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Awareness and correlates of short-term and long-term consequences of alcohol use among Australian drinkers

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Alcohol use is associated with a number of short-term and long-term consequences, e.g. motor vehicle accidents, injury and cancer.^{1,2} More than a quarter of Australians over the age of 14 consume alcohol at levels that put them at risk of acute accident or injury at least once a month, and 18% exceed the daily drink limit for lifetime risks.³ In 2010, 15 deaths and 430 hospitalisations per day in Australia were attributable to alcohol,⁴ with the social costs of alcohol use estimated to be up to \$36 billion annually.⁵

To reduce harmful consequences of alcohol use, drinking guidelines stipulating the maximum number of standard alcoholic drinks that can be consumed to reduce risk of short- and long-term consequences have been developed. The current Australian guidelines specify that no more than four standard drinks (defined as 10 grams [12.5 mL] of alcohol) be consumed on any occasion to reduce the risk of injury arising from that occasion, and no more than two standard drinks per day to reduce the lifetime risk of alcohol-related disease or injury harms.⁶ Despite these guidelines, those who consume alcohol at high-risk levels, and drinkers with less than tertiary level education are less likely to be aware of the recommended number of safe drinks.⁷ Further, younger people (14-19 year olds) and heavier drinkers (>4 drinks per day) tend to overestimate the maximum number of drinks to reduce harms.⁸

Abstract

Objective: To investigate awareness of short-term and long-term consequences of alcohol use among a sample of Australian adult drinkers. Demographic correlates of the awareness of each consequence were also explored.

Methods: Participants aged 18-45 years (n=1,061; mean age=33.2 years) drawn from an online panel completed a web-based survey assessing demographics, awareness of alcohol warning labels, and awareness of seven short-term and 12 long-term consequences of alcohol use.

Results: The level of awareness of short- and long-term consequences ranged from 16% (breast cancer) to 69% (low coordination and slower reflexes). The study found consistent differences in awareness of consequences by gender, with some differences for specific consequences by age, education, SES, rurality and awareness of alcohol warning labels.

Conclusions: Most consumers lack a sufficient understanding of the potential consequences of alcohol use. Particular subgroups of drinkers may not equate drinking with negative consequences.

Implications for public health: Front-of-label alcohol warnings on all products and public health and education campaigns presenting messages targeting subgroups of drinkers could increase awareness of short- and long-term negative health and social effects of alcohol use.

Key words: Alcohol; short-term consequences; long-term consequences; demographics

Typically, there is a low awareness among adult drinkers of the harmful consequences of alcohol use. For instance, it is estimated that 14%-48% of drinkers list alcohol as a risk factor for cancer,⁹⁻¹² between 5% and 79% of drinkers are aware that alcohol is a risk factor for heart disease,^{10,11,13} and 20%-27% are aware it is linked to an increased risk of stroke.^{14,15} However, one Australian study indicates a near perfect (98% of their sample) awareness of the link between alcohol use and liver problems.¹¹ There is limited research examining the extent of understanding drinkers have regarding the short-term

consequences of alcohol-use, such as injuries, blackouts, or traffic accidents. For example, while one study demonstrated that drinkers' perceptions of risk of short-term harms associated with their own drinking is low, their study used an aggregate measure of harms rather than examining perceptions of risk for individual consequences of drinking.¹⁶ Young adults have typically been found to have poor understanding of alcohol-related short- and long-term social and health harms (as measured by an aggregate scale).¹⁶ Further, one Australian study found that less than half of drinkers were aware that alcohol

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causes cancer with no significant difference in awareness between light, moderate, and heavy drinkers.¹¹ Another UK study found no differences by age, gender, education, or ethnicity in the proportion who believed alcohol to be a risk factor for cancer (14%) or heart disease (25%).¹⁰

Alcohol warning labels, within a wider set of interventions, have also been developed with the aim of informing consumers of the likely consequences of risky drinking, and how consumers might reduce their risk.¹⁷ While there has been research examining the impact of alcohol warning labels on drinking intentions and behaviour,¹⁸ and on the awareness of warning labels,¹⁹ little is known regarding the impact of warning labels on increasing the knowledge of consequences of alcohol use. Recently, an online survey of 1,600 Australian adults demonstrated that the use of cancer warning statements on alcohol products could potentially increase the awareness of the link between alcohol use and cancer.²⁰

The current study aimed to extend the limited literature on consumer knowledge of alcohol as a risk factor for adverse social and health outcomes by investigating awareness of a number of short- and long-term consequences of alcohol use among Australian adult drinkers. It also explored demographic correlates, including recognition of alcohol warning

labels, of awareness of the consequences of alcohol use.

