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Exposure to Alcohol Advertising and Alcohol Consumption among Australian Adolescents

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Abstract — **Aims:** Underage drinking is a major problem in Australia and may be influenced by exposure to alcohol advertising. The objective of the present study was to collect data on 12–17 year old Australian adolescents' exposure to different types of alcohol advertising and examine the association between exposure to advertising and alcohol consumption. **Methods:** A cross-sectional survey of 1113 adolescents aged 12–17 years recruited with a variety of methods to gain a cross-section of participants across metropolitan, regional and rural New South Wales (including independent schools, mall intercepts and online). Participants answered a series of questions assessing adolescents' exposure to alcohol advertising across eight media (including television, Internet and point-of-sale). Alcohol consumption was assessed using three questions (initiation, recent consumption and frequency of consumption in the previous 12 months). **Results:** The majority indicated that they had been exposed to alcohol advertisements on television, in newspapers and magazines, on the Internet, on billboards/posters and promotional materials and in bottleshops, bars and pubs; exposure to some of these types of alcohol advertisements was associated with increased alcohol consumption, with differences by age and gender. **Conclusion:** The results are consistent with studies from other countries and suggest that exposure to alcohol advertisements among Australian adolescents is strongly associated with drinking patterns. Given current high levels of drinking among Australian youth, these findings suggest the need to address the high levels of young people's exposure to alcohol advertising.

INTRODUCTION

Underage consumption of alcohol is a major problem in Australia. The Australian School Students Alcohol and Drugs Survey (White and Hayman, 2006) recently established that by the age of 12, around 73% of students had tried alcohol; this increased steadily to around 80% by the age of 13, 86% by the age of 14 and 91% by the age of 15. The proportion of students reporting drinking in the week prior to the survey increased with age, from 10% of 12 year olds to 27% of 14 year olds and 49% of 17 year olds. These figures are concerning because underage alcohol consumption is associated with injuries, risky sexual behaviour, mental health problems and anti-social behaviour (Bonomo *et al.*, 2001). Regular alcohol consumption or binge drinking during adolescence also predicts heavier alcohol consumption, binge drinking and poor health outcomes in early and middle adulthood (Jefferis *et al.*, 2005; Pitkanen *et al.*, 2008).

The role of advertising

Mass media, and alcohol advertising in particular, has been shown to influence the alcohol-related attitudes and behaviours of young people (Anderson *et al.*, 2009a). As a result, there has been considerable focus on alcohol advertising among both researchers and policy makers in an effort to improve the regulation of unacceptable advertising practices.

A number of cross-sectional studies have examined the effects of alcohol advertising on young people's alcohol awareness, attitudes, intentions and drinking behaviours (see Anderson *et al.*, 2009a, for a review). Most of these studies have been conducted in the USA, and have focused on television and/or magazine advertising; they have consistently demonstrated that young people are heavily exposed to alcohol advertising (e.g. Garfield *et al.*, 2003; Jernigan *et al.*, 2005; Center on Alcohol Marketing and Youth, 2006a, b;

Jernigan, 2006). Furthermore, exposure to, and liking of, alcohol advertising has been linked with drinking intentions and behaviours (e.g. Austin and Knaus, 2000; Fleming *et al.*, 2004; Chen *et al.*, 2005; Hurtz *et al.*, 2007).

While the direction of causation cannot be determined from cross-sectional studies, more recently a number of longitudinal studies have been conducted which indicate that alcohol advertising leads to increased alcohol consumption in young people (Anderson *et al.*, 2009a). The first longitudinal study of the influence of alcohol advertising, conducted in New Zealand, found that young people's recall of alcohol advertisements increased between the ages of 13 and 15, and that among males greater recall of alcohol advertising at age 15 was associated with higher rates of beer drinking at age 18 (Connolly *et al.*, 1994). In a study of over 2000 middle school students in Los Angeles, exposure to television alcohol advertisements in the seventh grade predicted alcohol consumption, and the frequency of consuming three or more alcoholic drinks on at least one occasion, in eighth grade (Stacy *et al.*, 2004).

Similarly, among 3000 South Dakotan high school students, exposure to in-store beer displays in seventh grade predicted onset of drinking by ninth grade, whilst exposure to magazine advertising for alcohol, and to beer concessions at sports or music events, predicted frequency of drinking in ninth grade (Ellickson *et al.*, 2005). Collins *et al.* (2007) found that, after adjusting for covariates, exposure to alcohol marketing (including media advertising, store advertising and ownership of promotional merchandise) in sixth grade predicted seventh-grade drinking and intentions to drink; and young people exposed to more alcohol advertising were 50% more likely to report alcohol consumption. Pasch *et al.* (2007) also found that exposure to outdoor advertisements (e.g. billboards and bus stops) and storefront advertising during sixth-grade predicted alcohol behaviours, attitudes and intentions at eighth grade after adjusting for a range of potential confounding variables (Pasch *et al.*, 2007). Snyder *et al.*

(2006) conducted an econometric examination and found that for each additional alcohol advertisement a young person was exposed to (above the monthly youth average of 23), alcohol consumption increased by 1%; and for each additional dollar per capita spent on alcohol advertising in a local market (above the national average of \$6.80 per capita), average alcohol consumption among young people increased by 3%.

