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Perceptions of alcohol-impaired driving and the blood alcohol concentration standard in the United States

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Abstract

Introduction: Although the number of alcohol-impaired driving (AID) fatalities has declined over the past several years, AID continues to be a serious public health problem. The purpose of this effort was to gain a better understanding of the U.S. driving population's perceptions and thoughts about the impacts of lowering the blood alcohol concentration (BAC) driving standard below.08% on AID, health, and other outcomes.

Methods: A questionnaire was administered to a nationally representative sample of licensed drivers in the U.S. (n =1011) who were of age 21 or older on driving habits, alcohol consumption habits, drinking and driving habits, attitudes about drinking and driving, experiences with and opinions of drinking and driving laws, opinions about strategies to reduce drinking and driving, general concerns about traffic safety issues, and demographics.

Results: One-third of participants supported lowering the legal BAC standard, and participants rated a BAC standard of .05% to be moderately acceptable on average. 63.9% indicated that lowering 30 the BAC to .05% would have no effect on their decisions to drink and drive. Nearly 60% of respondents lacked accurate knowledge of their state's BAC standard.

Conclusions: Public support for lowering the BAC standardwasmoderate andwas partially tied to beliefs about the impacts of a change in the BAC standard. The results suggest that an opportunity for better educating the driving population about existing AID policy and the implications for lowering the BAC level on traffic injury prevention.

Practical applications: The study results are useful for state traffic safety professionals and policy makers to have a better understanding of the public's perceptions of and thoughts about BAC standards. There is a clear need for more research into the effects of lowering the BAC standard on crashes, arrests, AID behavior, and alcohol-related behaviors.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jsr.2017.08.013.

Keywords

Traffic safety; Public health; Drink driving

1. Introduction

Although the number of alcohol-impaired driving (AID) fatalities has declined over the past several years, AID continues to be a serious public health problem in the United States. From 2008 to 2014, the number of people who died in crashes involving a driver with a blood alcohol concentration (BAC) level of at least .08% g/dL[1] decreased 15% from 11,711 to 9,967 people (National Highway Traffic Safety Administration [NHTSA], 2009, 2016). During this same time period, however, total motor-vehicle-related fatalities also decreased so the proportion of all motor-vehicle fatalities accounted for by AID-related fatalities remained at about one-third for each year (NHTSA, 2009, 2016). Other patterns identified were that U.S. AID-related fatalities were more frequent: during the nighttime hours, particularly midnight to 3 AM; among drivers age 21–24 followed closely by drivers age 25–29; for men regardless of age; and for motorcycle and pick-up truck drivers (NHTSA, 2011).

One way to reduce the overall incidence of AID is well publicized, strict enforcement of AID policy (Bergen et al., 2014). In the United States, policy to combat AID is determined individually by each state. The cornerstone for each state's AID policy is setting a minimum BAC level above which a driver is considered impaired and operating a motor-vehicle illegally (Insurance Institute for Highway Safety, 2012). Many AID polices have a "specific deterrent" effect; that is, they are designed to reduce AID among a certain segment of the population, are likely to be caught by police if they engage in AID, even though studies have shown that the risk of arrest for driving with a BAC level of .08% or greater is only 1 in 1,016 trips (Zaloshnja, Miller, & Blincoe, 2013).

In the 1970s and early 1980s, most states mandated the illegal BAC level to be .10% (Hingson, Heeren, & Winter, 1996). Analyses showed that the incidence of AID was still considered by some to be high (Hingson et al., 1996). As a result of continuing efforts by states to further reduce AID-related crashes, fatalities, and injuries, starting around 1990, states began lowering the illegal BAC to .08%. Researchers at Boston University conducted an analysis of the first five states (Utah, Oregon, Maine, California, and Vermont) to make this change (Hingson et al., 1996). These researchers found that after controlling for changes found in nearby comparison states that had not lowered the illegal BAC, the proportion of AID-related fatalities declined by 16–18% in these five states. The researchers concluded that if all states adopted a .08% AID standard, 500 to 600 fewer AID-related fatal crashes could be expected. Because of these early successes and incentives from the Federal government, and from emerging evidence that .08% BAC will save lives and prevent injuries in the United States (Shults et al., 2001), all states eventually lowered the illegal BAC level to .08%. A scientific review of 14 evaluation studies found that lowering the illegal BAC

[1]When discussing BAC levels in this report, it is assumed that the percentage levels are in grams per deciliter (g/dL) units. This unit designation is therefore not repeated throughout the remainder of the report.

level from .10% to .08% resulted in reductions in alcohol-related crashes, fatalities, and injuries of 5–16% (Fell & Voas, 2006). A systematic review found the median post-law change in alcohol-related motor vehicle fatalities after the introduction of .08% BAC level was −7% with an interquartile range of −15% to −4% (Shults et al., 2001).

Despite the documented impacts of lowering the BAC level to .08%, AID remains a significant problem in the United States (NHTSA, 2015). Many countries outside the United States have lowered the illegal BAC level to .05% or lower. An analysis of BAC standards worldwide showed that 84 countries had illegal BAC levels that were less than or equal to .05%, including most European countries, as well as Australia, Japan, South Africa, and South Korea (World Health Organization, 2015). A number of studies have found that .05% or lower BAC laws are effective in reducing AID-related crashes, fatalities, and injuries (e.g., Albalate, 2008; Bartl & Esberger, 2000; Fell & Voas, 2006; Henstridge, Homel, & Mackay, 1995; Mercier-Guyon, 1998; Nagata, Setoguchi, Hemenway, & Perry, 2007; Smith, 1988). For example, Fell and Voas (2006) conducted a summary of the evidence for lowering the BAC standard from .08% to .05% and lower and concluded that lowering BAC levels to at least .05% is an effective general deterrent for AID crashes, fatalities, and injuries. Howat and colleagues (Howat, Sleet, & Smith, 1991) concluded that, on the basis of present evidence, a .05% BAC was justified in Australia. Thus, several researchers have concluded that lowering the illegal BAC level to at least .05% in the United States would significantly reduce the incidence of AID and save many lives (Fell & Voas, 2006; Sleet et al., 2009; Voas & Fell, 2011).

