Published in final edited form as:

Hum Factors Ergon Manuf. 2010 November 1; 20(6): 538–546. doi:10.1002/hfm.20239.

Do Alcohol Warning Labels Influence Men's and Women's Attempts to Deter Others from Driving When Intoxicated?

Tammy W. Tam, Ph.D. and Thomas K. Greenfield, Ph.D.

Alcohol Research Group, Public Health Institute, Emeryville, California

Abstract

Research on the federally mandated alcohol warning label has found mixed results, but some findings are consistent with a modest influence on precautionary behaviors to reduce drinkers' self-reported drunk driving. We hypothesized that warnings would also influence the likelihood of intervening to deter other's driving after drinking. Using data from 1376 adult drinkers in a US national survey, a conceptual model reflecting effects of exposure to the label's drunk driving message on taking actions to avert another's driving under the influence was tested in a structural equation modeling framework. For males and females, in structural models with drinking and handling of alcoholic beverages potentially affecting both message recall and intervening, the predicted relationships were found between message recall and actions to deter another's drinking driving. This finding suggests that an important preventive effect of the alcohol warning label may be to legitimate collateral's attempts to avert another's drunk driving.

1. INTRODUCTION

In November 1989 a federal law requiring alcohol container warning labels (Public Law No 100–690, 1988) took effect. From approximately 6 months before this, in Summer, 1989, until approximately five years after, in Summer, 1994, five U.S. national telephone surveys were conducted by the Alcohol Research Group (ARG) (Greenfield, 1997). The survey series, which included an Ontario, Canada control site, was part of a federally mandated evaluation of the new law (Greenfield, Graves, & Kaskutas, 1993; Greenfield, Graves, & Kaskutas, 1999). Congress intended that the warning label serve to remind the public of a number of the risks associated with alcohol consumption. The mandated container label reads: “GOVERNMENT WARNING: (1) According to the Surgeon General, women should not drink alcoholic beverages during pregnancy because of the risk of birth defects. (2) Consumption of alcoholic beverages impairs your ability to drive a car or operate machinery, and may cause health problems.” The multi-year study was designed as a pre-repeated-post, control-intervention-group quasi-experiment (Cook & Campbell, 1979) to examine potential effects of the natural experiment (Greenfield, 1994; Greenfield & Kaskutas, 1998). Analyses of data gathered shortly after implementation found modest potential effects on individuals' precautionary behaviors that might reduce their likelihood of driving while intoxicated (Greenfield et al., 1993). More recent quasi-experimental comparisons have shown mixed results. There was some indication that in the US there was a significant relationship between seeing the label and deciding not to drive after drinking (Greenfield, 1997; Greenfield et al., 1999).

This article examines the potential impact that the recipient of a product warning might have upon the individual seeing the message, to encourage taking actions to avert harms that could involve others' risk behavior. In studying impacts of the alcohol warning, the second author, as principal investigator of the warning label study described above, conceived the notion that the warning could legitimate interventions that might be aimed at deterring another person from engaging in a warned-about risk—specifically, to deter a friend, relative or acquaintance, from proceeding to drive, when the person in question was seen as being under the influence. From the viewpoint of human factors research on product warnings, this is a relatively unique framing of an important empirical question. Many warnings might engage the efforts of viewers to intervene so as to reduce others' risks. In the case of plastic bags, buckets, and hot-tub cover lock downs, which warn about suffocation or drowning dangers, this conceptualization of encouragement to take precautions on behalf of others is clear, though often aimed at reducing risks to children or infants. In the case of warnings on step ladders, a spouse might urge their partner to heed the warning not to stand on the top step. From the viewpoint of human factors research on warning labels, this consideration of actions taken to deter other adults from risky behavior has not been common. Specifically in regard to alcohol warning research, it is entirely new. We developed a set of questions to capture particular behaviors intended to stop another person from driving after having had too much to drink, and hypothesized that these may be engaged in more by those tending to recall the alcohol warning's driving impairment message.