Finally, a recent systematic review incorporating data from seven prospective cohort studies concluded that, consistent with the positive associations reported in cross-sectional surveys, there is evidence of a relationship between the amount of exposure to alcohol advertising or promotional activity at baseline and amount of alcohol consumed by young people at follow-up (Smith and Foxcroft, 2007).

Alcohol advertising in Australia

Australian adolescents, like their American counterparts, are exposed to a high level of alcohol advertising. For example, a recent Australian study, commissioned by the Commonwealth Department of Health and Ageing, analysed exposure to alcohol advertising via metropolitan free-to-air TV in Sydney and Melbourne, and found that exposure among 13–17 year olds was only slightly less than among 18–29 year olds (almost 90%). Importantly, the authors also cautioned that, while there are no data on exposure via subscription TV, we know that 32% of 13–17 year olds have access and that these young people spend more time watching subscription TV than free-to-air; and there are currently no restrictions on alcohol advertising on subscription TV (King *et al.*, 2005). Winter *et al.* (2008) reported that, from March 2005 to February 2006, teenagers (13–17 years) in Sydney were exposed to the same amount of alcohol advertising on free-to-air television as young adults (18–24 years), and children (0–12 years) were exposed to almost half as much alcohol advertising as teenagers.

The Alcohol & Public Policy Group report that countries with greater restrictions on advertising have fewer alcohol-related problems (International Centre for Alcohol Policies, 2001). Of 119 countries surveyed in 1996, seven had a complete ban on alcohol advertising; 45 restricted alcohol advertising by statutory legislation; 21 combined statutory legislation with self-regulation; 17 were solely self-regulated (including Australia) and the remainder (primarily developing countries) had no or limited controls (International Centre for Alcohol Policies, 2001). In Australia, two industry self-regulation codes apply to alcohol advertisements: the AANA Advertiser Code of Ethics, which applies to all forms of advertising and covers issues such as taste and the Alcoholic Beverages Advertising Code, which covers issues such as promotion of excessive consumption, appeal to children and depictions of success or mood enhancement.

There have been few studies examining the relationship between alcohol advertising and alcohol consumption in Australian adolescents. Several studies have assessed the nature, but not the extent, of alcohol advertising in magazines and/or on television—and these have consistently found that the messages in print advertising are inconsistent with the spirit, and in some cases the letter, of the self-regulatory advertising code (Jones and Donovan, 2002; Jones and Donovan, 2001; Donovan *et al.*, 2007; Jones *et al.*, 2008); and that the messages received by young people

encourage alcohol consumption and offer rewards for drinking (Jones and Donovan, 2001; Jones *et al.*, 2009). There are three published papers on point-of-sale advertising in Australia, all reporting small-scale pilot studies (Smith *et al.*, 2005; Jones and Lynch, 2007a, b).

Objectives of the paper

Underage drinking is a major problem in Australia and may be influenced by exposure to alcohol advertising. The objective of the present study was to collect data on 12–17 year old Australian adolescents' exposure to different types of alcohol advertising and examine the association between exposure to advertising and alcohol consumption.

METHODS

Participants

Adolescents (12–17 years) were recruited to complete a quantitative survey on drinking patterns and recall of exposure to advertising, with a variety of methods utilized to gain a cross-section of participants across metropolitan, regional and rural New South Wales (NSW). Four independent (i.e. non-government) high schools distributed surveys to students aged 12–17 years ($n=279$); intercept surveys were conducted at shopping malls ($n=210$); focus group participants from a parallel study (a focus group study on consumption of alcopops) completed the survey ($n=116$); and the social networking site 'Facebook' was used to recruit participants to complete an online version of the survey ($n=508$). Data collected online were available in a format that could easily be combined with the remaining surveys (which had been entered manually); and an indicator variable was used to signify whether surveys were completed online or in hard copy to detect any likely sources of systematic error that may be attributable to the survey medium. It is possible that the type of recruitment may have biased the results. As a consequence, adjustment is made in the analyses, as outlined below.

Participants who completed the survey had to be between the ages of 12–17 years and currently living in NSW. After removing invalid responses (from participants outside the target age group and area of residence; and those without complete responses to all items), a total of 1113 were entered into the analysis.

The study protocol was approved by the University's Human Research Ethics Committee, and all participants provided informed consent.