The purposes of the project were to gain a better understanding of:

1. The United States driving population’s knowledge about current AIDpolicy, and perceptions and beliefs about the health and other impacts (such as AID, alcohol consumption, crashes) of lowering the BAC driving standard below .08%.
2. How this knowledge and these perceptions relate to the drivingpopulation’s perception of the effectiveness and acceptability of lowering the BAC driving standard.

This understanding can be used to improve implementation and enforcement of the existing BAC standard along with understanding how knowledge, attitudes, and beliefs could influence compliance with a lower limit if it were instituted. The project team completed this task through a nationally representative survey administered to licensed drivers in the United States who were of legal age to consume alcohol (age 21 or older). This survey was part of a larger effort to understand the impacts of lowering the BAC standard that also included structured interviews with stakeholders and an analysis of the potential impacts on motor vehicle crashes, injuries, and associated costs. The results of these other activities are reported separately.

2. Methods

The project team developed an outline of topics for the questionnaire based on a review of literature, and the project team’s expertise. The final topics for the questionnaire were: driving habits, alcohol consumption habits, drinking and driving habits, attitudes about

drinking and driving, experiences with and opinions of drinking and driving laws, opinions of strategies to reduce drinking and driving, general concerns about traffic safety issues, and demographics. Questions for each topic were developed by the project team, as well as drawn from several previously published questionnaires with minor modification to wording to ensure consistency across the questionnaire. These sources included: *National Survey of Drinking and Driving Attitudes and Behaviors: 2008* (Drew, Royal, Moulton, Peterson, & Haddix, 2010); *Behavioral Risk Factor Surveillance System*, BRFSS (Centers for Disease Control and Prevention, 2013); and *Road Safety Monitor: Drinking and Driving* (Beirness, Simpson, Mayhew, & Pak, 2001). On the questionnaire respondents were told the current legal BAC standard after being asked what it was but before being asked questions about its effectiveness. Participants were told the number of drinks related to a limit of .05% (based on BAC charts developed by MADD Canada, 2014[2]) prior to being asked questions about the effectiveness and acceptability of lowering the limit to .05%. Pilot testing of the draft questionnaire was conducted with a convenience sample of 10 licensed drivers age 25–74. Pilot test participants provided feedback on the questions, wording, and response categories. Minor revisions were made based on this feedback. The complete questionnaire can be found at the supplemental data link shown at the end of this article. The survey was approved by the University of Michigan Institutional Review Board.

The goal of the sample design was to gather nationally representative data from licensed drivers age 21 or older while maintaining reasonable survey costs. This goal was met by stratifying the population of licensed drivers into three age groups: 21–34 years; 35–64 years; and 65 years or older. The number of respondents in each age category was based on an analysis of the distribution of ages by sex in the United States licensed driving population. This distribution is shown in Table 1. Given the intended total sample size of 1,000, these distributions yielded the following intended numbers of respondents by age group: 257 (age 21–34), 570 (age 35–64), and 173 (age 65 or older). Because of the very slight differences in the distributions of licensed drivers by sex for each age group, the decision was made to equally split respondents between men and women for each age group.

A professional survey company, Abt-SRBI, conducted the survey, programming the questionnaire in a Computer Assisted Telephone Interview (CATI) system. Data were collected from a random-digitdialing (RDD) national probability dual-frame sample, selecting both landline and cellular telephone numbers.

2.1. Landline frame

A national sample of assigned telephone banks was randomly selected from an enumeration of the Working Residential Hundred Blocks within the active telephone exchanges within the United States. The Working Residential Hundred Blocks were defined as each block of 100 potential telephone numbers within an exchange that included one or more residential listings. A two-digit number was then randomly generated by computer for each Working Residential Hundred Block selected in the previous step (RDD). Every telephone number

[2]There are dozens of BAC calculators and BAC charts, and resulting BAC levels vary considerably based on sex, weight, and a variety of other factors (see e.g., NHTSA, 1994). We chose to use a recent BAC chart developed by MADD Canada (2014) and picked the number of drinks that yielded the BAC level closest to .05%without going over for both average weight men and women.

within the Hundred Block had an equal probability of selection, regardless of whether it was listed or unlisted. The RDD sample of telephone numbers were dialed to determine which numbers were currently working residential household telephone numbers. Non-working numbers, nonresidential numbers, and ineligible households (e.g., no eligible respondent in the household, or language barriers) were replaced by another RDD telephone number. Non-answering numbers were not replaced until a maximum number of call attempts (five) was reached. Finally, for the landline sample, interviewers asked to speak with the adult (age 21 or older) at home with the last birthday. If the selected respondent was not home, the interviewer arranged a time to call back.

2.2. Cellular phone frame

A nationally representative cellular phone sample was obtained using the same techniques described for the landline frame, except that the selection of Hundred Blocks was limited to exchanges reserved only for cellular phones. For the cellular phone sample, interviews were conducted with the person who answered the phone (if they were age eligible). Respondents contacted on their cellular phone were asked if they were in a safe place to take the call (e.g., not currently driving) to ensure the safety of the respondent.

Each landline or cellular phone number was called up to five times. Calls were staggered over times of day and days of the week to maximize the chance of making contact with potential respondents. The schedule and interval between calls were set to reduce the chances of non-contact. Response rate in RDD surveys is a ratio of completed interviews relative to the eligible telephone numbers called. The American Association for Public Opinion Research (AAPOR, 2015) provides four ways to report response rates depending on how partial interviews and unknown telephone numbers are treated. In this case the survey response rate ranged from 5.0% to 6.9%. Further details on the response rates are presented in the supplemental data link shown at the end of this article.

