(3, 687) = 58.25$, $p < .001$, with follow-up tests indicating that regular beer (mean = 6.64) was perceived to be higher in calories than light beer (mean = 4.97), wine (mean = 5.19), and distilled spirits (mean = 5.33). There was no overall main effect of exposure to Serving Facts information ($F < 1$) on calorie perception.

Fat Evaluation

For fat perception, the results showed main effects for Serving Facts availability, $F(3, 693) = 12.30$, $p < .001$, and alcohol type, $F(3, 693) = 63.70$, $p < .001$. However, the alcohol type × Serving Facts information interaction was also significant, $F(3, 693) = 3.37$, $p < .05$, providing support for H1b. Given the lack of fat in any of the beverages, not surprisingly, the plot showed that the Serving Facts disclosure significantly reduced perceived fat levels for all products, but the decrease was most substantial for regular beer.

Carbohydrate Evaluation

For carbohydrates, analyses also revealed an alcohol type × Serving Facts information interaction, $F(3, 493) = 13.26$, $p < .001$, as predicted in H1c. The plot of means is in Figure 1. Follow-up analyses indicated that nutrition information significantly decreased perception for the level of carbohydrates for wine, $F(1, 229) = 20.31$, $p < .001$, and distilled spirits, $F(1, 229) = 27.34$, $p < .001$. However, exposure to the Facts information did not have an effect on light beer and regular beer. The analysis also revealed a strong significant effect for alcohol type, $F(3, 493) = 149.92$, $p < .001$, indicating that regular beer (mean = 7.37) was perceived to be higher in carbohydrates than light beer (mean = 5.61), wine (mean = 5.02), and distilled spirits (mean = 4.27).

Effect on Consumption Intention Levels

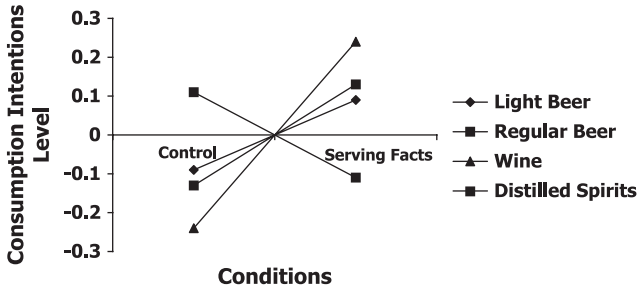
To eliminate differences between estimates of expected consumption levels across the beverage types, a z transformation procedure was used

to standardize consumption intention measures to produce dependent variables with a mean equal to 0 and a standard deviation of 1. Consistent with H1d, the analysis yielded a significant alcohol type × Serving Facts information interaction, $F(3, 635) = 7.71$, $p < .001$. As suggested by the plot of means in Figure 2, exposure to the Facts information significantly increased consumption intention levels for wine, $F(1, 231) = 14.72$, $p < .001$, and distilled spirits, $F(1, 231) = 4.19$, $p < .05$. However, the Facts information did not significantly affect consumption intention levels for light beer, $F(1, 231) = 2.05$, $p > .10$, or regular beer, $F(1, 231) = 2.80$, $p > .10$.

Effects on Average and Total Calorie Estimates from Personal Consumption

H2 predicted that the provision of objective calorie information in Serving Facts panels would increase consumers' estimates of (a) mean calorie estimates per drink they consumed in the prior week and (b) total calories from their seven-day total alcohol beverage consumption. Mean estimates for calories, fat, carbohydrates, and consumption intention across all beverage types are shown in Table 3. The reported number of standard drinks consumed for the seven-day period ranged from zero (24 percent of the sample) to more than fifty. For drinkers, the average number of drinks consumed was 14.2 (SD = 13.9). To test H2, a one-way multivariate analysis of covariance was performed with mean calorie and

FIGURE 2
Effects of Alcohol Type and Serving Facts Exposure Condition on Consumption Intentions Level



Note: Consumption level estimates across beverage types are standardized values based on z score transformations so that means = 0 and standard deviations = 1.

TABLE 3
Study 2: Dependent Variable Cell Means for Evaluations of Calories, Fat, Carbohydrates, and Consumption Intentions Level

Independent Variables	Calories*	Fat*	Carbohydrates*	Consumption Intentions Level†
Serving Facts condition				
Control (none)				
Light beer	4.97	4.12	5.65	−0.09
Regular beer	6.87	5.42	7.50	0.11
Wine	5.57	4.02	5.64	−0.24
Distilled liquor	5.13	3.92	5.14	−0.13
Serving Facts provided				
Light beer	4.98	3.35	5.57	0.09
Regular beer	6.41	4.00	7.24	−0.11
Wine	4.81	2.91	4.41	0.24
Distilled liquor	5.54	2.96	3.41	0.13

*Nine-point scales with endpoints of very low (1) and very high (9).
†Standardized values based on z transformations so that overall means = 0 and standard deviations = 1.

total calorie estimates as dependent variables, the Serving Facts condition as the independent variable, and the number of drinks reported as a covariate. The multivariate effect of the Facts condition was significant (Wilks' λ, $F = 4.72$, $p = .01$). When exposed to the Serving Facts panel, the average calorie estimate per drink consumed was significantly greater than when the panel was not available (mean = 108.3 vs. 87.3 calories, $F = 4.53$, $p < .05$).[1] For total calories estimated from all alcohol beverages consumed, the presentation of the Serving Facts panel increased calorie estimates by three hundred total calories (mean = 1,373 vs. 1,072), a difference that was significant ($F = 9.48$, $p < .01$). The results support H2a and H2b.