Materials

The questionnaire included items on age (coded as 12–15 years and 16–17 years), gender and country of birth (coded as 'born in Australia' and 'born overseas'). Religion was assessed through an open-ended question, with responses coded as 'No religion/atheist' or 'Christian/Other Religion'. Participants were asked about patterns of alcohol consumption among their family and friends: whether mother and/or father consumed alcohol ('yes, no, not sure, do not have/see this parent'); whether brother(s) and/or sister(s) consumed alcohol ('yes, no, don't know, only child'). Participants were

asked whether any of their friends regularly consumed alcohol (yes, no).

A series of questions assessed whether young people had been exposed to alcohol advertising. This involved asking participants to indicate whether they had seen alcohol advertising in any of the following media: television, newspapers, magazines, bars or pubs, billboards/posters, the Internet and promotional materials; and whether they had ever seen alcohol advertisements in a bottleshop (store that sells alcohol for off-premise consumption). This is important because in Australia, take-away alcohol is only sold in bottle-shops/liquor stores; this is different to many other countries (such as the USA) where alcohol is sold in convenience stores or supermarkets. For each medium, participants responded by selecting yes (i.e. had been exposed to the advertising medium) or no.

We assessed alcohol consumption using three questions; first, whether the individual had ever consumed alcohol ('never', 'a few sips', '<10 drinks' and '≥10 drinks': Hingson *et al.*, 2006; Buchmann *et al.*, 2009 defined alcohol initiation as having consumed 'one or more full drinks'); second, about the frequency of alcohol consumption in the previous 12 months ('less than monthly' or 'more than monthly' which is referred to as 'regular alcohol consumption' in the remainder of this paper); third, about consumption of any alcohol in the previous 4 weeks ('no consumption' or 'some consumption' which is referred to as 'recent alcohol consumption' in the remainder of this paper).

Statistical analysis

The relationship between exposure to each type of alcohol advertising and alcohol consumption (initiation, recent consumption and regular consumption) was examined using logistic regression. In the unadjusted analyses, each type of alcohol advertising was entered into a separate model predicting alcohol consumption (i.e. initiation, recent consumption and regular consumption). In the adjusted analyses, the relationship between exposure to each type of alcohol advertising and alcohol consumption was examined controlling for age, gender, country of birth, religion, mother's alcohol consumption, father's alcohol consumption, siblings' alcohol consumption and friends' alcohol consumption. Since the source of recruitment (facebook, school survey etc.) had the potential to bias the results, this was also included as a covariate in the analyses.

The analyses were conducted on the entire sample and then in each of the four age and sex groups (i.e. males aged 12–15 years, males aged 16–17 years, females aged 12–15 years and females aged 16–17 years). The results are reported in terms of unadjusted and adjusted odds ratios (AORs) with *P* values <0.05 considered statistically significant.

RESULTS

The demographic characteristics of the sample (*n* = 1113) are presented in Table 1. A total of 60.9% of participants had initiated alcohol consumption (i.e. more than a few sips), increasing from 40.9 to 76.6% across the two age groups. A total of 38.4% indicated that they had regularly consumed

Table 1. Demographic characteristics of the sample of Australian adolescents

	12–15 years (<i>n</i> = 489)		16–17 years (<i>n</i> = 624)		Total (<i>n</i> = 1113)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender						
Male	208	42.5	238	38.1	446	40.1
Female	281	57.5	386	61.9	667	59.9
Religion						
Christian/other religion	352	72.0	406	65.1	758	68.1
No religion	137	28.0	218	34.9	355	31.9
Country of birth						
Australia	441	90.2	543	87.0	984	88.4
Other	48	9.8	81	13.0	129	11.6
Ever consumed alcohol						
Never/a few sips	289	59.1	146	23.4	435	39.1
1 drink or more	200	40.9	478	76.6	678	60.9
Frequency of consumption in past 12 months						
Regular (>monthly)	123	25.2	304	48.7	427	38.4
<monthly	366	74.8	320	51.3	686	61.6
Alcohol consumption in the past 4 weeks						
Yes	145	29.7	349	55.9	494	44.4
No	344	70.3	275	44.1	619	55.6
Any of your friends drink alcohol						
Yes	225	46.0	497	79.6	722	64.9
No	264	54.0	127	20.4	391	35.1
Does your mother drink alcohol						
Yes	297	60.7	439	70.4	736	66.1
No	192	39.3	185	29.6	377	33.9
Does your father drink alcohol						
Yes	354	72.4	475	76.1	829	74.5
No	135	27.6	149	23.9	284	25.5
Brother(s)/sister(s) drink alcohol						
Yes	195	39.9	337	54.0	532	47.8
No	294	60.1	287	46.0	581	52.2
Ever seen an alcohol advertisement:						
On television	462	94.5	586	93.9	1048	94.2
In a magazine	348	71.2	483	77.4	831	74.7
In a newspaper	228	46.6	363	58.2	591	53.1
On the Internet	260	53.2	357	57.2	617	55.4
On a billboard/poster	281	57.5	395	63.3	676	60.7
In a bottleshop	366	74.8	513	82.2	879	79.0
In a bar or club	250	51.1	347	55.6	597	53.6
On promotional materials	208	42.5	364	58.3	572	51.4

alcohol in the previous 12 months (increasing from 25.2 to 48.7% across the age groups); and 44.4% indicated that they had consumed alcohol recently (increasing from 29.7 to 55.9%).