This study used a subset of the US cross-sectional data collected in the 1993 and 1994 study years, about 3.5 to 4.5 years after the law's implementation. In this longer-term phase of the research, improved, sensitive measures (Greenfield, 1994) were developed to assess impacts that might accrue over time as a greater proportion of the drinking public became exposed to the label's specific messages such as the driving impairment message. For example, by 1993 and 1994, it was estimated between 35 and 45 percent of male heavy drinkers saw the warning label and recalled its drunk driving message (Greenfield & Kaskutas, 1998). The hypothesized impact we focus on here was not directly on the drinking driver, but instead upon his or her collaterals—friends, acquaintances or significant others. We hypothesized that those seeing and recalling the warning label's driving impairment message would be more likely than others, all things equal, to intervene so as to deter another person from driving when intoxicated. Epidemiological research has recognized that certain individuals may want a heavy drinker to drink less (Room, Greenfield, & Weisner, 1991), but often 'hold back,' Sometimes perceiving it to be socially inappropriate to attempt to 'control' others' behavior. We believed that the warning label message might serve to 'legitimize' a socially challenging intervention, so increasing the likelihood of reporting behaviors designed to reduce the likelihood of an inebriated person getting behind the wheel. Early in the news media's coverage of the alcohol warning label (Lemmens, Vaeth, & Greenfield, 1999), a related instance was reported in which two waiters were fired from a Seattle restaurant after confronting a drinking patron who was obviously pregnant by giving her a copy of the label with its other main message that pregnant women should not drink. In just such a way we believed, friends and acquaintances of someone about to risk a DWI might intervene to discourage driving or provide alternatives. We reasoned that those who had seen the label's drunk driving message might be emboldened to act so as to deter another from drinking driving, hopefully with less dire personal consequences than suffered by the waiters.

Survey waves 4 and 5 (1993, 1994) collected data on five questions to tap the domain of relevant behaviors involved in interventions to deter another from drunk driving, such as simply asking someone not to drive, offering to drive them home, having them stay over, or suggesting they take a taxi, bus or subway, among others (see Measures). With these

measures, we proposed a conceptual model that examined the direct and indirect relationships among alcohol consumption, container handling, message recall, and such deterrence-oriented interventions. The model includes the following hypothesized relationships: (1) warning label message recall, alcohol consumption, and container handling will have direct positive effects on intervention, (2) higher consumption level and frequent container handling will be associated with higher likelihood of label message recall, and (3) higher consumption level will be associated with more frequent container handling that will have an indirect effect on intervention (see Figure 1). The model also controls for the effects of gender, age, ethnicity, and education on the relationships detailed in the model.

Using Structural Equation Modeling (SEM) techniques, this study examines: 1) How well does the proposed model relating recall of the label's drunk driving message to actions taken to deter others' drunk driving, fit the data? 2) Are the relationships between the warning label message and intervening to deter drunk driving the same for men and women?

Regarding the last issue, we know that more young men than women drink heavily (Greenfield, Giesbrecht, & Kavanagh, 1996; Greenfield & Rogers, 1999b), especially beer (Rogers & Greenfield, 1999), and are more often stopped for DWI (Berger & Snortum, 1985). Young males, in particular, often overestimate the quantity of alcohol that they can drink before driving is impaired (Greenfield & Rogers, 1999a; Hennessy & Saltz, 1990). There is a dearth of empirical data on intervening with collaterals to prevent people from drinking and driving; we do not know, for example, whether women or men are more likely to assertively intervene to deter acquaintances, friends, and lovers from drinking and driving. Although women have sometimes been regarded as less assertive than men (Fukuyama & Greenfield, 1983), their frequent role as "navigators" (in couples at least), their potentially greater interest in health warnings, and a stronger health consciousness (Kaskutas & Greenfield, 1997) might suggest that the influence of warning messages on women's willingness to intervene might exceed that of men. The present study aimed to explore this dimension of preventive behavior and examine the relationships between message recall and intervening for US men and women.

