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Review

Does Industry-Driven Alcohol Marketing Influence Adolescent Drinking Behaviour? A Systematic Review

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Abstract

Aim: To systematically review evidence on the influence of specific marketing components (Price, Promotion, Product attributes and Place of sale/availability) on key drinking outcomes (initiation, continuation, frequency and intensity) in young people aged 9–17.

Methods: MEDLINE, EMBASE, SCOPUS, PsychINFO, CINAHL and ProQuest were searched from inception to July 2015, supplemented with searches of Google Scholar, hand searches of key journals and backward and forward citation searches of reference lists of identified papers.

Results: Forty-eight papers covering 35 unique studies met inclusion criteria. Authors tended to report that greater exposure to alcohol marketing impacted on drinking initiation, continuation, frequency and intensity during adolescence. Nevertheless, 23 (66%) studies reported null results or negative associations, often in combination with positive associations, resulting in mixed findings within and across studies. Heterogeneity in study design, content and outcomes prevented estimation of effect sizes or exploration of variation between countries or age subgroups. The strength of the evidence base differed according to type of marketing exposure and drinking outcome studied, with support for an association between alcohol promotion (mainly advertising) and drinking outcomes in adolescence, whilst only two studies examined the relationship between alcohol price and the drinking behaviour of those under the age of 18.

Conclusion: Despite the volume of work, evidence is inconclusive in all four areas of marketing but strongest for promotional activity. Future research with standardized measures is needed to build on this work and better inform interventions and policy responses.

INTRODUCTION

Heavy drinking or high intensity alcohol use is the leading risk to health and well-being in young people, accounting for 7% of disability adjusted life years in 10–24-year olds globally (Gore *et al.*, 2011). Short-term implications, which pose the greater immediate

threat to health and well-being, include accidents, violence and assaults, early and unprotected sex, exacerbation of mental health problems, and poor school attendance and educational attainment (Witt, 2010). Acute problems may have lifetime consequences such as permanent disfigurement or unintended pregnancies. Early onset

or initiation of alcohol use has been reported to be a strong predictor of alcohol problems and dependence in adulthood (Grant *et al.*, 2001; Bonomo *et al.*, 2004; Kuntsche *et al.*, 2013), although a recent systematic review has challenged this finding, highlighting a lack of concrete and direct longitudinal data or evidence of tracking (Maimaris and McCambridge, 2013). Nevertheless, the longer and heavier an individual drinks, the greater the risk of developing chronic health problems such as liver disease or cancers later in life (Secretan *et al.*, 2009; Holmes *et al.*, 2014b; Williams *et al.*, 2014; Bagnardi *et al.*, 2015).

The impact of alcohol marketing on consumption has received considerable attention, both in terms of research and public policy, with the World Health Organisation (WHO) identifying the regulation of alcohol marketing as one of three 'best buy' policies for reducing harms in its Global Alcohol Strategy (World Health Organisation, 2010), alongside restrictions on availability and affordability. In reality, the marketing of alcohol is a complex process, comprising four well-established and interconnected domains: pricing, product launch and development (characteristics, image and branding), promotional activity (including both above and below the line advertising) and placement (point of sale marketing or distribution) (Hastings *et al.*, 2005; Sheron and Gilmore, 2016). A growing body of literature, including two systematic reviews, has reported an association between exposure to aspects of alcohol marketing and initiation or progression (continued use) of alcohol use among young people (Anderson *et al.*, 2009; Smith and Foxcroft, 2009). However, as the associated literature searches went up to 2008 and 2006, respectively, these reviews were unable to examine emergent marketing strategies, including digital marketing. Alcohol marketing communications are increasingly present in diverse forms, from traditional television advertisements to 'new media' platforms such as social network sites, viral campaigns and the sponsorship of products, services and events. Indeed, European alcohol advertising on the internet (post 2009) comprised one-fifth of the advertising expenditure of all media measured (internet, television, magazines and newspapers) (EACA, 2009). More recently, a third systematic review of longitudinal studies published since 2008, updating the systematic reviews conducted by Smith and Foxcroft (2009) and Anderson *et al.* (2009), concluded that young people who have greater exposure to alcohol marketing appear to be more likely to subsequently initiate alcohol use and engage in binge and hazardous drinking (Jernigan *et al.*, 2016).

Nevertheless, all three reviews considered only one aspect of marketing (promotion). Four further systematic reviews have considered marketing influences, including placement and availability (Meier *et al.*, 2008; Bryden *et al.*, 2012), price (Meier *et al.*, 2008), advertising (Meier *et al.*, 2008; Bryden *et al.*, 2012; Stutz *et al.*, 2016) and sports sponsorship (Brown, 2016) on alcohol consumption. Meanwhile, a recent systematic review has investigated the content of, and exposure to, alcohol marketing in relation to self-regulated guidelines (Noel *et al.*, 2016). However, these reviews included both adults and adolescents. One final systematic review has explored the relationship between exposure to internet-based alcohol content and alcohol use among young people (Gupta *et al.*, 2016). Yet, exposure measures of interest in this review were both user-generated and industry-led. Therefore, our study aimed to systematically review the evidence on the influence of specific alcohol marketing (Price, Promotion, Product and Placement) on behavioural drinking outcomes (initiation, continuation, frequency and intensity) for adolescents only (young people aged 9–17).