Nearly all participants indicated that they had seen alcohol advertising on television (94.2%) with the majority indicating that they had seen advertisements for alcohol in bottle-shops (79.0%); while our question was worded as 'in a bottleshop' it is possible that some of our respondents may have been referring to seeing advertising on the outside of a bottleshop or, in the case of a bottleshop attached to a supermarket, by seeing the interior from within the supermarket.) and in magazines (74.7%). About half indicated that they had seen alcohol advertisements on a billboard or poster (60.7%), on the Internet (55.4%), in a bar/pub (53.6%), in a newspaper (53.1%) or on promotional material (51.4%).

Associations between alcohol consumption and advertising

Advertising and alcohol initiation

In the full sample (see Table 2), individuals who indicated that they had seen alcohol advertisements in a magazine

Table 2. The association between reported exposure to alcohol advertising and alcohol consumption

	OR	95% CI	AOR ^a	95% CI
Alcohol initiation				
TV	1.12	0.67–1.85	0.91	0.47–1.74
Magazine	2.40*	1.82–3.16	1.69*	1.20–2.38
Newspaper	1.35*	1.06–1.72	0.96	0.71–1.29
Internet	1.47*	1.15–1.87	1.26	0.93–1.70
Billboard	1.33*	1.04–1.70	1.00	0.73–1.37
Bottleshop	2.15*	1.61–2.88	1.49*	1.04–2.14
Bar	2.00*	1.57–2.55	1.49*	1.10–2.01
Promotional	2.10*	1.64–2.68	1.36*	1.01–1.84
Alcohol consumption in the past 12 months				
TV	0.71	0.43–1.18	0.55*	0.30–0.99
Magazine	1.89*	1.41–2.54	1.32	0.93–1.86
Newspaper	1.34*	1.05–1.71	1.04	0.78–1.38
Internet	1.17	0.92–1.50	0.99	0.74–1.32
Billboard	1.25	0.97–1.60	1.07	0.80–1.45
Bottleshop	1.87*	1.36–2.57	1.35	0.94–1.95
Bar	2.19*	1.65–2.71	1.69*	1.27–2.25
Promotional	1.52*	1.20–1.95	1.06	0.79–1.41
Drink in the past 4 weeks				
TV	0.87	0.53–1.43	0.69	0.38–1.24
Magazine	2.06*	1.55–2.74	1.54*	1.11–2.14
Newspaper	1.40*	1.10–1.77	1.13	0.86–1.49
Internet	1.52*	1.19–1.93	1.36*	1.03–1.79
Billboard	1.30*	1.02–1.66	1.06	0.80–1.42
Bottleshop	1.80*	1.33–2.43	1.29	0.91–1.83
Bar	1.89*	1.49–2.41	1.44*	1.09–1.91
Promotional	1.63*	1.28–2.06	1.17	0.89–1.54

^aOdds ratio adjusted for the following covariates: age, gender, mother drink, father drink, country of birth and religion.

**P* < 0.05.

(AOR = 1.69; 1.20–2.38), bottleshop (AOR = 1.49; 1.04–2.14), pub/bar (OR = 1.49; 1.10–2.01) or on promotional materials (AOR = 1.36; 1.00–1.84) were significantly more likely to have initiated alcohol consumption. The specific types of advertising exposure associated with alcohol initiation differed significantly by age and sex as shown in Table 3. Among males and females aged 12–15 years and males aged 16–17 years, after adjusting for covariates, there was no association between alcohol initiation and exposure to alcohol media of any type.

Among females aged 16–17 years, alcohol initiation was associated with recalling exposure to alcohol advertising in magazines (AOR = 1.85; 1.05–3.26), bottleshops (AOR = 2.04; 1.11–3.74) and bars/pubs (AOR = 2.22; 1.32–3.74).

Advertising and regular alcohol consumption (in the previous 12 months)

In the full sample (see Table 2), exposure to alcohol advertising in a pub/bar (AOR = 1.69; 1.27–2.25) was associated with regular alcohol consumption in the previous 12 months. In contrast, having seen an alcohol advertisement on TV was associated with reduced odds of regular alcohol consumption (AOR = 0.55; 0.30–0.99). The relationships between advertising exposure and regular alcohol consumption differed by age and sex groups (see Table 4). For example, among males aged 12–15 years, exposure to Internet advertising was associated with regular alcohol consumption (AOR = 2.18; 1.02–4.70). For males aged 16–17 years, exposure to alcohol advertising in a bottleshop (AOR = 2.88; 1.21–6.90) or bar/pub (AOR = 2.10; 1.13–3.88) was associated with regular