Analyses were conducted using SAS 9.4 survey analysis procedures. The Rao–Scott modified chi square (χ^2) test in PROC SURVEYFREQ was used to test the null hypothesis of no association between row and column variables in tables. The Rao–Scott chi-square statistic is computed from the Pearson chi-square statistic with a design correction based on the design effects of the proportions. Means and standard errors were calculated using PROC SURVEYMEANS, which accounts for the sampling design as well. The software program SAS 9.4 PROC SURVEYLOGISTIC was used to fit linear binary logistic regression models for discrete response survey data by the method of maximum likelihood that incorporates the sample design into the analysis.

The survey was administered during April 2014 and the average time to complete it was 13 min. In total, 1,011 respondents completed the questionnaire. Raw survey data were weighted to increase the generalizability of results. The final weights produced for this survey aligned the full sample to match the population parameters of the non-institutionalized population age 21 or older. The weighting was based on the sample of 1,011 respondents. The full sample was ratio adjusted to match population data for sex, age, race–ethnicity, education, and marital status computed from Census ACS 2012 PUMS population data for non-institutionalized adults at least 21 years old.

Percent distributions for demographics and yes/no questions in the survey were analyzed by respondent knowledge of the BAC law, with respondents who either overestimated or underestimated combined with those who did not know the BAC level to create a binary category of knowledge about the law (not knowledgeable vs. knowledgeable). Means and standard deviations were calculated for Likert-scale responses as there was a sufficient sample size (>20) in each cell and the responses were normally distributed (Sullivan & Artino, 2013).

3. Results

Respondent demographics by age, sex, and other demographic variables, are shown in Table 2. Note that all percentages are weighted. A total of 48.5% were men and 51.5% were women, with roughly equal percentages across the three age groups. Slightly more than 70% were White and 12% were Black/African American. Slightly more than one-half were married and another quarter were single and had never married. No children were reported in about two-thirds of households and almost one-quarter had either one or two children in the household. About three-quarters had a high school degree or higher education. Household income was distributed across the range with the largest percentage in the $30,000 to $49,000 range. Slightly more than 90% considered themselves to be frequent drivers, driving at least several times per week (not shown in table). There were no differences in driving frequency by sex ($\chi^2(1) = 1.2550$; p = 0.2626) or age group ($\chi^2(2) = 0.0710$; p = 0.9651).

Respondents were asked about their consumption of alcoholic beverages in the past year, using a definition of one standard drink as a 12-ounce beer, a 5-ounce glass of wine, or a drink with a shot of liquor. Approximately 57% reported having consumed alcohol in the past year. Men were significantly more likely to have consumed alcohol in the past year ($\chi^2(1) = 16.75$; p = <.0001) and such consumption decreased significantly with increasing age group ($\chi^2(2) = 23.28$; p = <.0001). Those who indicated that they had not consumed alcohol in the past were not asked any further questions about alcohol consumption. However, they were categorized as non-drinkers for later analyses by respondent alcohol consumption status (drinker vs. non-drinker).

Respondents were also asked what they believed the BAC standard was for driving in their state. Given that all states had a BAC standard of .08%, analyses were conducted based on the accuracy of answers and whether they reported they did not to know the level. Table 2 shows that 40% of respondents could correctly state the BAC level with another 39% reporting that they did not know the level. Not shown in the table, about 13% reported a higher BAC level and 7% reported a lower BAC level than the actual state BAC level. Significantly more men than women knew the correct BAC level (51.0% vs. 29.6%; $\chi^2(3) = 47.85$; p = b.0001) and correct knowledge of the BAC level significantly decreased with age group (57.9%, 36.6%, 26.0% respectively; $\chi^2(6) = 49.07$; p = <.0001).

3.1. Alcohol consumption and driving

Table 3 shows that among those who reported having consumed alcohol in the past year, most were regular drinkers, with only a few reporting no alcohol consumption in the past month. Those reporting alcohol consumption in the past year reported on average consuming

at least one drink on 8 days in the past month. Men reported drinking on more days in the past month than women (8.7 days vs. 6.7 days; $F(1) = 4.78$; $p < 0.05$). Although only marginally significant, the number of days drinking alcohol increased with age group (6.6 days, 8.2 days, 9.6 days respectively; $F(2) = 2.95$; $p = 0.0533$). Those who reported drinking on at least one day in the past month reported drinking an average of 2.6 drinks on the days they consumed alcohol. Men reported consuming more drinks than women (3.0 drinks vs. 2.1 drinks; $F(1) = 7.49$; $p < 0.01$) and the number of drinks per day on the days that they consumed alcohol, decreased significantly as age increased (2.9 drinks, 2.6 drinks, 1.6 drinks respectively; $F(2) = 30.69$; $p < 0.0001$). Those who reported consuming alcoholic beverages in the past month were also asked about binge drinking behavior defined as having five or more drinks for men (or four or more drinks for women) in a single sitting. Overall, about 70% reported not having engaged in binge drinking in the past month. Among those who reported binge drinking at least once, the average number of times in the past month was 4.8, with men reporting significantly more binge drinking (6.2 episodes vs. 2.4 episodes; $F(1) = 5.41$; $p < 0.05$). Binge drinking appeared to be lowest among the 21–31 year olds (3.8 episodes) and highest among the 35–64 year olds (6.1 episodes), although these differences did not reach significance.

Those who reported consuming at least some alcohol in the past month were also asked several questions about alcohol and driving. Respondents believed that they could consume nearly three alcoholic beverages in 2 h and still be safe to drive, with men reporting significantly more drinks than women (3.2 vs. 2.2; $F(1) = 24.68$; $p < 0.0001$). There were no significant differences by age group. Respondents were asked if they had ever driven a vehicle within 2 h of consuming any amount of alcohol. Overall, about one-third reported that they had. Men were more likely to report driving after consuming alcohol compared with women (43% vs. 28%; $\chi^2(1) = 9.55$; $p = 0.0020$) and the oldest age group was more likely than other age groups to report this behavior ($\chi^2(2) = 7.78$; $p = 0.0205$). Indeed, more than one-half (54%) in the 65 or older age group reported driving within 2 h of consuming alcohol compared to 32% and 36% for the younger age groups.