DISCUSSION

A primary objective of this research was to provide insight regarding how the provision of a Serving Facts panel on alcohol beverages may

1. As might be anticipated, there were outliers on the low and high estimates for calorie consumption across the total drink consumption level. Averages were calculated after omitting participants reporting fewer than ten calories or more than three hundred calories per standard drink. Mean differences between the Serving Facts (present/absent) conditions were consistent for total calorie estimates with and without inclusion of the outliers.

influence consumers' perceptions and consumption intentions. While the college student segment is a significant target market for alcohol beverage marketers, the generalizability of our findings is limited by the use of a college student sample. However, the initial results suggest that additional research that addresses supplementary questions with broader samples of consumers is warranted. Our results suggest that the availability of objective calorie, nutrient, and alcohol content information on alcohol beverage containers may have both potential benefits and unintended consequences.

Many policy makers assume that consumers equipped with objective information will make more informed and therefore better choices (e.g., reduce alcohol consumption and limit caloric intake, thereby reducing the risk of alcohol-related health problems). Again, while broader samples are of interest, our findings suggest some potentially unintended effects for certain alcohol beverage types. For instance, our findings indicate that the availability of Serving Facts information significantly decreased calorie and carbohydrate evaluations for wine and increased consumption intentions. For distilled spirits, it reduced perceived fat and carbohydrate levels and increased future consumption intentions. That is, for this specific sample, our findings suggest that the provision of a Serving Facts panel may potentially lead to more favorable evaluations and increase consumption intentions of beverages with higher alcohol content by volume. This raises the question "Will Serving Facts information that reveals lower levels of calories and carbohydrates for wine and spirits than for beer encourage certain consumer segments (such as some college student segments) to increase consumption of beverages with greater alcohol content per volume?" Such potential effects would not be the intention in providing a Serving Facts panel and seem to warrant additional research.

Effects related to the disclosure of information showing that the alcohol beverages contained no fat also raise some concerns. Our findings indicate that perceived fat levels were significantly lower across light beer, regular beer, wine, and distilled spirits when nutrition information was available. When Serving Facts information was not present, consumers overestimated fat levels in all four beverage types. It seems possible that manufacturers could misuse Serving Facts information to promote the "fat-free" nature of their product in a campaign to increase alcohol beverage consumption in some target markets. These findings seem to support the argument that a Serving Facts panel should only present information for a given nutrient when the level of that nutrient reaches a specific threshold (*Federal Register* 2007, 41868). Although

fat content is useful for products such as cream-based liqueurs that contain significant levels of fat, on balance, the findings suggest that fat grams should not be listed on the Serving Facts panels of beverages that never contain fat.

As would be desired by policy makers, estimates of the absolute level of calories and calories per drink for participants' own consumption over a one-week period were significantly greater when Serving Facts information was provided. For weekly consumption, calorie estimates increased an average of three hundred calories. When considered over the long term, this is a significant amount. For some heavier drinkers, an increased awareness of the calorie intake associated with alcohol consumption may potentially lead to decreased consumption.

The new proposed rule, combined with these findings, offers intriguing opportunities for future research. For example, based on deviations from consumer expectations found in the pilot study, we predicted and examined differences in the effects of Serving Facts information across four types of alcohol beverages in the main study. However, the expectations literature (e.g., van Raaij 1991) would suggest that there are individual-level deviations from consumers' expectations about alcohol content, calories, and nutrients. These deviations, combined with the importance of these attributes to the individual, could be used to gauge how specific consumer segments might react to the provision of information on the Serving Facts panel. Consumer reactions to specific beverages should vary as a function of the importance of the attribute (calories, alcohol content, etc.) and the level of deviations from the individual's prior expectations.

In sum, given the goals of the diverse stakeholders (alcohol beverage manufacturers, federal and state policy makers, the TTB, and consumers), the results of this study raise a number of questions concerning the possible use of Serving Facts labels on alcohol beverages. If confirmed in subsequent studies with broader samples of adult consumers and different methods, it is possible that some alcohol beverage manufacturers may decide to become more proactive about promoting such information, while public policy makers may prefer to consider more limited nutrient information (e.g., not including fat levels on alcohol beverage Serving Facts panels). For both policy makers and academic researchers, the results of this study will encourage further consideration of questions and additional research relevant to decisions and potential outcomes regarding Serving Facts panels on alcohol beverages.

APPENDIX 1
Examples of Stimuli

Control condition: Light Beer

Manipulated condition: Wine

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