METHODS

Eligibility criteria

Primary studies of any design, published in the English language, which examined the relationship between marketing exposure and alcohol consumption outcomes among 9–17 (inclusive)-year olds were eligible for inclusion. Papers which also included participants aged 18 or more were excluded if data on adolescents were not presented separately. The exposure of interest was industry-led alcohol marketing. We defined this to include the following practices: (a) price promotions, discounts or changes, (b) promotion in terms of any measurable exposure to alcohol products/images or associated merchandise, (c) product launch and development (including characteristics, image and branding) and (d) placement point of sale marketing or distribution, including reported density of off-premise outlets (e.g. shops) and on-premise outlets (e.g. bars). We defined the 'alcohol industry' as any company that produces, markets or distributes alcoholic beverages (Brown, 2016). Thus, we excluded studies that focused upon aspects of alcohol availability (such as server behaviour, parental supply of alcohol) or policy-level intervention (such as minimum age laws, restrictions on hours, days and volumes of alcohol sales in a given community) not driven by industry. Studies reporting general media alcohol portrayal (e.g. seeing actors drinking alcohol in a TV show), product placement or where participants were presented with alcohol imagery and assessed in an artificial environment were also excluded from this review, as were studies reporting proxy outcome measures (e.g. alcohol-related hospital admissions; purchasing behaviour) or drinking intentions only without measuring effects on consumption. Whilst product placement is considered to be predominantly industry-led, it is difficult to disentangle this practice from general portrayal of alcohol products, resulting in little available data on drinking impact.

Search strategy

One author (S.S.) searched MEDLINE, EMBASE, SCOPUS, PsychINFO, CINAHL and ProQuest databases (including CSA Illumina) from inception to July 2015 using appropriate MeSH terms. The search was split into three core concepts—(a) alcohol consumption (initiation, continuation, frequency and intensity), (b) participants (young people aged 9–17) and (c) marketing techniques (full details of database-specific search terms available upon request from the corresponding author). Database searching was supplemented with searches of Google Scholar, hand searches of key journals and backward and forward citation searches of reference lists of identified papers. Key journals were defined as the most common five journals revealed by electronic searches. Relevant websites and grey literature (including theses, conference abstracts, unpublished/ongoing studies and reports) were also examined.

Study selection and data extraction

The title and abstract of all records retrieved were downloaded to Endnote X7 and independently screened by two reviewers (S.S. and R.T.), with full text copies of potentially relevant papers retrieved for in-depth review against the inclusion criteria. Uncertainties were resolved through discussion and referral to a third member of the review team (E.K.). Data were independently extracted by two authors (S.S. and R.T.) on study design; individuals' exposure to alcohol marketing; alcohol drinking behaviour; characteristics of the sample population; study results and author conclusions; limitations of the study; reported analyses and analysis type. Primary outcomes

of interest were reported changes in participants' behaviour in relation to drinking initiation, continuation, frequency and intensity measures. Odds ratios (OR), adjusted odds ratios (AOR), 95% confidence intervals (CI) and other measures reported were extracted. We defined mixed findings as any combination of positive associations, negative associations and null results. Negative associations were defined as significant decreases in drinking linked to alcohol marketing, whereas null results were defined as no reported effect of alcohol marketing on drinking behaviour.

Data synthesis and assessment of methodological quality

The methodological quality of all studies was assessed independently by two researchers (S.S. and R.T.) as strong, moderate or weak using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool (National Collaborating Centre for Methods and Tools, 1998); studies were not excluded on the basis of the overall quality rating. The aim of this review was to systematically identify and synthesize the full evidence base. Quality assessment supported data synthesis by providing an indication of the degree of confidence

that could be placed on findings from different studies based on their risk of bias. Studies were combined using narrative synthesis, structured according to drinking outcome of interest (e.g. initiation) followed by marketing technique (e.g. price). Heterogeneity in terms of study designs, study populations and the exposure/outcomes measured precluded the use of meta-analytical techniques. Reporting adhered to PRISMA statement guidelines (Moher *et al.*, 2009).

RESULTS

Description of included studies

The review identified 48 publications covering 35 unique or 'index' studies (see Fig. 1). Analysis focused on the latter (but flagged linked references) to avoid placing undue weight on specific evaluations due to multiple reports. Participants ranged between 9 and 17 years old at baseline; sample sizes ranged from 172 to 371,194 participants. In total, 57% ($n = 20$) of the studies originated in the USA (Workman, 2003; Stacy *et al.*, 2004; Zogg, 2004; Ellickson *et al.*, 2005; McClure *et al.*, 2006; Saffer and Dave, 2006; Collins *et al.*, 2007; Fisher *et al.*, 2007; Paschall *et al.*, 2007; Dumsha, 2008;