Method

Participants

Participants were recruited using an online research panel. Such an approach to recruitment has been successfully used in past similar studies.^{7,18,19,21} Both online (e.g. banner ads) and offline (e.g. TV and print advertising) methods are used to invite members to join the panel, which ensures a wide range of demographics of panel members. The research panel undergoes regular demographic profiling to make certain it remains representative of the Australian population.²² Online panel members received emails inviting them to take part in surveys in return for reward points redeemable for retail vouchers. Participants were required to be aged 18–45 years and quotas were set for gender (50% male and 50% female). As the rates of risky drinking among Australian adults decreases among those aged over 45 years, we did not include older adults in our sample.³ A total of 2,554 respondents commenced the survey. Survey participants were excluded if they were outside the target age range or reported they were non-drinkers (n=1,023), attempted to complete the survey once quotas were full

(n=216), or did not complete the survey after commencement (n=254). There were 1,061 participants in the final sample.

The demographic distributions of the current sample were largely similar to national population distributions for gender, remoteness, socioeconomic status (SES), and education.^{23–25} However, there was an over-representation of participants in the 34–45 year old age category and an under-representation of participants in the 18–24 year old category. Post-stratification population weights were applied for age by gender, and state of residence using 2011 Australian Census Data.²³ Table 1 provides details of participant characteristics.

Measures

Awareness of the consequences of alcohol-use:

Awareness of short-term and long-term consequences of alcohol use were measured using two items. First, participants were asked: "Which of the following do you think are likely consequences of a single occasion of heavy drinking (i.e. short-term consequences)?" followed by a list of seven short-term consequences that are related to alcohol use. While heavy drinking was not defined prior to this survey item, participants were asked to provide their own definition of short-term heavy drinking earlier in the survey. On average, participants defined short-term heavy drinking as 2.9 drinks for female drinkers and 3.8 drinks for male drinkers,⁷ which is lower than the current Australian safe drinking guidelines.⁶ Participants were then asked "Which of the following do you think are likely consequences of consuming alcohol over many years (i.e. long-term consequences)?" for a list of 12 long-term consequences associated with alcohol use. The order of the short-term consequences and long-term consequences were randomised for each participant. For analyses, responses for each short-term consequences and long-term consequences were dichotomised as 'definitely true' compared to 'probably true, probably false, and definitely false'.

Awareness of alcohol product warning labels:

Participants were first asked how often they see warning labels on alcohol containers, followed by an open-ended item asking 'Which label(s) do you recall seeing?' Participants then typed in a brief description of the label to generate a measure of spontaneous warning label recall. The items assessing recall of a warning label were

Table 1: Characteristics of participants.

	Unweighted data		Weighted data ^a	
	N	%	N	%
Gender				
Male	545	51.4	527	49.7
Female	516	48.6	533	50.3
Age				
18–24	195	18.4	257	24.2
25–34	378	35.6	377	35.6
35–45	488	46.0	427	40.2
Education				
Less than tertiary	600	56.6	611	57.6
Tertiary or above	461	43.5	450	42.4
SES				
Low	355	33.5	356	33.6
Mid	465	43.8	462	43.6
High	241	22.7	243	22.9
Geographic location of residence				
Metropolitan	712	67.1	723	68.2
Regional/rural	349	32.9	378	31.8
AUDIT-C score				
Low-risk drinking	410	38.6	411	38.8
High-risk drinking	651	61.4	650	61.3
Awareness of any warning label				
Yes	549	51.7	559	52.7
No	512	48.3	502	47.3