2. METHODS

2.1 Sample

Data came from ARG's long-term Impact of Alcoholic Beverage Warning Labels project (Greenfield, 1997; Greenfield & Kaskutas, 1998), using institutionally approved voluntary consent procedures. The US national data were collected approximately 3.5 and 4.5 years after the implementation of the Warning labels act (1988 Public Law No. 100-690) in November, 1989. Cross-sectional samples were drawn by RDD methods in 1993 ($n = 1026$) and 1994 ($n = 1016$) from 48 contiguous states; respondents were interviewed in July and August each year using CATI techniques and closely comparable instruments, with response rates of 63% and 54%, respectively. These rates are similar to those of other recent telephone surveys (Frey, 1989). Subjects within a household who were 18 and older were selected by the most recent birthday technique. This paper examines only the data collected from 1376 men and women who reported drinking at least once a year ("drinkers").

Design effects for the surveys were modest. Increased standard errors due to the RDD sampling design arise primarily from the unequal probabilities of selection caused by more than one telephone number and/or more than one adult in a household. Calculations indicated increases in sample variance of 29 and 33 percent, respectively each year in the U.S. due to these factors and weighting for sample representativeness by gender and age (Greenfield et al., 1999). In statistical comparisons of proportions, design effects was accounted for by appropriate weighting (Greenfield & Kaskutas, 1998). The cross-sectional

data from the two years were pooled since statistical differences in key variables were not seen. Rates and percentages reported here are based on the weighted data, while the sample sizes reported are unweighted.

2.2 Measures

The ARG warning label project assessed the following in each respondent: demographic variables, exposure to the warning label and recall of its contents, alcohol consumption, alcohol container purchases and handling, and behaviors relevant to the investigation of potential effects. Specific measurement approaches have been detailed elsewhere (Greenfield et al., 1993; Greenfield et al., 1999; Kaskutas & Greenfield, 1992).

Label and Message Recall—Exposure to the label was assessed in each year's survey by the question: "Now thinking about the last 12 months, have you seen any labels on bottles or cans of beer, wine, or liquor?" After the label awareness question(s), respondents were asked a series of questions about what the warning labels said. The question on message recall of drunk driving: "Did the warning label say anything about drunk driving?" was used here. The dichotomous measure indicating recall of this message seen on the warning label during the last 12 months was used in the analyses.

Interventions to Deter Drunk Driving—The dependent variables, actions taken to deter another person's drunk driving, were assessed by a series of questions as follows:

- Have you asked someone not to drive?
- Have you offered to drive someone home yourself?
- Have you asked someone to take a taxi, bus, or subway?
- Have you tried to take someone's car keys?
- Have you asked someone to stay at your home?

These items represent a variety of preventive steps hosts or friends might take. In the interview they followed a series of items on drinking and driving as well as precautionary behaviors the respondent might undertake to avoid his or her own drunk driving (Greenfield & Kaskutas, 1993). The immediately preceding items were two questions on driving impairment given certain levels of consumption, so that the context for asking about interventions to deter drunk driving was clear to respondents. Response categories for each item were binary indicating an affirmative response to the questions (1 vs 0).

Container Handling—Purchase and handling of alcoholic beverages were assessed by two items, respectively: "In the last 30 days have you bought any alcoholic beverages in a store?" and "In the last 30 days have you opened a bottle or can of any alcoholic beverage?" For use in the analyses, a three-category 'container handling' measure was constructed indicating negative response to both questions (0), affirmative response to one (1), or to both (2) questions.