Those who reported driving within 2 h after drinking alcohol in the past year were asked how many times they had done this in the past month. On average, they reported having engaged in this behavior about 3 times in the past month, with men reporting significantly more times driving within 2 h after drinking alcohol (4.0 vs. 1.4; $F(1) = 4.03$; $p < 0.05$). There were no significant differences by age group. Those who reported driving within 2 h of drinking alcohol in the past year were asked how many times in the past year they had driven when they thought their BAC level was greater than the limit allowed by law. When analyses included those who previously indicated that they had never driven in the past year after drinking alcohol, overall, only 0.3% of total respondents indicated that they had knowingly driven while over the legal BAC level, with no differences by sex or age. Of the 40 who reported at least one incident of driving within 2 h of drinking alcohol, the frequency of driving when one thought they were legally impaired was an average of 4 times in the past year with men reporting more incidents than women.

Respondents were asked about how many alcohol beverages in a 2-hour period a standard man or woman (as appropriate for the reporter's sex) would need to drink to reach the legal

BAC standard. Analyses were conducted separately for men and women. Men reported the average number of drinks to be 3.1 ± 0.2 and women reported this number to be 2.3 ± 0.1. There were no significant differences by age group.

3.2. Perceived consequences of drunk driving

Table 4 presents respondent attitudes of the likelihood of four outcomes related to people who drive when their BAC level is over the legal limit using a scale from 1 to 5 (with 1 being "not at all likely" and 5 being "very likely"). Respondents thought the most likely outcome of alcohol-impaired driving was getting into a crash (3.9). However, the likelihood ratings for the remaining three outcomes (getting stopped, arrested, or convicted for drinking and driving) were all above 3, the midpoint of the scale, suggesting that they were also considered to be moderately likely outcomes. In each case, women assigned significantly higher likelihood ratings than men except for perceived likelihood of conviction (crash: 4.1 vs. 3.7; $F(1) = 4.60$; $p < 0.0001$; arrest: 3.6 vs. 3.3; $F(1) = 8.20$; $p < 0.005$; stopped: 3.3 vs. 2.9; $F(1) = 17.96$; $p < 0.0001$). The youngest age group perceived a significantly higher likelihood of arrest and conviction than the other age groups (arrested: 3.8, 3.3, 3.4 respectively; $F(2) = 9.72$; $p < 0.0001$; convicted: 3.8, 3.3, 3.3 respectively; $F(2) = 9.88$; $p < 0.0001$), with no differences for the other two outcomes. Non-drinkers reported significantly higher likelihood for all outcomes except for getting convicted (crash: 4.3 vs. 3.6; $F(1) = 46.04$; $p < 0.0001$; arrested: 3.7 vs. 3.3; $F(1) = 13.94$; $p < 0.001$; stopped: 3.4 vs. 2.9; $F(1) = 24.81$; $p < 0.0001$). Those who were knowledgeable about their state's BAC level judged the likelihood of each outcome as significantly lower than those who were not knowledgeable, except for convicted (crash: 3.7 vs. 4.1; $F(1) = 19.62$; $p < 0.0001$; arrested: 3.3 vs. 3.5; $F(1) = 5.82$; $p = 0.016$; stopped: 2.8 vs. 3.3; $F(1) = 26.56$; $p < 0.0001$).

3.3. Legal BAC level: opinions and impacts

Overall, about 60% reported that the BAC standard should stay the same and 30% thought it should be lower (Table 5). Men were more likely to report that the limit should stay the same or be higher (76.8% versus 66.5%; $\chi^2(2) = 10.75$; $p = 0.0046$). Non-drinkers were more likely to report that the BAC level should remain the same or should be lower (55.5% versus 28.7%; $\chi^2(2) = 58.66$; $p < 0.0001$).

Because all states had lowered their BAC standard to .08% when the survey was conducted, respondents were asked how likely they thought this change was in reducing alcohol-related crashes, injuries, and deaths (ranging from 1, not at all, to 5, very). Overall, reported likelihood ratings averaged just under 3. There were no significant differences by sex or age group. Those who were knowledgeable of their state's BAC level gave significantly lower likelihood ratings than those who were not knowledgeable (preventing drunk driving: 2.5 vs. 3.0, $F(1) = 16.24$; $p < 0.0001$; preventing crashes, injuries, or deaths: 2.7 vs. 3.0, $F(1) = 11.03$; $p = 0.0009$). Respondents were asked about the effect that lowering the BAC standard to .05% would have on their drinking and driving behaviors. Overall, 63.9% indicated that the lowered BAC level would have no effect on their decisions about drinking and driving. There were no significant differences by sex, age group, or knowledge of the state BAC level. Responses on this item differed significantly by drinking status (66.2% drinker vs. 55.9% non-drinker: $\chi^2(1) = 6.8862$, $p = 0.0087$).

Respondents rated how acceptable a BAC level of .05% would be to *them personally* on a 5-point scale (1, not at all acceptable to 5, very acceptable). Ratings averaged just over 3. There were no differences by sex, age group, or drinking status. Those who were knowledgeable of their state's current BAC level gave significantly lower acceptability ratings than those who were not knowledgeable (3.1 vs. 3.5; $F(1) = 10.03$; $p = 0.002$). Respondents were also asked about how acceptable a legal BAC of .05% would be to the *general public* on a 5-point scale (1, not at all acceptable to 5, very acceptable). These average ratings were below 3, with no significant differences by sex or age group. Those who were non-drinkers reported higher effectiveness ratings than drinkers (3.0 vs. 2.6; $F(1) = 12.1$; $p = 0.0005$), and those who were knowledgeable of the BAC law gave significantly lower ratings than those not knowledgeable (2.5 vs. 3.0; $F(1) = 16.51$; $p < 0.0001$).