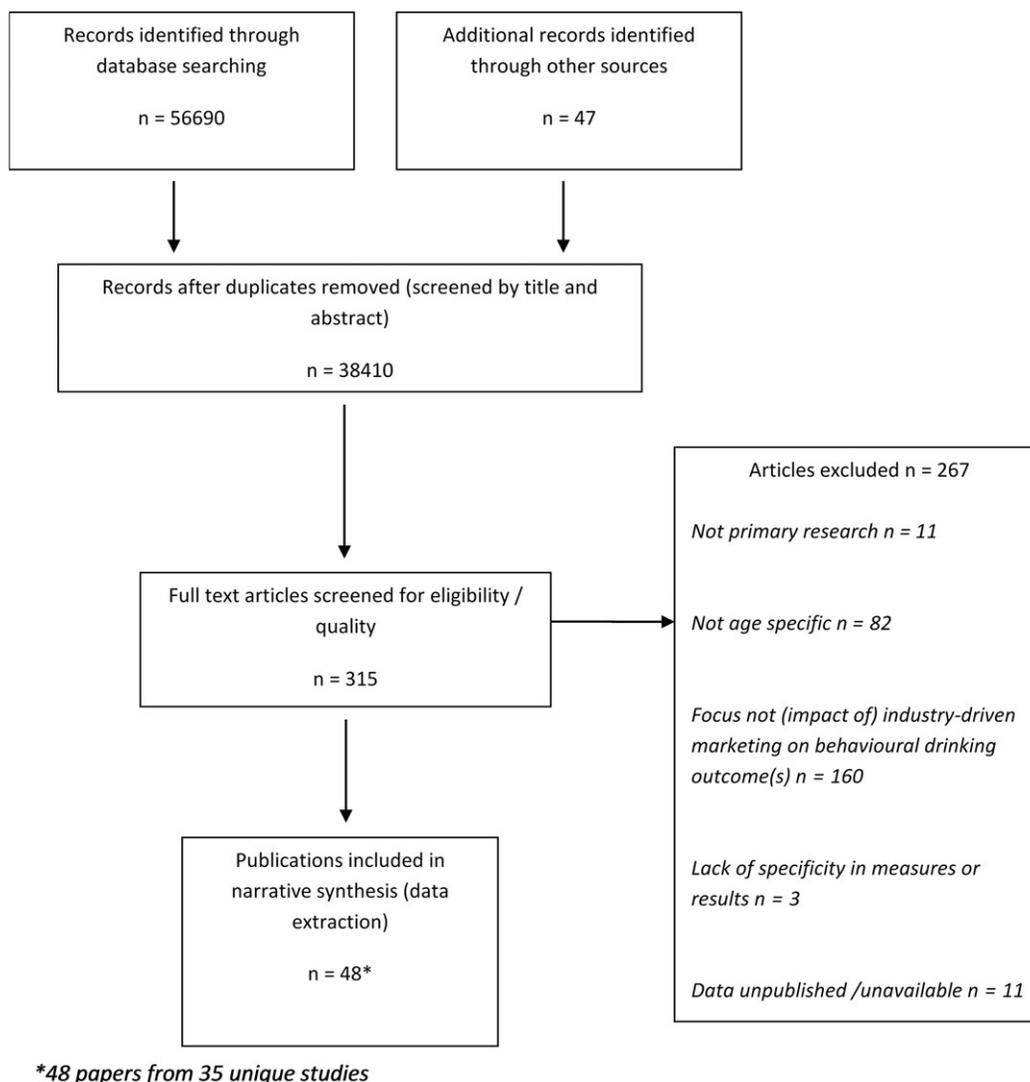


Fig. 1. Flow chart showing study selection process.

Grenard, 2008; Henriksen *et al.*, 2008; Truong, 2008; McClure *et al.*, 2009; Pasch *et al.*, 2009; Tobler, 2009; Tobler *et al.*, 2009; Truong and Sturm, 2009; Chen *et al.*, 2010; Dumsha, 2011; Reboussin *et al.*, 2011; Shamblen *et al.*, 2011; Stanley *et al.*, 2011; Tobler *et al.*, 2011; Stoolmiller *et al.*, 2012; Grenard *et al.*, 2013; Lo *et al.*, 2013a, b; McClure *et al.*, 2013; Rowland *et al.*, 2014), 6% ($n = 2$) from the UK (Gordon *et al.*, 2010a, b; Gordon, 2011; Young *et al.*, 2013), 9% ($n = 3$) from Australia (Jones and Magee, 2011; Rowland *et al.*, 2014; Azar *et al.*, 2016), 6% ($n = 2$) from New Zealand (Huckle *et al.*, 2008; Lin *et al.*, 2012) and one study from Denmark (Bendtsen *et al.*, 2013), Brazil (Faria *et al.*, 2011), Switzerland (Kuntsche *et al.*, 2008), Zambia (Swahn *et al.*, 2011), the Philippines (Swahn *et al.*, 2013) and the Netherlands (van Hoof *et al.*, 2008). Two further studies (6%) spanned several European countries, with data collected in Germany, Italy, Scotland, the Netherlands and Poland (de Bruijn *et al.*, 2012; Anderson *et al.*, 2012; Morgenstern *et al.*, 2014; de Bruijn *et al.*, 2016a, b). The majority of studies focused exclusively on alcohol promotion ($n = 14$, 40%) or its placement in retail outlets ($n = 13$, 37%), with a much smaller number examining price ($n = 1$) or the development, launch or branding of alcohol products ($n = 1$) only. The remaining studies cut across more than one area of marketing ($n = 6$). Categorization of studies according to marketing focus was guided by criteria from the UK's National Institute for Health and Care Excellence (NICE) (2010) and the WHO (World Health Organisation, 2010). A summary of included studies, including exposure and behavioural outcome measures, as well as participant characteristics (age, gender, ethnicity and socio-economic status where reported) is provided in the Supplementary material (Supplementary Table S1). The following sections and Supplementary Table S2 report findings first by methodological quality and then by key drinking outcomes (initiation, continuation, frequency and intensity) and marketing technique (Price, Placement, Product and Promotion). Finally, Supplementary Table S3 reports specifically on the relationship between alcohol promotions and binge drinking. Specific negative associations and null results are shaded grey in Supplementary Tables S2 and S3.