Alcohol consumption—Average number of drinks per day was assessed by the question: "On those days when you drink wine, beer, or hard liquor, how many drinks do you usually have per day?" (Actual number of drinks). A dichotomous measure of usual amounts of three or more drinks in a day was used in the analysis to indicate higher quantity consumption. This amount clearly exceeds the moderate drinking guidelines established by the Federal Department of Agriculture (Dufour, 1999) which are no more than two drinks a day for men and one drink a day for women choosing to drink. To avoid confounding measurement differences with gender, we retained the 3+ drinks level for both men and

women (Graham et al., 1998), representing more than light (but not necessarily heavy) drinking.

2.3 Analysis

The Chi-square test of independence was conducted to examine gender differences in demographic characteristics, alcohol consumption, recall of drunk driving message, handling of alcoholic beverage, and interventions to deter others' drunk driving. Fisher's Exact Test (Wickens, 1989) was used to compare contingency tables with small cell sizes. Multiple comparisons were adjusted by the Bonferroni method.

In the proposed model, the five variables measuring actions taken to deter another's drunk driving were analyzed as indicators of a latent construct of intervention. Our analyses first examined the reliability, validity, and factor structure of the measurement model for this latent construct of intervention by confirmatory factor analysis (CFA) (Bollen, 1989). Since the five observed variables were dichotomous, the models were estimated by weighted least square using the latent variable structural equation modeling program *Mplus* (Muthén & Muthén, 1998–2007). Testing of gender differences in the measurement relationship was conducted using multiple-group analysis.

The path model that examined the relationship between categorical variables of recall of the drunk driving message on the warning label and actions taken to deter others' drunk driving was estimated by weighted least squares with robust standard errors and the mean- and variance-adjusted chi-square test statistic, again using *Mplus*. Model fit was evaluated using summary statistics including model chi-square, root mean square of approximation (RMSEA), and weighted root mean square residual (WRMR). As a general guideline, a model is considered to be a good representation of the data when the chi-square to degree of freedom ratio is less than two (Newcomb, 1994), RMSEA values less than .05 (Browne & Cudeck, 1993; Yu & Muthén, 2001), or WRMR value less than .9 (Yu & Muthén, 2001). The significance, direction and magnitude of the regression paths in the model were also examined to evaluate how well the data fit the conceptual model. Significance of coefficients was evaluated as *z* statistics at $p < .05$.

3. RESULTS

3.1 Bivariate Analyses

There were no significant gender differences in demographic characteristics including age, income, and education (Table 1). However, a higher proportion of Hispanic and 'Other' ethnicities were found in the male sample ($p < .05$). Men reported usually drinking a higher quantity of drinks in a drinking day (33.5% vs 13.8% for women), purchased *and* opened alcoholic beverages more often, and were more likely to recall seeing the drunk driving message on beverage containers than women ($p < .01$). With regard to actions taken to deter drunk driving, however, no gender differences were found in all five measures.

3.2 Confirmatory Factor Analysis

Confirmatory factor analysis was conducted with the full sample of drinkers ($n = 1376$) to evaluate the unidimensional model representing interventions to deter another's drunk driving. Table 2 shows the estimated validity and reliability of the measures. The proposed unidimensional model demonstrated excellent fit to the data ($\chi^2 = 6.56$, $df = 5$, $p = .25$; RMSEA = .02; WRMR = .63). The average off-diagonal absolute standardized residual was .02, indicating small discrepancies between the observed and estimated covariance among the variables. This analysis shows that the five measures are good observed indicators of a latent construct of intervention. The reliability of the five measures as

indicated by the squared multiple correlation coefficient (R^2) (Bollen, 1989) ranged from a low of .42 to a high of .94. The validity of each measure with respect to the intervention factor was evaluated by the magnitude of the direct structural relation between the factor indicators and the latent factor (Bollen, 1989). The unstandardized validity coefficients (ranging from .67 to .91) indicated acceptable validity of the measures. Overall, the item “asked someone to take a taxi, bus, or subway” has the least validity and reliability among the five measures. Additional multiple-group analyses to test for gender differences (data not shown) suggested that the relationship between the latent factor of intervention to deter another’s drunk driving and each of the five observed measures did not statistically differ across gender.