^a Data weighted by age, sex, and state of residence

mandatory; that is, participants were unable to proceed in the survey until these items had been answered in order to prevent viewing warning label images that are presented later in the survey. Participant descriptions of the labels were categorised according to each of the current four Australian warning label types and a general 'Get the facts' logo (a message depicted on all current warnings). These warnings consist of: 'It is safest not to drink while pregnant'; an image of a silhouette of a pregnant woman with a strikethrough; 'Is your drinking harming yourself or others?' and, 'Kids and alcohol don't mix'. All descriptions that mentioned pregnancy were coded in the one category; that is, the two different types of pregnancy labels were not coded separately. To assess logo and warning label recognition, the 'Get the facts' logo and each label were then shown to participants. Participants were asked if they had seen this logo/label on any alcohol products.

The spontaneous recall and prompted recognition responses were then combined to generate a measure of overall awareness. Awareness of a label was defined as the proportion of participants who freely recalled any alcohol warning label, plus the proportion who did not freely recall the label, but recognised it after being presented with an image of the label. The variable was therefore coded as 'yes – aware of any warning label' vs. 'no – not aware of any warning label'.

Alcohol use: Typical alcohol consumption behaviour was assessed using the Alcohol Use Disorders Identification Test (AUDIT-C).²⁶ The AUDIT-C uses three items from the 10-item AUDIT, and asks about the frequency and quantity of alcohol consumption to measure alcohol dependence. These three items are summed and a score of ≥ 4 for men and ≥ 3 for women is indicative of high-risk drinking.²⁶

Demographics: Participants were asked about their gender, age (categorised into 18-24 years, 25-34 years, and 35-45 years), and highest educational attainment (coded as 'less than tertiary' or 'tertiary or higher'). Participants also provided their residential postcode, which was used to classify their location of residence according to the Australian Statistical Geography Standard remoteness structure²⁴ of major city, inner regional, outer regional, remote and very remote. Due to small cell sizes in the latter four categories, geographic location was

dichotomised into 'metropolitan' and 'regional/rural'. Postcode was also used to code for areas level SES according to the 2011 national Socioeconomic Index for Areas (SEIFA) Index of Relative Advantage and Disadvantage.²⁵ SES was categorised into low-, mid-, and high-SES using national SEIFA tertiles.

Procedure

The study was approved by the Deakin University Ethics Committee. The plain language statement and survey link was emailed to members of the online panel. Invited participants indicated consent by submitting the completed survey. Participants completed the survey in 10-15 minutes.

Data analysis

All analyses used Stata 13.1. Multivariable logistic regression analyses were used to examine demographic correlates of awareness of each short- and long-term consequence of alcohol use. Power calculations²⁷ indicated that the sample size was sufficient to detect a small effect size (odds ratio of 1.25)²⁸. Prior to analysis multicollinearity between the independent variable were tested; the variance inflation factors were low (mean=1.10; range=1.02-1.21), indicating multicollinearity was not present in the data.

Results

Awareness of short-term consequences

Table 2 shows that at least half the participants were aware of most of the short-term consequences associated with alcohol consumption. However, less than half agreed that drownings and coma or death were associated with alcohol. Multivariable logistic regression models were then conducted to examine demographic correlates of awareness of short-term consequences (see Table S1 for full model details).

Females were significantly more likely than males to respond 'definitely true' to all short-term consequences; OR=1.42, 95% confidence interval (CI)=1.10-1.84, $p=0.007$ (drownings) to OR=1.88, 95%CI=1.41-2.49, $p<0.001$ (reduced concentration). Additionally, compared to participants with less than a tertiary level education, those with tertiary education or higher were significantly less likely to respond 'definitely true' that alcohol use can lead to alcohol poisoning (OR=0.76, 95%CI=0.58-0.99, $p=0.039$; 47% vs. 54%).