Table 3. The association between advertising and alcohol initiation according to age and sex groups

	OR	95% CI	AOR ^a	95% CI
Males aged 12–15 years				
Television	2.66	0.54–13.15	1.69	0.19–15.42
Magazine	2.50*	1.33–4.72	1.14	0.50–2.58
Newspaper	1.31	0.75–2.27	0.97	0.47–2.00
Internet	1.70	0.98–2.96	1.52	0.74–3.12
Billboard	1.49	0.85–2.60	0.91	0.43–1.94
Bottleshop	2.02*	1.06–3.83	1.29	0.57–2.92
Bar	2.04*	1.16–3.57	1.18	0.56–2.52
Promotional materials	2.38*	1.36–4.19	1.52	0.73–3.16
Males aged 16–17 years				
Television	0.94	0.19–4.56	0.37	0.05–2.53
Magazine	1.92	0.96–3.85	1.43	0.62–3.32
Newspaper	0.89	0.46–1.71	0.66	0.30–1.44
Internet	0.64	0.33–1.22	0.53	0.24–1.16
Billboard	0.61	0.30–1.22	0.46	0.19–1.11
Bottleshop	2.10	0.99–4.44	1.12	0.46–2.71
Bar	1.06	0.56–2.01	0.71	0.33–1.54
Promotional materials	1.04	0.54–1.99	0.73	0.33–1.59
Females aged 12–15 years				
Television	1.04	0.39–2.78	0.44	0.13–1.50
Magazine	3.30*	1.78–6.12	2.08	0.99–4.35
Newspaper	1.30	0.81–2.10	1.30	0.71–2.38
Internet	1.76*	1.08–2.89	1.33	0.72–2.46
Billboard	1.47	0.90–2.40	1.06	0.57–1.96
Bottleshop	1.48	0.82–2.66	0.99	0.47–2.05
Bar	2.45*	1.50–4.00	1.49	0.81–2.74
Promotional materials	2.10*	1.28–3.43	1.46	0.79–2.70
Females aged 16–17 years				
Television	1.01	0.41–2.45	1.05	0.40–2.78
Magazine	2.09*	1.25–3.50	1.85*	1.05–3.26
Newspaper	1.09	0.68–1.73	0.89	0.53–1.49
Internet	1.73*	1.08–2.75	1.66	1.00–2.77
Billboard	1.37	0.86–2.19	1.41	0.82–2.40
Bottleshop	2.56*	1.48–4.41	2.04*	1.11–3.74
Bar	2.49*	1.54–4.02	2.22*	1.32–3.74
Promotional materials	1.67*	1.05–2.66	1.35	0.81–2.25

^aOdds ratio adjusted for the following covariates: country of birth, religion, mother drinks alcohol, father drinks alcohol and friends drink alcohol.

**P* < 0.05.

alcohol consumption. Alcohol advertising on TV was associated with a reduced likelihood of regular alcohol consumption in this group (AOR = 0.16; 0.03–0.92). Exposure to alcohol advertisements in a bar/pub predicted greater alcohol consumption among females aged 12–15 years (AOR = 2.73; 1.29–5.76); TV advertising was associated with a reduced likelihood of regular consumption (AOR = 0.24; 0.06–0.91). None of the advertising media was associated with regular alcohol consumption among females aged 16–17 years.

Advertising and recent alcohol consumption

In the full sample (see Table 2), recent alcohol consumption was associated with exposure to alcohol advertising in a magazine (AOR = 1.54; 1.11–2.14), on the Internet (AOR = 1.36; 1.03–1.79) or in a pub/bar (AOR = 1.44; 1.09–1.91). When the analyses were broken down by age and sex (see Table 5), alcohol advertising in magazines (AOR = 2.38; 1.03–5.61) and on the Internet (AOR = 3.05; 1.45–6.40) was associated with alcohol consumption among males aged 12–15 years. In females aged 12–15 years, advertisements in newspapers (AOR = 2.15; 1.12–4.13) and bars/pubs (AOR = 2.11; 1.08–4.10) were associated with recent alcohol consumption. Exposure to TV advertising was associated with

Table 4. The association between advertising and regular alcohol consumption in adolescents according to age and sex groups