3.4 Structural Equation Model

Since the measurement properties of the intervention factor were invariant across gender, the proposed path model was evaluated for the entire sample. Summary statistics of model fit indicated reasonable fit of the model with the data ($\chi^2 = 62.14$, 28 df, $p = .0002$, RMSEA = .03, WRMR=.86). Figure 1 shows the estimated standardized coefficients for the measurement and structural parts of the model. Table 3 summarizes the regression parameters for the socio-demographic variables that are included in the model.

All of the factor loadings for the intervention factor were substantial and significant. All, but one of the estimated regression parameters were significant and demonstrated the relationships as hypothesized. Usual consumption of three or more drinks on a drinking day (standardized $\beta = .28$), greater handling of alcoholic beverages ($\beta = .08$), and recall of the drunk driving message ($\beta = .08$) all had significant positive direct effects on the intervention factor. As plausible, in addition to direct effects, the relationship between container handling and intervention is mediated by recall of drunk driving message. Those who purchased or opened alcoholic beverages within the last 30 days were more likely to recall the drunk driving message on the warning label ($\beta = .18$) which subsequently has a positive effect on intervention.

With regard to socio-demographic characteristics, men were more likely to usually consume three or more drinks ($\beta = .30$), handle alcoholic beverages ($\beta = .13$), and recall the drunk driving message ($\beta = .09$), but were less likely to take action to intervene on other’s drunk driving ($\beta = -.11$) than women (Table 3). Thus the SEM result differs somewhat from the bivariate results. Those who were 40 years old or younger were more likely to usually drink heavily ($\beta = .20$), recall the drunk driving message ($\beta = .23$), and to take action by intervening to deter other’s drunk driving ($\beta = .30$). Ethnic minorities were more likely to intervene than those who were white ($\beta = -.07$). These findings indicate varying effects of gender, age, and ethnicity on drunk driving message recall and intervention.

4. DISCUSSION

We take this empirical instance as a specific example of the type of analysis that should more often be undertaken in the general case to study how warning messages might potentially enhance a recipient’s propensity to intervene so as to mitigate another’s risk behavior. Conceptually this might be so by reducing the sense of social inappropriateness of taking such actions, although to confirm this hypothetical mechanism of action would require further research. First, we showed that a short research scale could be developed to assess intervention to deter another from driving when perceptually impaired by alcohol. The measurement model we developed were invariant to gender indicating that the short scale we developed to capture intervention to prevent others’ drunk driving is applicable for men and women.

Of more substantive importance, a major finding involves the relationship observed between awareness of the warning label's message that "consumption of alcoholic beverages impairs your ability to drive a car..." (as gauged by seeing the label and recalling that it included a message about drunk driving) and a scale made up of five interventions to deter another individual from driving after drinking. Within the structural model which controls for several plausible influences on both label exposure and precautionary driving-related behavior (Greenfield & Kaskutas, 1993), the effect of warning labels on intervening with others perceived to be at risk for driving when intoxicated was revealed. To our knowledge, this is the first such empirical evidence suggesting an indirect role for warning labels in legitimating pro-social risk-reducing behavior aimed at other individuals, of a kind noted anecdotally in earlier news reports (Lemmens et al., 1999).

Though recall of the label's drunk driving message, other factors taken account of in the model, appears to be associated with increased intervention efforts for both men and women, women more than men appear to be influenced to deter others from drunk driving. As mentioned in the introduction, there are several plausible reasons this may be so. Although somewhat stereotypic, women may be socialized to 'take care' of others, and they may nevertheless be affected more than male drinkers, by authoritative health warnings. This legitimation may free them more to discourage drunk driving by partners or guests. Clearly, what underlies this gender difference is speculative and calls for further study. We believe that human factors studies of this type could be productive in relation to many types of product warnings. Supervisors might be 'authorized' by warnings on industrial equipment to take corrective action; spouses might try to prevent their partners from a range of dangerous behaviors, 'emboldened' by recourse to an authoritative warning. With regard to the alcohol case, it is known that risk behaviors are engaged in more by men than women (Greenfield & Rogers, 1999a), and it appears, as here, that women may more often attempt to prevent them from drunk driving, especially when they recall the warning label's impairment message.