Methodological quality

Our assessment found that 46% ($n = 16$) of included studies were categorized as having a high risk of bias whilst 23% ($n = 8$) were categorized as methodologically strong. Most papers presented cross-sectional data, with a predominance of self-reported rather than objective exposure and outcome measures, precluding the possibility of causal attribution. One study reported findings from a quasi-experiment (Dumsha, 2008) whilst a third of studies ($n = 12$) were longitudinal in design, seven of which (58%) were categorized as methodologically 'strong', and better able to examine the impact of alcohol marketing from early to later adolescence and beyond (Stacy *et al.*, 2004; McClure *et al.*, 2006; Fisher *et al.*, 2007; Tobler, 2009; Shamblen *et al.*, 2011; de Bruijn *et al.*, 2012; Morgenstern *et al.*, 2014). Additional criteria drew these seven longitudinal and methodologically strong studies together. Six focused on alcohol promotional activity, with three studies specifically exploring the effect on reported consumption of owning alcohol merchandise. Outcome measures relating to drinking initiation and drinking volume also featured heavily in this subset of studies (five studies). Outcome measures reported in six (of seven) studies were dichotomized. Nevertheless, outcome measures were not standardized (and could not be combined statistically); and these longitudinal studies

continued to demonstrate heterogeneity in target behaviours and exposure measures.

Drinking initiation (10 studies; 4 methodologically strong)

Price: no studies

Placement: no studies

Product: $n = 1$

Dumsha (2008) reported null results and found the introduction of alcopops to have no immediate or long-term effect on age at first drink among US adolescents aged 14–17; study results did not differ when stratified by age, gender or ethnicity.

Promotion: $n = 9$

All study authors reported that—to some degree—alcohol promotion influenced drinking initiation among young people. Nevertheless, exposure and outcome measures varied considerably across studies (see Supplementary Table S1). Four studies (of 9, 44%) were categorized methodologically 'strong' (McClure *et al.*, 2006; Fisher *et al.*, 2007; Gordon, 2011; Morgenstern *et al.*, 2014). Furthermore, of this grouping of studies, one was longitudinal in design, and demonstrated that owning and/or being willing to use alcohol merchandise was associated with higher drinking uptake, particularly among older (aged 15 or over) rather than younger US boys (older: OR = 2.43, CI = 1.51–3.91; younger: OR = 1.50, CI = 1.08–2.09, $P = 0.08$) (Fisher *et al.*, 2007). Three studies reported both positive associations and null results (Ellickson *et al.*, 2005; Gordon, 2011; Jones and Magee, 2011). Thus, Ellickson *et al.* (2005) reported that exposure to in-store alcohol displays was the only measure (of four measures studied) of alcohol promotion that significantly predicted drinking initiation at follow-up in US adolescents aged 13–15 (OR = 1.42; $P < 0.05$). Gordon (2011) found that, whilst participation in alcohol marketing at baseline significantly increased the odds of drinking initiation at follow-up among Scottish 14–16-year olds (AOR = 1.31, CI = 1.003–1.711, $P < 0.05$), the number of brands recalled at baseline had no significant impact. Meanwhile, Jones and Magee (2011) reported that the relationship between alcohol promotion and drinking initiation varied by age and gender, finding no significant association between exposure to alcohol promotional media (of any type studied) and drinking initiation for Australian males and females aged 12–15 and males aged 16–17.

Drinking continuation (12 studies; 3 methodologically strong)

Price: $n = 1$

van Hoof *et al.* (2008) found that alcohol discounts had a significant effect on alcohol consumption among young people aged 14–17 in the Netherlands ($m = 3.39$, SD = 0.76, $t[149] = 6.25$, $P = 0.000$). This effect did not significantly differ between age groups (14–15 and 16–17) ($t[138,54] = 0.91$, $P = 0.367$).

Placement: $n = 3$

Whilst all study authors identified that—to some degree—alcohol placement influenced continued alcohol use among young people, all three studies reported both positive associations and null results. Two (of three) studies were categorized methodologically 'strong' (Tobler, 2009; Shamblen *et al.*, 2011). Shamblen *et al.* (2011) found that US students in high off-trade outlet density communities increased their alcohol use between sixth and eighth grades (equivalent age range: 11–14); but that students attending schools in

low outlet density communities had higher initial levels of alcohol use that remained relatively stable over time (lifetime: OR = 0.87; past year: OR = 0.88; past 30-days: OR = 0.88). Furthermore, Tobler reported that outlet density did not have a significant direct effect on alcohol use in eighth grade. Furthermore, among low-income US African-American adolescents, the effects of alcohol outlet density at baseline on alcohol use in 12th grade were mediated entirely by beliefs favourable to use (equivalent age: 17–18 years) ($\beta = 0.037$, $P = 0.001$) and deviant peer affiliations ($\beta = 0.016$, $P = 0.017$). Meanwhile, Rowland *et al.* (2014) identified that all types of outlet density (general density, packaged outlet density, on-premise density and club density) were associated with increased alcohol use, but only when included as an interaction with age. For every 10% increase in overall alcohol density outlet, a significant percentage increase (PI) in adolescent alcohol consumption occurred for Australian young people aged 12–14 years (12: PI = 2.04, CI = 0.74–3.35; 13: PI = 1.66, CI = 0.53–2.80; 14: PI = 1.12, CI = 0.14–2.11) but not for those aged 15–17 (15: PI = 0.29, CI = -7.32–1.31; 16: PI = -1.19, CI = -2.91–5.29; 17: PI = -4.452, CI = -9.04–0.01).

Product: n = 3

Lin *et al.* (2012) found that having a favourite alcohol brand increased the odds of being a drinker among 12–15-year olds in New Zealand (OR = 4.56, CI = 3.62–5.76); whilst Henriksen *et al.* (2008) identified that small increases in the odds of alcohol use at follow-up were associated with better brand recall at baseline among US 10–15-year olds (brand recall: OR = 1.13, CI = 0.94–1.33). However, as with drinking initiation, Dumsha (2008) reported null results and found the introduction of alcopops had no immediate or long-term effect on drinking continuation among US adolescents aged 14–17; study results did not differ when stratified by age, gender or ethnicity.