Participants from high-SES areas were significantly more likely to agree that alcohol was related to injuries (OR=1.55, 95%CI=1.04-2.29, $p=0.030$; 64% vs. 54%) compared to those from low-SES areas. Participants from mid-SES areas were also significantly more likely than those from low-SES areas to agree that alcohol was related to injuries (OR=1.45, 95%CI=1.08-2.98), $p=0.015$; 63% vs. 54%). Last, high-risk drinkers as measured by the AUDIT-C had significantly lower odds of responding 'definitely true' that alcohol is a likely cause of traffic accidents (OR=0.67, 95%CI=0.50, 0.91, $p=0.009$; 65% vs. 73%) compared to low-risk drinkers.

Awareness of long-term consequences

Table 2 shows fewer participants were aware of the long-term consequences compared to short-term consequences. Participants were least aware of specific types of cancer. Multivariable logistic regression models were then used to investigate demographic correlates of each long-term consequence. Full model details are provided in Supplementary Table 2.

Compared to males, females were significantly more likely to respond

Table 2: Adjusted percentage of participants who responded 'definitely true' to each short-term and long-term consequence.

	Definitely true (%)
Short-term consequence	
Lack of coordination and slower reflexes	69.3
Reduced concentration	69.0
Motor vehicle, bicycle and pedestrian accidents	68.5
Injuries associated with falls, accidents, violence and intentional self-harm	60.0
Alcohol poisoning	50.7
Drownings	42.4
Coma and death	32.7
Long-term consequence	
Harm to unborn babies	67.3
Cirrhosis of the liver	61.6
Brain damage	45.8
Stomach problems	44.8
Heart and blood disease	40.8
Pancreatitis	32.7
Bowel cancer	24.4
Pharyngeal cancer	22.2
Oesophageal cancer	21.1
Mouth cancer	21.0
Larynx cancer	21.0
Breast cancer	15.6

Note. Data weighted by age, sex, and state of residence. Percentages adjusted for gender, age, education, risky drinking, SES, remoteness, and awareness of warning labels.

'definitely true' to the following long-term consequences: harm to unborn babies, cirrhosis, brain damage, stomach problems, heart and blood disease, and pancreatitis; OR=1.36, 95%CI=1.05-1.76, $p=0.018$ (brain damage) to OR=1.87, 95%CI=1.42-2.46, $p<0.001$ (harm to unborn babies). Participants aged 35-45 years had significantly higher odds than 18-24 year olds of responding 'definitely true' to cirrhosis (OR=1.96, 95%CI=1.35-2.82, $p<0.001$; 70% vs. 55%).

Additionally, compared to participants with less than a tertiary level education, those with tertiary education or higher were significantly more likely to respond 'definitely true' that alcohol use can lead to pancreatitis, bowel cancer, oesophageal cancer, mouth cancer, and breast cancer; OR=1.42, 95%CI=1.02-1.98, $p=0.034$ (mouth cancer) to OR=1.54, 95%CI=1.10-2.15, $p=0.011$ (oesophageal cancer). Participants from rural or regional areas were significantly less likely to respond 'definitely true' to breast cancer (OR=0.64, 95%CI=0.42-0.99, $p=0.044$; 12% vs. 17%). Those who were classified as high-risk drinkers also had significantly lower odds of responding 'definitely true' to cirrhosis (OR=0.75, 95%CI=0.56-0.99, $p=0.44$; 59% vs. 66%) compared to low-risk drinkers.

Lastly, participants who were aware of any alcohol warning label were significantly more likely than participants not aware of warning labels to respond 'definitely true' to harm to unborn babies (OR=1.34, 95%CI=1.00-1.78, $p=0.048$; 70% vs. 64%) and cirrhosis of the liver (OR=1.50, 95%CI=1.13-1.99, $p=0.005$; 66% vs. 57%).

Sensitivity analyses

The series of multivariable logistic regression models were re-run using 'probably' or 'definitely true' compared to 'probably' or 'definitely false' as the dichotomised outcomes variable. The pattern of results for short-term consequences was largely similar. However, there was a consistently different pattern for high-risk drinkers compared to low-risk drinkers. High-risk drinkers were significantly less likely than low-risk drinkers to respond with 'probably' or 'definitely true' to the additional following items: low co-ordination and slower reflexes, reduced concentration, injuries, alcohol poisoning, and drownings; OR=0.31 95%CI=0.12-0.77, $p=0.012$ (low co-ordination) to OR=0.64 95%CI=0.41-0.99, $p=0.045$ (drownings).