4.1 Limitations

As with any such study, appropriate caveats and cautions are in order. Measurement of drunk driving message recall was based on a leading question about drunk driving rather than asking respondents open-ended questions about the warning label messages. A less 'directed' measure of recall might increase or decrease the observed correlation between salient recall and intervention leading to findings different from those reported here. Additionally, the results are based on self-report surveys, involving cross-sectional not longitudinal data. Relationships are truly associational and direction of causality cannot be determined. Factors other than warning label recall, such as previous engagement in drunk driving, might increase the likelihood of message recall and subsequently increasing a collateral's attempt to reduce another's drunk driving. This said, however, results are consistent with a small effect of the appropriate sign. We believe the structural model helps shed light on the possible pathways of influence deserving further research.

4.2 Conclusions

The potential alcohol container warning labels have to instigate harm-reducing social discourse by encouraging drinkers to urge on each other caution, when heavy drinking happens in conjunction with risky situations, is very important for prevention (Greenfield, 1997). In this case, greater awareness of the warning label's relevant message may encourage interactions with people close to one who appear to have drunk too much yet propose to drive. We observed that respondents reporting greater recall of the alcohol warning label's driving impairment message, other factors equal, tended to also say they had headed off their associates from driving when they thought they had too much to drink. (Of course we know nothing about the success of these efforts.) Similar results have been

reported that are consistent with significant, though small effects of the warning label; these include sparking conversations about several other topics on the warning label, notably drinking and pregnancy and drinking and health, respectively (Greenfield et al., 1999). Together with the present finding, these may be viewed contextually as collectively promoting more prudent situational norms (Greenfield & Room, 1997) that may tend to discourage risk taking with alcohol. Our analyses support the possibility that government warning messages on alcohol containers may enhance a collateral's attempts to reduce another's drinking and driving to some demonstrable, if small, degree. Such influences (or more properly associations) are consistent with Congressional intent, when enacting the federal warning label legislation, that the label serves to "remind" drinkers of certain health risks of alcohol consumption, like drinking when pregnant or when driving (Greenfield et al., 1999; Kaskutas, 1995). We believe that the illustration provided here, outlining an indirect social mechanism by which labels may help promote safer alcohol-related behavior, is among the more important products of the nationally mandated warning label policy and its evaluation. The example also suggests that research on other types of product warnings might productively measure potential effects on various significant others (including supervisors) that might encourage them to reinforce a product user's compliance with particular messages or reduce warned risks.

Acknowledgments

Data were drawn from the Alcohol Research Group's Impact of Alcoholic Beverage Warning Labels project funded by Grant No. R01 AA08557 from the National Institute on Alcohol Abuse and Alcoholism. Analyses and writing were funded by this and National Alcohol Research Center Grant No. P30 AA05595 to the Alcohol Research Group, Public Health Institute. The authors thank Dr. Lee Ann Kaskutas for her valuable input in development of the survey instrument, collection of the data, and commenting on a draft of this paper.