Promotion: n = 8

Two studies (of 8, 25%) were categorized methodologically ‘strong’ (Stacy *et al.*, 2004; Tobler, 2009). However, findings from both studies were not clear-cut, with both positive associations and null results reported. Stacy *et al.* (2004) identified that seventh-grade exposure to advertising via popular TV shows (equivalent age: 12–13 years) was the only measure (of three measures studied) of alcohol promotion that was significantly associated with eighth-grade beer and wine/liquor use among US young people (equivalent age: 13–14 years) (AOR = 1.44, CI = 1.27–1.61, $P < 0.001$). Furthermore, Tobler (2009) demonstrated that exposure to alcohol advertisements was significantly associated with alcohol use in eighth grade ($\beta = 0.049$, $P < 0.05$). However, among US low-income Hispanic adolescents, the effects of alcohol advertisement exposure on alcohol use in 12th grade (equivalent age: 17–18 years) were entirely mediated through beliefs favourable to use in 8th grade ($\beta = 0.014$, $P = 0.076$). Whilst exclusively positive associations were reported in three studies (Collins *et al.*, 2007; Henriksen *et al.*, 2008; Lin *et al.*, 2012), negative associations and null results were also reported by Swahn *et al.* (2011) and Zogg (2004). Thus, despite reporting a positive relationship between provision of free alcohol from an industry representative and current alcohol use (OR = 4.37, CI = 3.21–5.95), Swahn *et al.* (2011) found exposure to billboard advertisements was associated with ‘decreased’ reported alcohol use among Zambian young people aged 11–16 (OR = 0.65, CI = 0.46–0.92). Meanwhile, Zogg (2004) identified that exposure to TV alcohol advertisements during the seventh grade significantly predicted beer use 1 year later ($P < 0.05$), but not wine or liquor use. Furthermore, Zogg (2004) also found that exposure to alcohol

advertising around popular TV shows and TV sports in seventh-grade predicted beer and wine or liquor use by eighth grade, but only for white respondents (TV shows: $P < 0.001$; wine/liquor: $P < 0.001$; TV sports: beer: $P < 0.01$; wine/liquor: $P < 0.05$).

Drinking frequency (19 studies; 2 methodologically strong)

Price: no studies

Placement: n = 10

Paschall *et al.* (2007) measured school district-level alcohol sales across 3 months whilst nine studies focused upon community-level outlet density (Huckle *et al.*, 2008; Kuntsche *et al.*, 2008; Truong, 2008; Pasch *et al.*, 2009; Chen *et al.*, 2010; Stanley *et al.*, 2011; Lo *et al.*, 2013a; Young *et al.*, 2013; Azar *et al.*, 2016). Young *et al.* (2013) reported significant associations between the proximity and density of alcohol off-sales outlets and weekly drinking among Scottish 15-year olds; and Kuntsche *et al.* (2008) identified that on-premise outlet density was positively related to quantity frequency drinking (no. of drinks consumed in a typical occasion multiplied by frequency of alcohol use) among 12–17-year olds in Switzerland ($P < 0.05$). Nevertheless, one study reported a mixture of positive associations and null results (Azar *et al.*, 2016); two studies identified negative as well as positive associations (Chen *et al.*, 2010; Stanley *et al.*, 2011); while four studies found no relationship whatsoever between alcohol outlet density and drinking frequency (Huckle *et al.*, 2008; Truong, 2008; Pasch *et al.*, 2009; Lo *et al.*, 2013a, b) (see Supplementary Table S2). Furthermore, despite a domination of studies measuring alcohol placement and drinking frequency, none were categorized methodologically ‘strong’ (moderate: $n = 5$; weak: $n = 5$).

Product: n = 2

Faria *et al.* (2011) found past 30-day drinking to be associated with having a favourite alcohol brand among Brazilian 11–16-year olds (OR = 5.150, CI = 3.355–7.906, $P < 0.001$); whilst Lin *et al.* (2012) identified that having a favourite alcohol brand increased frequency of alcohol consumption among 12–15-year olds in New Zealand (OR = 1.65, CI = 1.41–1.92).

Promotion: n = 9

All study authors identified that—to some degree—alcohol promotion influenced drinking frequency among young people. Five (of 9, 56%) studies reported wholly positive associations, whilst three reported null results and one identified a negative association, in addition to positive associations. One study was categorized methodologically ‘strong’ (Gordon, 2011) yet reported null results as well as positive associations between alcohol promotion and drinking frequency. Specifically, the authors found that higher marketing involvement at baseline significantly increased the odds of fortnightly and monthly drinking at follow-up among Scottish 14–16-year olds (fortnight: AOR = 1.43, CI = 1.146–1.795, $P < 0.01$; monthly: AOR = 1.33, CI = 1.072–1.644, $P < 0.05$). Uptake of fortnightly drinking at follow-up was also significantly associated with marketing awareness at baseline (AOR = 1.11, CI = 1.005–1.234, $P < 0.05$). However, they found no association between uptake of fortnightly drinking at follow-up and number of brands recalled at baseline; and no association between uptake of monthly drinking at follow-up and awareness of alcohol marketing or number of brands recalled at baseline. Three studies found a positive relationship between exposure to alcohol marketing via the internet or social media platforms and drinking frequency (Jones and Magee, 2011; de Bruijn *et al.*, 2012; Lin *et al.*, 2012). Thus,

de Bruijn *et al.* (2012), categorized as methodologically 'strong', found that the extent of exposure to online alcohol marketing among European 14-year olds was associated with frequency of past 30-day alcohol use 14–15 months later ($P < 0.001$). Furthermore, Jones and Magee (2011) reported exposure to advertising via the internet predicted past 4-week alcohol use among Australian 12–17-year olds (AOR = 1.36, CI = 1.03–1.79); and Lin *et al.* (2012) found that engagement with both traditional and web-based alcohol marketing increased frequency of alcohol consumption among 12–15-year olds in New Zealand (OR = 1.34, CI = 1.08–1.66).