Nearly 79.2% of respondents indicated that they thought a lower BAC level would not reduce general alcohol consumption, with no significant differences by sex, age group, drinking status, or knowledge of the BAC law. Overall, the average reported likelihood rating (1, not at all likely to 5, very likely) for a lowered BAC level reducing drinking and driving behavior was 2.5, with no differences by sex, age group, or knowledge of the state BAC level. Non-drinkers reported significantly higher likelihood ratings than drinkers (2.7 vs. 2.4; $F(1) = 8.69$; $p = 0.003$). Overall, the likelihood ratings (1, not at all likely to 5, very likely) for a lowered BAC reducing crashes and injuries was 2.8, with women (2.6 vs. 2.5; $F(1) = 4.48$; $p < 0.05$), non-drinkers (3.0 vs. 2.6; $F(1) = 12.23$; $p = 0.0005$), and those not knowledgeable (2.7 vs. 2.9; $F(1) = 7.53$; $p = 0.006$) assigning higher likelihood ratings.

3.4. Binary logistic regression modeling

To further examine the factors that might help explain perceptions about the impacts and acceptability of a lower BAC standard, a set of binary logistic regression models were fit to the data using SAS 9.4. Binary logistic regressions model the logit-transformed probability of an outcome as a linear relationship with predictor variables in the following form:

$$\text{logit}(p) = \log(p/(1-p)) = \beta_0 + \beta_1 * x_1 + \ldots \beta_k * x_k$$

where p is the probability of a binary outcome variable, $x_1,\ldots, x_k$ are a set of predictor variables, and $\beta_0, \beta_1,\ldots, \beta_k$ are parameters to be estimated.

Three questionnaire items were outcome variables in the binary logistic regression models:

- Using a five-point scale, where 1 is not at all effective and 5 is very effective; please tell me how effective you think each of the following strategies would be at reducing or preventing drunk driving. [Lowering the BAC legal limit.]
- How acceptable would a BAC level of .05% be to you personally — using a five-point scale, where 1 is not at all acceptable and 5 is very acceptable?
- How acceptable would a [BAC level of .05%] be to the general public in your state — using a five-point scale, where 1 is not at all acceptable and 5 is very acceptable?

Responses were recoded to binary form where values of 1–3 were coded as 0 (i.e., not effective or not acceptable) and values of 4–5 were coded as 1 (i.e., effective or acceptable). These groupings were chosen based on the project team's interest in better understanding the factors that predict perceived effectiveness and acceptability rather than the lack of effectiveness or acceptability.

A preliminary set of explanatory variables was selected based on an examination of the bivariate analyses (see Table 6). The final set consisted of those variables that resulted in the highest max-rescaled R^2 value (Nagelkerke, 1991), which is interpreted as the model with the highest proportion of explained variation.

Table 7 shows logistic regression model results for perceived effectiveness of a lowered BAC standard to .05% in reducing alcohol impaired driving. Only four predictor variables were significantly related to the outcome. When controlling for all other explanatory variables, the odds of women thinking that lowering the legal BAC standard would be effective in reducing AID were about 1.6 greater than the odds of men thinking that lowering the legal BAC standard would be effective. The odds of drivers who drove after drinking (even under the legal BAC standard), and thinking that lowering the BAC standard would be effective, were about one-third that of the odds of drivers who did not consume alcohol or drove after consuming any amount of alcohol. Drivers who did not know the state legal limit had odds 1.6 times greater than the odds of drivers who knew the legal BAC standard when it came to thinking that a lower BAC standard would reduce AID. Drivers who believed that drunk drivers are more likely to be arrested had higher odds of perceiving that lowering the legal BAC standard would be an effective method of reducing AID. The overall fit of this model was max-rescaled $R^2 = 0.11$, indicating that, collectively, these variables did not account for much of the variance found for this outcome variable.

Table 8 shows the logistic regression model results for the outcome variable of how personally acceptable lowering the BAC level to .05% would be to the respondent. Only two predictor variables were significant predictors. When controlling for all other explanatory variables, those who thought that lowering the BAC standard would not be effective in decreasing AID had lower odds of considering the BAC standard of .05% to be personally acceptable. The odds of personal acceptability of those who did not know the legal BAC standard in their state were about 1.5 times that of those who knew the state's current legal BAC standard. The overall fit of this model was max-rescaled $R^2 = 0.08$, indicating that these variables did not account for much of the variance found for this outcome variable.

Table 9 shows logistic regression model results for the outcome variable of how acceptable respondents' thought that lowering the BAC level to .05% would be to the general public. Only three predictor variables were significantly related to the outcome. Those who thought that lowering the BAC standard would not be effective in decreasing AID had lower odds of reporting the BAC standard of .05% to be acceptable to the general public. Respondents who reported driving after drinking any amount of alcohol had lower odds of thinking that a lower BAC standard would be acceptable to the public than drivers who did not consume alcohol or drove after consuming alcohol. The odds of respondents who did not know the legal BAC standard in their state were about 1.5 times that of respondents who knew the

BAC standard when it came to reporting that a BAC standard of .05% would be acceptable to the general public. The overall fit of this model was max-rescaled $R^2 = 0.11$, indicating that these variables did not account for much of the variance found for this outcome variable.