REFERENCES

- Berger DE, Snortum JR. Alcoholic beverage preferences of drinking-driving violators. *Journal of Studies on Alcohol* 1985;46:232–239. [PubMed: 4010301]
- Bollen, KA. *Structural equations with latent variables*. New York: John Wiley & Sons; 1989.
- Browne, MW.; Cudeck, R. Alternative ways of assessing model fit. In: Bollen, KA.; Long, JS., editors. *Testing Structural Equation Models*. Newbury Park, CA: SAGE Publications; 1993. p. 136-162.
- Cook, TD.; Campbell, DT. *Quasi-experimentation: Design and analysis issues for field settings*. Boston, MA: Houghton Mifflin; 1979.
- Dufour MC. What is moderate drinking? Defining "drinks" and drinking levels. *Alcohol Health & Research World* 1999;23(1):5–14.
- Frey, J. *Survey Research by Telephone*. Newbury Park, CA: SAGE Publications, Inc; 1989.
- Fukuyama MA, Greenfield TK. Dimensions of assertiveness in an Asian-American student population. *Journal of Counseling Psychology* 1983;30(3):429–432.
- Graham K, Wilsnack R, Dawson D, Vogeltanz N. Should alcohol consumption measures be adjusted for gender differences. *Addiction* 1998;1137–1147. [PubMed: 9813895]
- Greenfield TK. Improving causal inference from naturalistic designs: self-selection and other issues in evaluating alcohol control policies. *Applied Behavioral Science Review* 1994;2(1):45–61.
- Greenfield, TK. Warning Labels: Evidence of harm reduction from long-term American surveys. In: Plant, M.; Single, E.; Stockwell, T., editors. *Alcohol: Minimizing the harm*. London: Free Association Books; 1997. p. 105-125.
- Greenfield, TK.; Giesbrecht, N.; Kavanagh, L. Drinking patterns of young adults in the US and Canada: The policy implications; *International Alcohol Policy Conference*; 1996.
- Greenfield TK, Graves KL, Kaskutas LA. Alcohol warning labels for prevention: national survey findings. *Alcohol, Health and Research World* 1993;17(1):67–75.

- Greenfield TK, Graves KL, Kaskutas LA. Long-term effects of alcohol warning labels: findings from a comparison of the United States and Ontario, Canada. *Psychology & Marketing* 1999;16(3):261–282.
- Greenfield TK, Kaskutas LA. Early impacts of alcoholic beverage warning labels: national study findings relevant to drinking and driving behavior. *Safety Science* 1993;16:689–707.
- Greenfield TK, Kaskutas LA. Five years' exposure to alcohol warning label messages and their impacts: evidence from diffusion analysis. *Applied Behavioral Science Review* 1998;6(1):39–68.
- Greenfield TK, Rogers JD. Alcoholic beverage choice, risk perception, and self-reported drunk driving: effects of measurement on risk analysis. *Addiction* 1999a;94(11):1735–1743. [PubMed: 10892011]
- Greenfield TK, Rogers JD. Who drinks most of the alcohol in the U.S.? The policy implications. *Journal of Studies on Alcohol* 1999b;60(1):78–89. [PubMed: 10096312]
- Greenfield TK, Room R. Situational norms for drinking and drunkenness: trends in the U.S. adult population, 1979–1990. *Addiction* 1997;92(1):33–47. [PubMed: 9060196]
- Hennessy M, Saltz RF. The situational riskiness of alcoholic beverages. *Journal of Studies on Alcohol* 1990;51:422–427. [PubMed: 2232795]
- Kaskutas LA. Interpretations of risk: the use of scientific information in the development of the alcohol warning label policy. *The International Journal of the Addictions* 1995;30(12):1519–1548. [PubMed: 8557408]
- Kaskutas LA, Greenfield TK. First effects of warning labels on alcoholic beverage containers. *Drug and Alcohol Dependence* 1992;31:1–14. [PubMed: 1425211]
- Kaskutas LA, Greenfield TK. The role of health consciousness in predicting attention to health warning messages. *American Journal of Health Promotion* 1997;11(3):186–193. [PubMed: 10165097]
- Lemmens PH, Vaeth PAC, Greenfield TK. Coverage of beverage alcohol issues in the print media in the US, 1985–1991. *American Journal of Public Health* 1999;89(10):1555–1560. [PubMed: 10511839]
- Muthén, LK.; Muthén, B. *Mplus User's Guide*. Fourth ed.. Los Angeles: Muthén & Muthén; 1998–2007.
- Public Law No 100–690. Alcoholic Beverage Labeling Act of 1988; 100th Congress, 2nd session; Washington, D.C. 1988.
- Rogers JD, Greenfield TK. Beer drinking accounts for most of the hazardous alcohol consumption reported in the United States. *Journal of Studies on Alcohol* 1999;60(6):732–739. [PubMed: 10606483]
- Room R, Greenfield T, Weisner C. People who might have liked you to drink less: changing responses to drinking by U.S. family members and friends, 1979–1990. *Contemporary Drug Problems* 1991;18(4):573–595.
- Wickens, TD. *Multiway contingency tables analysis for the social sciences*. Hilldale, NJ: Lawrence Erlbaum Associates; 1989.
- Yu, C-Y.; Muthén, B. *Evaluation of model fit indices for latent variable models with categorical and continuous outcomes*. Los Angeles, CA: Social Research Division, Graduate School of Education & Information Studies, UCLA; 2001.