	OR	95% CI	AOR ^a	95% CI
Males aged 12–15 years				
Television	1.21	0.24–5.99	0.75	0.10–5.37
Magazine	2.04	0.97–4.29	1.09	0.45–2.67
Newspaper	1.06	0.57–1.97	0.90	0.42–1.89
Internet	1.95*	1.03–3.68	2.18*	1.02–4.70
Billboard	1.59	0.84–3.03	1.44	0.67–3.09
Bottleshop	1.30	0.64–2.65	0.91	0.39–2.11
Bar	1.39	0.74–2.61	1.08	0.50–2.33
Promotional materials	1.36	0.73–2.54	1.01	0.46–2.19
Males aged 16–17 years				
Television	0.46	0.12–1.84	0.16*	0.03–0.92
Magazine	1.47	0.80–2.71	1.21	0.59–2.48
Newspaper	0.95	0.56–1.62	0.78	0.42–1.44
Internet	0.72	0.43–1.21	0.70	0.38–1.29
Billboard	0.75	0.44–1.29	0.79	0.41–1.53
Bottleshop	3.61*	1.71–7.63	2.88*	1.21–6.90
Bar	2.48*	1.44–4.25	2.10*	1.13–3.88
Promotional materials	1.02	0.60–1.74	0.88	0.47–1.63
Females aged 12–15 years				
Television	0.64	0.23–1.78	0.24*	0.06–0.91
Magazine	2.10*	1.06–4.18	1.02	0.43–2.43
Newspaper	1.60	0.93–2.75	1.95	0.96–3.96
Internet	1.39	0.80–2.42	1.07	0.53–2.19
Billboard	1.16	0.67–2.02	0.70	0.34–1.43
Bottleshop	1.58	0.79–3.17	1.19	0.49–2.88
Bar	3.61*	1.99–6.53	2.73*	1.29–5.76
Promotional materials	2.31*	1.33–4.01	1.70	0.85–3.40
Females aged 16–17 years				
Television	0.72	0.34–1.57	0.78	0.34–1.78
Magazine	1.79*	1.09–2.93	1.61	0.95–2.75
Newspaper	1.22	0.82–1.82	1.00	0.64–1.55
Internet	1.07	0.71–1.60	0.92	0.59–1.44
Billboard	1.35	0.89–2.05	1.38	0.86–2.21
Bottleshop	1.40	0.83–2.36	1.13	0.64–2.02
Bar	1.67*	1.11–2.49	1.45	0.94–2.25
Promotional materials	1.10	0.73–1.64	0.92	0.59–1.44

^aOdds ratio adjusted for the following covariates: country of birth, religion, mother drinks alcohol, father drinks alcohol and friends drink alcohol.
**P* < 0.05.

reduced odds of recent consumption in males aged 16–17 years (AOR = 0.12: 0.02–0.82). However, none of the other advertising factors were associated with increased odds of recent alcohol consumption in males or females aged 16–17 years. The lack of significant associations could reflect that more than half of these individuals (55.9%) had consumed alcohol in the previous 4 weeks.

DISCUSSION

We observed that many young Australians were regularly consuming alcohol. For example, nearly half of the young people surveyed had consumed alcohol in the previous 4 weeks, with 38.4% indicating that they had consumed alcohol on a regular basis in the previous 12 months. Many younger adolescents (i.e. 12–15 year olds) also reported regular and recent alcohol consumption.

The majority indicated that they had been exposed to alcohol advertisements on television, in newspapers and magazines, on the Internet, on billboards/posters and promotional materials and in bottleshops, bars and pubs. Our results show higher awareness of in-store promotions,

Table 5. The associations between advertising and recent alcohol according to age and sex groups

	OR	95% CI	AOR ^a	95% CI
Males aged 12–15 years				
Television	3.97	0.49–32.41	2.54	0.24–26.75
Magazine	3.65*	1.72–7.74	2.38*	1.00–5.67
Newspaper	1.31	0.73–2.35	1.45	0.72–2.94
Internet	2.64*	1.45–4.82	3.05*	1.45–6.40
Billboard	1.52	0.84–2.76	1.16	0.56–2.43
Bottleshop	1.57	0.80–3.09	1.14	0.51–2.55
Bar	1.69	0.94–3.06	1.39	0.66–2.92
Promotional materials	1.89	1.05–3.41	1.56	0.75–3.25
Males aged 16–17 years				
Television	0.36	0.07–1.72	0.12*	0.02–0.82
Magazine	1.30	0.70–2.41	1.02	0.49–2.11
Newspaper	0.95	0.55–1.63	0.88	0.47–1.64
Internet	1.01	0.60–1.72	0.92	0.50–1.71
Billboard	0.67	0.39–1.17	0.54	0.28–1.07
Bottleshop	2.32*	1.16–4.62	1.62	0.72–3.61
Bar	1.40	0.82–2.39	1.05	0.57–1.93
Promotional materials	1.09	0.63–1.87	0.95	0.51–1.77
Females aged 12–15 years				
Television	1.00	0.34–2.90	0.49	0.14–1.71
Magazine	2.53*	1.28–5.01	1.39	0.62–3.12
Newspaper	1.96*	1.15–3.32	2.15*	1.12–4.13
Internet	1.51	0.88–2.59	1.19	0.61–2.30
Billboard	1.48	0.86–2.54	1.28	0.66–2.47
Bottleshop	1.49	0.77–2.89	1.10	0.50–2.43
Bar	3.25*	1.86–5.70	2.11*	1.08–4.10
Promotional materials	2.03*	1.19–3.45	1.64	0.86–3.12
Females aged 16–17 years				
Television	0.73	0.33–1.61	0.74	0.32–1.72
Magazine	1.72*	1.07–2.79	1.59	0.95–2.65
Newspaper	1.08	0.72–1.62	0.94	0.61–1.45
Internet	1.47	0.98–2.20	1.37	0.89–2.12
Billboard	1.41	0.94–2.14	1.40	0.89–2.21
Bottleshop	1.53	0.91–2.56	1.29	0.74–2.25
Bar	1.68*	1.12–2.51	1.48	0.96–2.27
Promotional materials	1.11	0.74–1.65	1.04	0.67–1.61