Drinking intensity (19 studies; 4 methodologically strong)

Price: n = 1

Using two large data sets, Saffer and Dave (2006) demonstrated that binge drinking among US adolescents (mean age: 15 years) reduced as price increased (data set 1 (MTF): price elasticity: -0.1842 , SE = 0.0562; data set 2 (NLSY): price elasticity: -0.7307 , SE = 0.4897). Effects were larger for females and white young people (data set 1 (MTF): female: -0.2369 , SE = 0.0803; white: -0.3611 , SE = 0.0658).

Placement: n = 8

No studies that measured alcohol placement were categorized as methodologically 'strong' for high intensity drinking (moderate: $n = 4$; weak: $n = 4$). Two studies (of 8, 25%) found no relationship between alcohol placement and drinking intensity (Pasch *et al.*, 2009; Bendtsen *et al.*, 2013). Furthermore, no studies reported wholly positive associations. Thus, 4 studies (of 8, 50%) identified both positive associations and null results (Huckle *et al.*, 2008; Kuntsche *et al.*, 2008; Truong, 2008; Azar *et al.*, 2016), whilst 2 studies (of 8, 25%) reported both positive and negative associations (Chen *et al.*, 2010; Lo *et al.*, 2013a). Specifically, Lo *et al.* (2013a) found that alcohol outlet density was significantly associated with 'reduced' binge drinking in the past 2 weeks (5 or more drinks in a 2-hour time period) among US 11–18-year olds ($P < 0.05$), but that binge drinking increased with grade level, and that this association became stronger among students living in neighbourhoods with high alcohol outlet density ($P < 0.05$). Meanwhile, Chen *et al.* (2010) identified that, among US 14–16-year olds, the initial level of frequency of excessive drinking (defined as number of days drunk in the past 12 months) related positively to outlet density (coefficient = 0.0009, $P = 0.000$). Nevertheless, growth of frequency of excessive drinking was related negatively to outlet density (coefficient = 0.0004, $P = 0.008$). Furthermore, the relationship between outlet density and drinking was mitigated by friends with access to a car.

Product: n = 2

As with both drinking initiation and continuation, Dumsha (2008) reported null results and found the introduction of alcopops had no immediate or long-term effect on episodic heavy drinking among US adolescents aged 14–17; study results did not differ when stratified by age, gender or ethnicity. However, reporting similar results to that which they found for drinking continuation and frequency, Lin *et al.* (2012) identified that having a favourite alcohol brand increased drinking amount on a typical drinking occasion (OR = 1.86, CI = 1.57–2.21) among 12–15-year olds in New Zealand.

Promotion: n = 10

Four studies (of 10, 40%) were categorized methodologically 'strong' (Stacy *et al.*, 2004; Fisher *et al.*, 2007; de Bruijn *et al.*, 2012;

Morgenstern *et al.*, 2014). All four studies were longitudinal in design. Thus, Morgenstern *et al.* (2014) reported that having a favourite advertisement was significantly associated with binge drinking among young people in Germany, Italy, Poland and Scotland (mean age: 13.5 years old) (AOR = 2.13 CI = 1.92–2.36). Studies which addressed drinking intensity or 'binge' had the greatest degree of consistency in terms of exposure measures and a common outcome. Across the entire review, 12 studies reported binge drinking (measured as 5 or more drinks in a specified time period) as the outcome measure. More specifically, seven of these studies considered the relationship between alcohol promotions and binge drinking (see Supplementary Table S3). Reported exposure to alcohol promotions in five of these studies fell into two groups: (a) self-reported recall of adverts as a scale (ordinal) measure (Stacy *et al.*, 2004; Zogg, 2004; de Bruijn *et al.*, 2012) and (b) ownership and/or awareness of alcohol merchandise as a binary (yes/no) measure (Fisher *et al.*, 2007; McClure *et al.*, 2009; de Bruijn *et al.*, 2012). Four (of 7, 57%) promotional studies reported only positive associations with binge drinking (Saffer and Dave, 2006; McClure *et al.*, 2009; de Bruijn *et al.*, 2012; Morgenstern *et al.*, 2014), two reported mixed results (positive associations and null results) (Zogg, 2004; Fisher *et al.*, 2007), whilst one reported no relationship (Stacy *et al.*, 2004). Thus, Fisher *et al.* (2007) found that owning and/or being willing to use alcohol merchandise predicted binge drinking 12 months later for US girls aged 11–18 but not boys (girls: OR = 1.79, CI = 1.16–2.77; boys: OR = 0.87, CI = 0.51–1.48); and Zogg (2004) reported that self-reported exposure to TV alcohol advertisements in seventh grade (equivalent age: 12–13 years) did not predict binge drinking for US adolescents by eighth grade (equivalent age: 13–14 years). Furthermore, exposure to alcohol advertising around popular TV shows and TV sports in seventh grade significantly predicted binge drinking by eighth grade for white respondents only (TV shows: $P < 0.05$; TV sports: $P < 0.01$). Meanwhile, Stacy *et al.* (2004) identified that eighth-grade binge drinking among US adolescents was not significantly associated with any measure of seventh-grade advertising exposure studied (self-reported exposure to TV alcohol advertising, exposure to advertising around popular TV shows and exposure to advertising around TV sports).