Figure 1.
Model predicting intervention to deter others' drunk driving.
Note: All coefficients are standardized
* $p < .05$

Table 1

Distribution of Demographic Characteristics and Other Measured Variables by Gender

	Women (n=645)	Men (n=731)	p-value
Age			0.46
18–25	17.4%	19.0%	
26–30	11.5	11.8	
31–40	24.7	27.6	
41–60	29.5	26.5	
61 or older	17.1	15.0	
Ethnicity			0.04
White	84.3	81.9	
Black	8.3	6.5	
Hispanic	3.9	5.7	
Other	3.5	6.0	
Income			0.08
less than \$20,000	14.5	11.1	
\$20,000–\$59,999	56.5	55.1	
\$60,000 or more	28.9	33.8	
Education			0.79
High school or less	42.5	43.3	
Some college	57.5	56.7	
Alcohol Consumption (drinks per day)			0.00
less than 1 drink	3.0	2.1	
1 to 2 drinks	51.3	33.9	
2 to 3 drinks	31.9	30.5	
3 to 4 drinks	8.6	13.9	
4 to 5 drinks	1.7	7.0	
5 or more drinks	3.5	12.6	
Recalled Drunk Driving Message on Beverage Container	20.8	31.1	0.00
Container Handling			0.00
Did not open or buy	37.2	20.6	
Opened or bought alcoholic beverage	20.6	20.2	
Opened and bought alcoholic beverage	42.2	59.2	
Intervention to Deter Drunk Driving			
Asked someone not to drive	48.7	45.8	0.29
Offered to drive someone home yourself	47.3	49.7	0.38
Asked someone to take a taxi, bus, or subway	12.9	16.6	0.06
Tried to take someone's car keys	21.7	21.8	0.98
Asked someone to stay at your home	37.7	40.6	0.26

Table 2

Estimated coefficients and reliability of items measuring intervention to deter drunk driving (n=1376)

Measures	b	β	R ²
Asked someone not to drive	1.00	.968	.937
Offered to drive someone home yourself	.911	.882	.778
Asked someone to take a taxi, bus, or subway	.671	.650	.423
Tried to take someone's car keys	.897	.868	.753
Asked someone to stay at your home	.796	.770	.593

b: unstandardized factor loadings; β : standardized factor loadings; R² estimated reliability

Table 3

Standardized regression parameters and critical ratios (in parenthesis) for socio-demographic variables predicting alcohol consumption, container handling, recall of drunk driving messages, and intervention to deter other's drunk driving.

	Alcohol Consumption	Container Handling	Recall Drunk Driving Message	Intervention
Male	.30* (8.50)	.13* (4.13)	.09* (2.60)	-.11* (-3.73)
White	-.05 (-1.82)	.02 (.76)	-.02 (-.48)	-.07* (-2.60)
College or more	-.16* (-4.86)	.13* (4.47)	.05 (1.36)	-.01 (-.23)
Age under 40	.20* (6.07)	.00 (-.03)	.23* (6.84)	.30* (9.51)

*
p< .05