For long-term consequences the results using 'probably' or 'definitely true' as the outcome

of interest were generally consistent to the models examining 'definitely true' only. However, as per short-term consequences, a systematic pattern regarding high-risk drinkers was found. High-risk drinkers compared to low-risk drinkers were additionally significantly less likely to respond with 'probably' or 'definitely true' to harm to unborn babies, brain damage, stomach problems, and pancreatitis; OR=0.47, 95%CI=0.24-0.91, $p=0.024$ (harm to unborn babies) to OR=0.64, 95%CI=0.44-0.92, $p=0.015$ (pancreatitis).

Discussion

This is the first study to examine awareness of an extensive list of both short- and long-term harmful consequences of alcohol use among Australian drinkers. This study is also one of the first to examine demographic correlates of such awareness. Participants' level of awareness of short- and long-term consequences ranged from 16% (breast cancer) to 69% (low coordination and slower reflexes), indicating that consumers have a lack of understanding of the potential consequences of alcohol use. We found consistent differences in awareness by gender, with some differences for specific consequences by age, education, SES, rurality, and awareness of alcohol warning labels.

Short-term consequences

The majority of participants ($\geq 60\%$) reported awareness of common short-term consequences of alcohol use, such as reduced concentration and traffic accidents. However, there was less awareness of more serious consequences, including coma and death, and drownings. This pattern of findings may simply be a reflection of the personal experiences of the participants, or it may be indicative of an avoidance coping strategy, given these strategies tend to be employed by those who engage in high levels of alcohol consumption.²⁹

We found that female respondents were more likely than males to be aware of all short-term consequences. This may be consistent with the gender differences in health beliefs – societal norms of health risk behaviours for males and health protective behaviours for females³⁰ and that health risks tend to be judged as lower for men than women.³¹ Further, those from mid- and high-SES areas were also more likely to be aware that alcohol can cause injuries.³² Australians living in areas

of the most disadvantage (i.e. low-SES areas) are more likely to engage in risky drinking than people living in more advantaged areas,³³ therefore improved education around the consequences of alcohol use is needed.

High-risk drinkers were less likely than low-risk drinkers to agree that traffic accidents are a consequence of alcohol use. Prior research shows that those who drink heavily are more likely to drink drive,³⁴ so it is concerning that more than a third of high-risk drinkers in our sample did not believe traffic accidents to be a consequence of alcohol use. Mass media campaigns have been found to reduce the likelihood of an individual to be involved in a drink driving incident, especially when delivered alongside other prevention measures such as high enforcement visibility.³⁵ It is likely that targeted messages aimed at high-risk drinkers could increase awareness surrounding the consequences of drink driving. Using 'probably' or 'definitely true' as the outcome of interest, high-risk drinkers were also significantly less likely to agree that low co-ordination and slower reflexes, reduced concentration, injuries, alcohol poisoning and drownings were consequences of alcohol use, which is concerning as high-risk drinkers are likely to experience such outcomes.^{36,37}

Long-term consequences

There was a lower level of awareness of long-term consequences than short-term consequences within this sample. For example, less than one-quarter of our sample were aware of specific types of cancer. This is consistent with low rates of awareness of alcohol as a risk factor for cancer in other studies.⁹⁻¹² Surprisingly, one-third of the sample did not say that harm to unborn babies was a consequence of alcohol use. Given up to 29% of women drink while pregnant³⁸ and the current Australian guidelines stipulate that there is no safe level of alcohol use during pregnancy,⁶ it appears that improved public health and education campaigns are needed to communicate the risks of drinking while pregnant to a substantial minority of consumers.