DISCUSSION

This review found a diverse literature spanning many countries though dominated by the USA. Twelve (of 35, 34%) studies reported wholly positive associations; 20 (57%) reported mixed findings (combinations of positive, negative and null results) and 3 (9%) reported no relationship between alcohol marketing and alcohol use among young people aged 9–17. The strength of the evidence differed according to the type of marketing exposure and drinking outcome studied. Only two studies identified by this review focused on alcohol price and drinking behaviour in those under the age of 18. Whilst both studies reported only positive associations, both of these studies were categorized as methodologically 'weak', and price and affordability remains a significantly understudied influence upon young people's drinking behaviour. Previous authors have reported that price and affordability might not be as effective at reducing drinking in young people as in adults, or as compared to other strategies such as point of sale or offer restrictions (Meier *et al.*, 2009). As work in Scotland has concluded, young adults are not a homogeneous group in relation to price sensitivity, and considerations about the price of alcohol compete with non-financial

considerations such as cultural norms regarding drinking activity (Seaman *et al.*, 2013). Eleven (of 14) placement studies reported mixed results. A further two reported null results only. Furthermore, whilst alcohol placement is not limited to outlet density *per se*, published studies in this area tended to focus their attention here (or upon similar measures such as outlet proximity). We were interested in studies which specifically reported effects on young people's (aged 9–17 years) alcohol consumption, and found very little which focused upon other aspects of placement or distribution, reflecting methodological gaps and limitations previously identified by Holmes *et al.* (2014a). We also identified few data which took into account targeted geographical positioning of alcohol outlets (and neighbourhood deprivation) when reporting the association between alcohol placement and objective consumption measures.

The largest cluster of evidence uncovered ($n = 20$) points to a relatively consistent association between alcohol promotion (predominantly advertising) and drinking outcomes in adolescence. Ten studies (of 20, 50%) reported exclusively positive associations and this relationship is supported by wider literature; previous research indicates that alcohol brand recognition occurs in 10–11-year olds (Alcohol Concern, 2012), while identification with desirable images in alcohol advertising has been seen in 8–9-year olds and brand-specific consumption in 13–20-year olds (Austin *et al.*, 2006; Siegal *et al.*, 2013). However, establishing causality between promotional activity and alcohol use is methodologically and ethically problematic, especially where subjects are under the legal age for purchasing alcohol. This is compounded further by the difficulty in separating advertisements aimed at adults from those aimed at children and young people, and the growth of marketing in youth focused outlets, in formats that are likely to appeal to children and young people (Hastings *et al.*, 2010; Barry *et al.*, 2016).

In psychological theory, exposure to marketing is thought to stimulate a motivation to drink alcohol via both conscious (explicit) and non-conscious (implicit) processes (Stautz *et al.*, 2016). Conscious processes include increasing positive expectancies and making attitudes more favourable; non-conscious processes include imitation, modelling and priming. Thus, positive alcohol-related cognitions may be activated immediately in response to a single exposure, as well as develop over time in response to repeated exposures (Stautz *et al.*, 2016). However, this framework assumes a linear 'effect' where marketing activity acts like a 'hypodermic syringe', injecting passive viewers with information which creates attitudes and behaviours in response (Baillie, 1996). In reality, individuals have the capacity to accept, reconstruct or reject the information they receive (Atkinson *et al.*, 2013) and may interpret marketing messages differently (Scott *et al.*, 2014). Work by Morgenstern *et al.* (2011) highlights the importance of attitudes as mediators of behaviour using the message interpretation process model, which suggests that the effectiveness of any marketing message is dependent on the formation of alcohol-related expectancies, namely desirability, identification and scepticism (Austin and Knaus, 2000; Austin *et al.*, 2006).

Increasingly, marketing is understood to operate within a rich milieu of other social and cultural influences on behaviour: behavioural drivers may work together to 'collectively' influence young people's drinking practices. This corroborates established theories of social behaviour which argue for the interaction between individual agency and social structure (Cockerham, 2005), e.g. Bourdieu's theory of practice (Bourdieu, 1990), aspects of which have been applied to the study of young people's alcohol use (Jarvinen and Gundelach, 2007; Lunnay *et al.*, 2011). Bourdieu's framework rests upon three

core concepts. 'Habitus' representing an embodied yet flexible system of shared tastes, habits and dispositions (Brierley-Jones *et al.*, 2014); 'field', a person's position in social, physical and digital space—those who occupy a proximal position often share similar lifestyles; and the type and amount of 'capital' (economic, cultural, social or symbolic) or assets an individual possesses relative to others (Demant and Jarvinen, 2011; Browne-Yung *et al.*, 2013; Christensen and Carpiano, 2014). Together, these concepts generate 'practices'. Applied to drinking practices, extensive, often subliminal, marketing lead to it becoming a seemingly ordinary and often subconscious aspect of daily life (Hastings *et al.*, 2010), creating an 'intoxicogenic' environment where social, physical and regulatory influences shape youth drinking (McCreanor *et al.*, 2008; Townshend, 2013). Marketers can reinforce aspects of the surrounding social ecology, by encouraging a link between alcohol and aspects of culture, identity and personal reward (Brierley-Jones *et al.*, 2014). The drinks industry works to develop an ongoing multifactorial relationship with consumers rather than aiming for a straightforward transaction (Nicholls, 2012). This relationship may begin earlier than previously assumed, being well under way in some young people by mid-adolescence (Scott *et al.*, 2014). Such relationships may be subtle and gradual, unlikely to be observed in studies investigating only the immediate effects of marketing exposure (Stautz *et al.*, 2016). In addition to industry-led marketing messages, recent studies have identified associations between assuming an 'alcohol identity' online and harmful drinking behaviour (Ridout *et al.*, 2012), illustrating a blurring of boundaries between commercial advertising and user-generated content (Moreno *et al.*, 2012).