^aOdds ratio adjusted for the following covariates: country of birth, religion, mother drinks alcohol, father drinks alcohol and friends drink alcohol.
**P* < 0.05.

television advertising, newspaper/magazine advertising and Internet advertising than those found in a survey of 1000 13 year olds in the UK (Gordon *et al.*, 2011); the levels of awareness of billboards or posters and branded promotional materials were similar. A Californian qualitative study with 304 middle school and high school students found high awareness of alcohol advertisements from television, magazines, newspapers, billboards, in-store, Internet and on promotional material (Center for Applied Research Solutions, 2006). These studies suggest that exposure to alcohol marketing among very young adolescents is not a uniquely Australian phenomenon.

We found that exposure to some of these types of alcohol advertisements was associated with increased alcohol consumption. Overall, exposure to alcohol advertising in magazines, bottleshops, pubs/bars and via promotional materials was associated with alcohol initiation. Alcohol advertising in pubs/bars was associated with regular consumption in the previous 12 months; and magazine, Internet and pub/bar advertising was associated with consumption in the past 4 weeks.

The nature of these associations differed by age and gender, as was the case in the Connolly *et al.* (1994) longitudinal study. This is important because it suggests that

alcohol advertising could have different effects across age and gender. Among younger and older males and younger females, none of the advertising media were associated with alcohol initiation (after controlling for other factors). This is perhaps not surprising, given that there is strong evidence that a range of other factors—such as participation in sporting teams (Lorente *et al.*, 2004) and peer/family drinking patterns (Bahr *et al.*, 1995)—also influence alcohol initiation in adolescents. Thus, it is possible that such factors play a more important role in influencing alcohol initiation among males and younger females than does advertising (although advertising appears to influence frequency and amount of consumption in these groups). Among females aged 16–17 years, exposure to alcohol advertising in magazines, bottle-shops and pubs/bars was associated with alcohol initiation, suggesting that strategies to reduce such exposure could perhaps be targeted as a way to delay alcohol initiation among females.

Among young males, exposure to advertising through the Internet and magazines was associated with recent alcohol consumption, with Internet advertising also associated with regular alcohol consumption. The findings for Internet advertising are of concern, given the increasing rates of Internet use among young people and the difficulties of regulating advertising content in this medium. Thus, although there was no clear evidence that advertising was associated with alcohol initiation among young males, the present results may suggest that alcohol advertising influences drinking habits. The association between alcohol consumption and exposure to alcohol advertising in magazines is also important. Many magazines in Australia that are technically for adults (and hence are allowed to include alcohol advertising) have a high youth readership. These results suggest that stricter regulation of alcohol advertising in magazines with high youth readership is required; this issue has also been identified in the USA (Siegel *et al.*, 2008).

Among older males, alcohol advertising at the point-of-sale (i.e. bottle-shops and pubs/bars) was significantly associated with regular alcohol consumption. This is not surprising given that the majority of males of this age had already initiated alcohol consumption and were more likely to be familiar with and exposed to alcohol advertising at the point-of-sale.

For young female adolescents, alcohol advertisements in a bar/pub were associated with recent alcohol consumption and regular alcohol consumption; newspaper advertisements also predicted recent consumption. The findings for alcohol advertisements in bars/pubs (for both males and females) are interesting given that the legal drinking age in Australia is 18 years. Adolescents aged <18 years are allowed to enter bars/pubs with a responsible adult (e.g. a family member); thus, entering a bar/pub could occur through involvement in an affiliated sport team or through a family activity such as a meal. Even though adolescents are unable to legally consume alcohol in these venues, they are still exposed to alcohol advertising and adults' drinking behaviours. These findings may indicate the need to reconsider policies and regulations regarding the visibility of alcohol advertisements in these venues.

There are several possible explanations for the observed associations in this study. First, it is possible that increased exposure to alcohol advertising contributes to increased

alcohol consumption in young people, by promoting positive attitudes to alcohol (Anderson *et al.*, 2009a). Although many studies examining the associations between alcohol advertising and alcohol consumption in young people have been cross-sectional, there are an increasing number of longitudinal studies that demonstrate that exposure to alcohol advertising does have an impact on young people's drinking behaviour (Anderson *et al.*, 2009a). For example, a recent study in the UK found an association between involvement with, and awareness of, alcohol marketing and drinking uptake or increased frequency of drinking (Gordon *et al.*, 2010). However, it is also possible that young people who regularly consume alcohol are more likely to remember and recall alcohol advertisements. Unfortunately, because the present data are cross-sectional, we are unable to determine the direction of causation in this paper.