Similar to that for short-term consequences, female respondents were more likely than males to be aware of long-term consequences of alcohol use. Additionally, those with higher education levels had typically greater awareness of long-term consequences. While our study showed that those with higher education had greater awareness of cancer

as a long-term consequence of alcohol use, a previous UK study did not find such differences.¹⁰ This may be related to generally lower levels of public health awareness in the UK, differences in alcohol container labelling or a lack of independent health information being available in the UK.³⁹

Older participants were more likely to be aware of cirrhosis of the liver. High-risk drinkers were less aware of cirrhosis of the liver, most likely indicative of the increased proportions of high-risk drinking in younger age groups.³ These findings may also be reflective of the older average age of diagnosis and hospitalisation of cirrhosis of the liver due to alcohol use among Australian adults.⁴⁰ High-risk drinkers were also less likely to agree that harm to unborn babies, brain damage, stomach problems, and pancreatitis were consequences of alcohol use when examining probably/definitely true as the outcome. Of particular concern is the perception among high-risk drinkers that alcohol consumption is not likely to harm unborn babies. Post-hoc exploratory analysis (gender x risky drinking interaction $p=0.899$) indicated that this finding was not due to male high-risk drinkers, rather high-risk drinkers regardless of gender responded in this way. This finding further highlights the need for effective public health and education campaigns addressing the risks of drinking during pregnancy.

The current study also found that drinkers from rural/regional locations were less aware of breast cancer as a long-term consequence of alcohol use. In Australia, the incidence of specific cancers (such as lung cancer and cervical cancer) and mortality rate of all cancers combined increases with remoteness,⁴¹ as do most alcohol-related harms.⁴² Greater education and targeted harm reduction and prevention measures regarding modifiable risk factors are needed in regional and remote locations.

Lastly, the awareness of alcohol warning labels increased awareness of harm to unborn babies and cirrhosis of the liver. Pregnancy-related messages are the most common type of warning displayed on alcohol products in Australia,⁴³ although still only 38% of Australian drinkers report awareness of this warning.⁷ It may be that such messages on alcohol products reinforces the abstinence guidelines for pregnant women, or that other mass media campaigns have educated consumers about cirrhosis of the liver.^{6,44}

Limitations

The current study recruited participants using an online research panel, which may limit the generalisability of the study. However, it is likely that more traditional survey methods (i.e., telephone or mail-out surveys) are becoming increasingly unreliable due to declining response rates over time.^{45,46} Online panels provide an advantageous way to access a research sample, with data weighting applied to bring the sample more in line with population demographic distributions. The list of consequences used in the current study did not use any decoy items (i.e. harms that are not linked to alcohol consumption). While the data were screened for response sets, it may be that participants selected probably true or definitely true for items despite not being aware of the contribution of alcohol to the listed consequence. Future research could include such decoy items in lists of harms presented to participants. Participants may also have different personal definitions of 'likely' (e.g. two participants believe there to be a 20% chance of an outcome, but one deems it 'probably likely' while the other views it as 'definitely likely'), which could result in participants who have awareness of a consequence but being placed in to different awareness groups. However, the sensitivity analyses conducted explored this issue. The current study also does not delineate between perceived personal risk and perceived risk at a population level of these alcohol-related consequences. It may be that participants would rate the likelihood of the consequences even lower if framed as a risk to themselves due to the perception that their own risk of experiencing negative health effects is lower than that of the wider population.⁴⁷ This study did not examine the cultural background of participants (e.g. Aboriginal or Torres Strait Islander). Finally, due to the number of models examined, any results that do not represent clear systematic patterns of difference should be interpreted with caution.

Conclusions

The study found low levels of awareness of a number of short-term and long-term consequences of alcohol use among Australian drinkers. Particular subgroups may not equate drinking with certain negative consequences. Future research should also examine the awareness of such consequences among non-drinkers, particularly among those who have recently stopped

drinking (e.g. due to pregnancy, illness, or consequence awareness). Public health and education campaigns such as mandatory front-of-container health information on all alcohol products that present a variety of messages are needed to communicate both the short- and long-term negative health and social effects of alcohol use.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Table 1: Multivariable logistic regression models predicting 'definitely true' for each of the short-term consequences.

Supplementary Table 2: Multivariable logistic regression models predicting 'definitely true' for each of the long-term consequences.