4. Discussion

This report presents the background, methods, and results for a nationwide survey of drivers age 21 or older on the perceptions and thoughts about the health and other impacts of lowering the BAC driving standard below .08% in the United States. The survey found that about 56% reported having consumed any amount of alcohol in the past year. Of those drivers, less than 5% reported at least one incident of binge drinking and about one-third reported driving within 2 h of consuming alcohol in the past month. Very few respondents (0.3%) who consumed alcohol in the past year reported that they drove while they thought they were over the legal BAC standard. The percentages of people reporting alcohol-impaired driving has been variable in past national samples ranging from 17% for teens (Carlson, 2005), 15% for drivers age 18 and over (Greenfield & Rodgers, 1999), to 1.8% for adults including non-drivers (Jewett, Shults, Banerjee, & Bergen, 2015), to .04% age 16 and older drivers (Zador, Krawchuck, & Moore, 2001). This variability in rates is likely related to differences in sample demographics, wording of the questions about impaired driving, and changes in impaired driving laws over time.

Respondents were asked about the likelihood of alcohol impaired drivers getting in a crash, being stopped by police, being arrested, and being convicted. Overall, respondents reported moderately high likelihoods for each of these outcomes, with getting in a crash receiving the highest average likelihood rating.

About 60% of respondents were unable to report the correct BAC standard in their state, with about 14% reporting it was higher than .08%, 7% reporting it was lower, and the rest reporting that they did not know the limit. After being informed of the actual BAC standard in their state (.08%), respondents were asked if the BAC standard should be higher, lower, or stay the same. About 29% overall reported that the limit should be lower. Respondents generally underestimated the number of drinks (approximately four for a man and three for a woman) it would take to reach a BAC level of .08%. These responses were also analyzed by a number of variables. Although perceived ratings of the positive outcomes of a BAC standard of .05% were low in general, women, older drivers, non-drinkers, and drivers who were not aware of the current state BAC standard were generally more likely to report that this limit would reduce AID, crashes, injuries, and deaths and to report higher acceptability for the limit. Respondents, in general, did not think that lowering the BAC standard to .05% would have much of an effect on general alcohol consumption, decisions to drive after consuming alcohol, or AID-related crashes, injuries, and deaths. Some subgroups of drivers (women, non-drinkers, older adults) were more favorable, but not overwhelmingly so. They also reported modest acceptance of lowering the BAC standard to .05% as a countermeasure for AID.

Logistic regression models were fit to the data to explore combinations of variables that best predicted various types of support (effectiveness and acceptability) for lowering the BAC

standard to .05%. The significant variables differed slightly between models, but in general being a woman, a non-drinker, believing that arrest was likely for AID, believing that a lowered BAC standard would reduce AID, and not knowing the current state BAC standard, all predicted stronger perceived effectiveness and acceptability for lowering the BAC standard to .05%. However, these models all had relatively low goodness-of-fit statistics indicating that there were other variables that were not measured that influenced responses to these questions. Nevertheless, the results show that public support for lowering the BAC standard is at least partially tied to beliefs about the impacts of a change in the BAC standard.

Collectively, these results suggest that about one-third of participants supported lowering the legal BAC standard, and participants rated a BAC standard of .05% to be moderately acceptable on average (ratings of about 3 on a scale of 1–5), with some subgroups reporting greater acceptability. This is despite the fact that 60% of respondents did not know what the current state BAC standard was. This lack of knowledge, combined with the participants' reporting moderate likelihood of an alcohol impaired driver being stopped by police or being arrested are suggestive of the usefulness (but are not conclusive) of publicity and enforcement to increase knowledge of the legal BAC level and the perception that drivers will be stopped when in violation of this level. Mass media campaigns directed at increasing awareness of enforcement, legal, social, and health consequences are effective in reducing AID (Elder et al., 2004). To be most effective, consideration should be given to conducting campaigns in collaboration with other prevention activities such as enhanced enforcement (Beck, 2009; Elder et al., 2004). Publicized sobriety checkpoints that combine publicity and enforcement have been effective in reducing self-reported AID behaviors and alcohol-involved fatalities (Bergen et al., 2014; Clapp et al., 2005; Lacey, Ferguson, Kelley-Baker, & Rider, 2006), yet sobriety checkpoints are not legal in several states.

This study had several strengths including: the use of a nationally representative sample of 1,011 adult drivers and development of a questionnaire instrument that incorporated, to the extent possible, items used in other surveys with demonstrated reliability and validity. Limitations included the reliance on self-report and the unavoidable bias that can potentially be introduced with the voluntary nature of survey responses. Also, the response rate for the survey was fairly low and the findings may be subject to nonresponse bias. The weighted estimations, however, were designed to reduce the level of the bias in the estimates. While the percent of the sample who reported drinking alcohol in the past year was lower than the 71% reported on another national survey (SAMHSA, 2015) results were shown stratified by and controlled for drinking status. Finally, the questionnaire asked about the number of drinks needed to reach a BAC level of .05% for the average weight female or male. There are a number of issues that could have had an unknown impact on the ability of respondents to accurately answer this question including, the myriad of factors that impact BAC levels including alcohol consumption history and whether or not a person had eaten, the respondent's weight difference as compared to the average person, and the alcohol level of the drinks being reported. Thus, the results for this question should be interpreted with caution.

Practical applications

Given the continued societal concern about AID and the lowering of the BAC standard in Utah, the study results are useful for state traffic safety professionals and policy makers to have a better understanding of the public's perceptions of and thoughts about BAC standards. Given the relationship between perceived impacts and public support for lowering the BAC standard, there is a clear need for more research into the effects of lowering the BAC standard on crashes, arrests, and AID behavior.

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Table 1

Distribution of licensed drivers in the United States by age group and sex in 2011 (Federal Highway Administration, 2013).

Driver age group, years	Men N, percent	Women N, percent	Total N, percent
21–34	25,478,775	25,679,235	51,158,009
	25.9%	25.5%	25.7%
35–64	56,254,263	57,254,525	113,508,788
	57.1%	56.8%	57.0%
65+	16,722,132	17,843,814	34,565,947
	17.0%	17.7%	17.3%
Total	98,455,170	100,777,574	199,232,744
	100%	100%	100%

Table 2

Respondent demographics for a national survey on alcohol-impaired driving, weighted %, United States, 2013.