The findings for alcohol initiation, particularly among older adolescent females, are of concern. While the association between initiation and exposure via on-premise and off-premise marketing is likely to operate in both directions (exposure leads to initiation and initiation leads to exposure), we found a strong association between exposure to magazine advertisements for initiation of drinking among older adolescent females. This latter finding—combined with findings from qualitative studies of reasons for drinking initiation, content analyses of Australian print alcohol advertising, and survey studies of young people's responses to these advertisements (Jones and Donovan, 2001; Jones *et al.*, 2009)—suggests that advertising exposure via magazines is an important predictor of alcohol initiation among Australian adolescent females.

The present study is novel because although research conducted in the USA and UK has demonstrated that different forms of alcohol advertising are associated with underage drinking, to our knowledge there have been no similar studies conducted in Australia. Furthermore, most US studies have focused on television and magazine advertising, with very few studies examining the associations between adolescent drinking behaviours and exposure to other forms of alcohol advertising involving the Internet and promotions at the point-of-sale. Alcohol advertising and promotions at the point-of-sale is also an important factor, but has been largely ignored in Australia—perhaps due to the perception that as alcohol is only sold in licensed venues (i.e. not in convenience stores and supermarkets as in the USA) young people in this country are not exposed to point-of-sale marketing. However, our results suggest that many young people are exposed to point-of-sale alcohol promotions and this may impact on their drinking behaviour. This supports calls for the regulation of alcohol messages in point-of-sale advertising.

There are some limitations of this study that warrant discussion. The cross-sectional design means that we are unable to determine whether exposure to alcohol advertising causes underage drinking or *vice versa*. However, based on longitudinal data from other countries, it is plausible to conclude that at least among some young people, increased exposure to alcohol advertising influences drinking patterns. Furthermore, although we examined several types of alcohol advertising, we were not able to quantify the level of exposure. This is likely to be important because the impact of alcohol advertising on underage drinking could depend on

the amount of exposure to the different forms of advertising. Also, alcohol consumption was assessed using two relatively crude measures: (a) frequency of alcohol consumption in the previous year; and (b) recent alcohol consumption. Although these items provide an indication of young people's drinking behaviours, the use of more detailed measures that provide an indication of the amount and type of alcohol that young people are consuming will provide a more comprehensive insight into these relationships. Previous research has demonstrated that a range of factors including psychological expectations and exposure to family members being drunk are associated with alcohol consumption in adolescents. Although we did include data on adolescents' perceptions that their parents consumed alcohol, we did not have specific data relating to whether they had seen their parents drunk. We also did not have specific data relating to adolescents' psychological expectations associated with drinking. Therefore, although the present study controlled for factors such as age, gender, country of birth, exposure to parent and peer alcohol consumption, future research will need to also assess and control for these other variables. Finally, it is possible that the present sample is not representative of the Australian adolescent population and that the type of recruitment (particularly recruiting online) may have biased the results. Although this was controlled statistically in the present research, future research on more representative samples, taking into account the considerations raised above, will be important in further clarifying the nature of the association between advertising and alcohol consumption.

The strengths of the present study are the large sample size (particularly in the young adolescent age group) and the focus on Australian adolescents. This study therefore provides an important insight into the potential impact of alcohol advertising on the drinking habits of young people. The large sample size also allowed us to examine how the associations between different forms of alcohol advertising and alcohol consumption varied by age and sex.

In their analysis of the effectiveness of potential harm reduction strategies, Anderson *et al.* (2009b) concluded that young people in countries with higher exposure to alcohol advertising are more likely to increase their drinking as they enter adulthood and, importantly, that voluntary systems of alcohol marketing (self-regulation) are ineffective in preventing marketing content that influences young people. The recent Australian National Preventative Health Taskforce, aimed at changing the pro-drinking culture in Australia, identified an 'optimal package' of interventions, with the second priority (after introducing volumetric taxation) being bans on alcohol advertising (Doran *et al.*, 2010).

CONCLUSION

To our knowledge, this study provides the first insights into the potential impacts of different types of alcohol advertising on underage drinking in an Australian sample. The results are consistent with overseas studies and suggest that exposure to alcohol advertisements across a variety of media is strongly associated with drinking patterns. These findings are important because in the current environment, young people are exposed to at least some form of alcohol advertising, much of which is subject to limited, if any, regulation

on its placement, frequency and content. Researchers and policy makers therefore need to develop ways to minimize young people's exposure to alcohol advertising in order to reduce its impact on their drinking attitudes and behaviours.

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