Characteristic	All (n = 1011)	Sex		Age group		
		Men (n = 511)	Women (n = 500)	21–34 (n = 257)	35–64 (n = 578)	65+ (n = 176)
Total respondents	100	48.5	51.5	26.4	54.6	19.0
Age group, years						
21–34	26.4	27.5	25.3	100	0	0
35–64	54.6	55.3	53.9	0	100	0
65 and older	19.0	17.2	20.8	0	0	100
Race						
American Indian/Alaskan	5.4	5.9	5.0	5.5	5.6	4.7
Asian	1.8	2.0	1.7	3.9	1.5	0.0
African American	12.5	11.7	13.2	14.6	12.2	10.2
Native Hawaiian	0.6	0.5	0.7	0.0	0.8	0.9
White	71.2	70.2	72.0	61.3	72.2	81.7
Hispanic/Latino	5.7	6.5	4.9	12.1	4.6	0.0
Other	1.0	0.7	1.2	0.0	1.3	1.5
Refused	1.6	2.5	0.7	1.6	1.8	0.9
Don’t know	0.3	0	0.6	1.1	0.0	0.0
Marital status						
Married	52.8	54.3	51.4	35.4	58.8	59.7
Divorced	11.6	8.6	14.4	5.4	14.7	11.3
Separated	2.0	2.8	1.1	2.5	2.1	0.8
Widowed	7.9	5.7	9.9	0.3	7.4	19.6
Single/never married	23.8	26.1	21.6	52.9	15.5	7.0
Unmarried couple	1.2	1.6	0.8	3.1	0.6	0.3
Refused	0.8	0.9	0.7	0.3	0.9	1.3
Number of children under age 18 in household						
0	67.5	67.3	67.7	50.1	67.5	91.8
1	12.9	14.0	11.8	18.2	13.2	4.5

Characteristic	All (n = 1011)	Sex		Age group		
		Men (n = 511)	Women (n = 500)	21–34 (n = 257)	35–64 (n = 578)	65+ (n = 176)
2	10.7	11.7	9.7	14.7	11.7	2.2
3	5.3	4.4	6.2	10.2	4.6	0.6
4 or more	2.9	1.8	3.9	6.1	2.2	0.4
DN/refused	0.7	0.8	0.7	0.7	0.8	0.6
Highest education						
Kindergarten or less	0.5	0.9	0.6	1.1	0.3	0.0
Elementary	1.3	2.1	6.4	0.0	1.5	2.6
Some high school	11.6	17.0	30.3	10.1	12.5	10.8
High school grad	27.7	24.9	34.6	23.9	28.8	29.7
Some college	30.2	25.4	27.3	38.7	27.3	26.6
College graduate	28.2	29.1	0.4	25.6	28.8	29.7
DN/refused	0.5	0.6	0.4	0.6	0.7	0.6
Household income						
>$15,000	12.2	12.2	12.3	17.6	10.4	10.1
$15,000–$29,999	17.6	15.0	20.1	19.4	15.4	21.5
$30,000–$49,999	20.7	18.4	22.9	25.0	17.9	23.0
$50,000–$74,999	14.4	14.4	14.4	10.4	15.5	16.6
$75,000–$99,999	11.0	12.5	9.5	7.5	13.4	8.9
$100,000–$149,999	8.4	11.3	5.7	9.1	9.9	3.4
$150,000 or more	7.5	8.7	6.3	4.7	10.2	3.5
Don’t know	1.3	1.0	1.5	2.3	0.5	1.9
Refused	6.9	6.6	7.3	3.9	6.9	11.3
Any alcohol consumption in past 12 months						
Yes	56.5	64.3	49.1	67.9	56.5	40.3
No	43.5	35.7	50.9	32.1	43.5	59.4
Know BAC level in state						
Yes	40.1	51.0	29.6	57.9	36.6	26.0
No	59.9	49.0	70.4	42.1	63.4	74.0

Table 3

Alcohol consumption patterns by sex and age group, United States, 2013.

Characteristic	All	Sex		Age group		
		men	Women	21–34	35–64	65 +
	Mean ± C.I.[a] (N)	Mean ± C.I.[a] (N)	Mean ± C.I.[a] (N)	Mean ± C.I.[a] (N)	Mean ± C.I.[a] (N)	Mean ± C.I.[a] (N)
Average number of days (in a month)	7.8 ± 0.9	8.7 ± 1.4	6.7 ± 1.1	6.6 ± 1.3	8.2 ± 1.4	9.6 ± 2.5
	(526)	(309)	(217)	(158)	(301)	(67)
Average number of drinks on days when consuming alcohol	2.6 ± 0.4	3.0 ± 0.6	2.1 ± 0.2	2.9 ± 0.3	2.6 ± 0.6	1.6 ± 0.2
	(520)	(308)	(212)	(157)	(298)	(65)
Average times binge drinking	4.8 ± 2.2	6.2 ± 3.1	2.4 ± 0.5	3.8 ± 1.4	6.1 ± 4.4	5.0 ± 4.6
	(138)	(93)	(45)	(71)	(64)	(3)

[a]95% confidence interval.

Table 4

Average likelihood ratings (5-point scale)[a], for various outcomes for drivers who are over the legal BAC standard, United States, 2013.

Characteristic	Outcomes			
	Get in crash	Be arrested	Be convicted	Be stopped by police
	Mean ± C.I.[b] (N)	Mean ± C.I.[b] (N)	Mean ± C.I.[b] (N)	Mean ± C.I.[b] (N)
All	3.9 ± 0.1	3.4 ± 0.2	3.4 ± 0.1	3.1 ± 0.1
	(982)	(1000)	(981)	(996)
Men	3.7 ± 0.2	3.3 ± 0.1	3.3 ± 0.2	2.9 ± 0.1
	(493)	(504)	(495)	(502)
Women	4.1 ± 0.1	3.6 ± 0.1	3.5 ± 0.1	3.3 ± 0.1
	(489)	(496)	(483)	(494)
Age 21 −34	3.8 ± 0.2	3.8 ± 0.2	3.8 ± 0.2	3.2 ± 0.2
	(253)	(256)	(251)	(245)
Age 35–64	3.9 ± 0.1	3.3 ± 0.1	3.3 ± 0.2	3.0 ± 0.1
	(564)	(572)	(563)	(571)
Age 65+	4.0 ± 0.2	3.4 ± 0.3	3.3 ± 0.3	3.1 ± 0.2
	(165)	(172)	(167)	(170)
Drinker	3.6 ± 0.1	3.3 ± 0.1	3.3 ± 0.1	2.9 ± 0.1
	(597)	(605)	(591)	(605)
Non-drinker	4.3 ± 0.1	3.7 ± 0.2	3.5 ± 0.2	3.4 ± 0.2
	(385)	(395)	(390)	(391)
Knowledgeable[c]	3.7 ± 0.1	3.3 ± 0.2	3.3 ± 0.2	2.8 ± 0.1
	(428)	(433)	(429)	(434)
Not knowledgeable[c]	4.1 ± 0.1	3.5 ± 0.1	3.5 ± 0.2	3.3 ± 0.1
	(529)	(541)	(528)	(536)

[a] 1 = “not at all likely” to 5 = “very likely”.

[b] 95% confidence interval.

[c] Knows/doesn’t know the legal BAC standard = .08%.

Table 5

Opinions on raising, lowering or maintaining blood alcohol concentration limit by sex, age group, drinking status, and knowledge of current BAC standard, United States, 2013.

Characteristic	Opinion		
	Remain the same	Higher	Lower
	Percent (SE)	Percent (SE)	Percent (SE)
All (N = 955)	59.7	11.8	28.5
	(1.9)	(1.4)	(1.7)
Men (N = 487)	62.0	14.8	23.2
	(2.8)	(2.2)	(2.4)
Women (N = 468)	57.5	9.0	33.6
	(2.6)	(1.6)	(2.5)
Age 21–34 (N = 243)	61.5	11.0	27.5
	(3.7)	(2.5)	(3.3)
Age 35–64(543)	60.9	11.1	28.1
	(2.6)	(1.9)	(2.3)
Age 65+ (N = 169)	53.9	15.0	31.1
	(4.5)	(3.4)	(4.3)
Drinker (N = 582)	71.2	12.3	16.4
	(2.2)	(1.8)	(1.7)
Non-drinker (N = 373)	44.5	11.2	44.3
	(3.0)	(2.2)	(3.1)
Knowledgeable (N = 425)	63.6	13.2	23.2
	(2.8)	(2.1)	(2.4)
Not knowledgeable (N = 509)	57.0	10.9	32.2
	(2.7)	(1.9)	(2.4)

Table 6

Explanatory variables used in logistic regression modeling.

Variable	Categories
Sex	Female Male
	Male
Age group	21–34
	35–64
	65+
Knows legal BAC standard	No
	Yes
Drinking and driving behaviors	Drinks and drives (both legal and illegal BAC)
	Does not drink or does not drive after drinking
Binge drinking behavior	Did not binge drink in past 12 months
	Binged at least once in past 12 months
Alcohol consumption behavior (past 1 year)	No
	Yes
Knows someone who was involved in alcohol-related crash (past 2 years)	No
	Yes
Likelihood of drinking driver over legal BAC standard being in crash	Not likely
	Likely
Likelihood of police stopping driver who is over legal BAC standard	Not likely
	Likely
Likelihood of driver over legal BAC standard being arrested	Not likely
	Likely
Likelihood of driver over legal BAC standard being convicted	Not likely
	Likely
Effectiveness of lowering BAC in reducing drunk driving[a]	Not effective
	Effective

[a]Tested as explanatory variable in model of acceptability.

Table 7

Logistic regression model to predict perceived effectiveness of lowering legal BAC standard to .05% to reduce drunk driving (referent category).

Parameter	df	Estimate	St. error	Wald χ^2	p	Odds ratio (95% Wald CI)
Intercept	1	−1.3828	0.1568	77.81	<.0001	
Sex (female)	1	0.2239	0.0948	5.58	.0182	1.57 (1.079–2.270)
Drinking and driving behavior (drives after drinking)	1	−0.5650	0.1269	19.78	<.0001	0.32 (0.197–0.532)
Likelihood of driver over legal BAC standard being arrested (not likely)	1	0.5561	0.1787	9.69	.0019	1.74 (1.229–2.475)
Knows legal BAC standard (does not know)	1	0.2195	0.0949	5.34	.0208	1.55 (1.069–2.250)

Table 8

Logistic regression model to predict the reported personal acceptability of a BAC standard lowered to .05% (referent category).

Parameter	df	Estimate	St. error	Wald χ^2	p	Odds ratio (95% Wald CI)
Intercept	1	0.1977	0.0930	4.52	.0334	
Effectiveness of lowering BAC level in decreasing drinking and driving (not effective)	1	−0.4837	0.0932	26.92	<.0001	0.38 (0.264–0.548)
Knows BAC legal limit (does not know)	1	0.2024	0.0820	6.09	.0136	1.50 (1.087–2.067)

Table 9

Logistic regression model to predict the reported acceptability of a BAC standard lowered to .05% to the general public (referent category).

Parameter	df	Estimate	St. error	Wald χ^2	p	Odds ratio (95% Wald CI)
Intercept	1	−1.3512	0.1441	87.87	<.0001	
Effectiveness of lowering BAC level in decreasing drinking and driving (not effective)	1	−0.4019	0.1029	15.26	<.0001	0.45 (0.299–0.670)
Drinking and driving behavior (drives after drinking)	1	−0.5567	0.1400	15.81	<.0001	0.33 (0.190–0.569)
Knows BAC legal limit (does not know)	1	0.2373	0.1047	5.13	.0235	1.61 (1.066–2.434)