STRENGTHS AND LIMITATIONS

Studies varied in terms of exposure type and measures as well as reported behavioural outcomes. This heterogeneity made it difficult to synthesize key findings, or to explore variation between countries or age subgroups and prevented quantitative meta-analysis for estimating effect sizes. The quality of statistical reporting sometimes made it difficult to interpret findings. We extracted beta, standard error and coefficient values as reported in published papers. However, at times, the meaning of these values was not clear. Furthermore, a different terminology was used to describe drinking behaviour across identified studies. For example, whilst most referred to high intensity drinking as 'binge' drinking, others described comparable behaviour as 'drunkenness', 'episodic', 'risky single occasion', 'heavy' or 'excessive' drinking. Where used, 'binge' drinking was typically measured as 5+ drinks in a single occasion/within a couple of hours. Nevertheless, the time frame varied from within the last fortnight to as much as a month or year. Most studies reported ethnic background, race or migration status as part of sample characteristics, many of which identified associations between ethnicity and alcohol use. Nevertheless, only six studies (Zogg, 2004; Saffer and Dave, 2006; Dumsha, 2008; Tobler, 2009; Chen *et al.*, 2010; Stanley *et al.*, 2011) reported multivariate analysis of associations between ethnic background, marketing exposure and alcohol use (see Supplementary Table S2). Thus, whilst there is evidence to demonstrate that adolescents from different ethnic backgrounds respond to marketing differently, especially in terms of brand preference (Ross *et al.*, 2015), this review did not identify an influence upon measurable alcohol consumption.

Only 12 studies were longitudinal in design (seven of which were categorized as methodologically 'strong') and thus better able to examine the impact of alcohol marketing in early adolescence on

subsequent behaviour (Smith and Foxcroft, 2009). Whilst most studies adjusted results for known predictors of drinking, it is impossible to determine whether all relevant confounding factors were accounted for. It is also not possible to rule out reciprocity, i.e. whether alcohol consumption influences marketing rather than *vice versa*. Furthermore, this review may be subject to publication and reporting bias. It is impossible to predict the impact of unpublished data on our findings, and included papers may not have always reported null results or negative associations, especially where several research questions were addressed. Non-English language studies were excluded for practical reasons, and this may have excluded relevant literature from European countries in particular. Whilst most of the studies in this review took place in the USA, a small number were conducted in non high-income countries, which may reflect the increasing engagement of industry with developing alcohol markets (Jernigan and Babor, 2015). Several exposure measures included in these papers were not compatible with marketing regulations in high-income countries, including the provision of free alcohol by industry representatives to 11–16-year old adolescents (Swahn *et al.*, 2011, 2013).

Additional exclusion criteria may have affected our findings. We excluded studies that examined general media portrayal as well as those focusing on product placement. The exposure of interest in this review was industry-led alcohol marketing. Whilst product placement is considered to be predominantly industry-led, it is difficult to disentangle this practice from general portrayal of alcohol products, resulting in little available data on drinking impact. Studies where assessments took place in an artificial environment were also excluded as they tended to include older adolescents and young adults and so were beyond the scope of this review. A recent systematic review included experimental studies, and assessed immediate effects of exposure to alcohol marketing on alcoholic beverage consumption and related cognitions among adults (predominantly undergraduate students). This work concluded that viewing alcohol advertisements (but not alcohol portrayals) may increase immediate alcohol consumption by small amounts (Stautz *et al.*, 2016). Finally, studies were excluded from our review if the primary focus was exposure to brand-specific marketing as a predictor of market share rather than the impact of branding on young people's overall alcohol consumption (Siegel *et al.*, 2011; Roberts *et al.*, 2014; Ross *et al.*, 2014a, b, 2015). We also excluded studies where purchasing behaviour was reported without measuring effects on consumption. As there are large discrepancies between survey-based measures of consumption and those based on alcohol sales (Bellis *et al.*, 2009; Livingston and Callinan, 2015), it is not appropriate to infer consumption from purchasing behaviour.

CONCLUSION

Previous systematic reviews have suggested that exposure to media and alcohol advertisements is associated with the likelihood that adolescents will start to drink alcohol, and with increased drinking among baseline drinkers. Despite the limitations outlined above, this systematic review also found a majority of evidence that linked industry-driven alcohol marketing (Price, Promotion, Product and Place) to key drinking outcomes (initiation, continuation, frequency and intensity) in young adolescents (aged 9–17 years). Nevertheless, we also found null results or negative associations. A field of highly variable and inconsistent exposure and outcome measures hampered our ability to conduct any data pooling. We did find a cluster of seven studies that focused on alcohol promotions exposure and

'binge' drinking outcomes. Yet these findings could not be pooled due to widely varying exposure measures (e.g. ownership of alcohol branded material, having a favourite advertisement, self-reported exposure to TV alcohol advertising). Future longitudinal research with standardized measures is needed to build on our work and enable robust effect size estimation in this field. Nevertheless, the volume and balance of evidence in this review provides sufficient confidence of an overall effect of promotional marketing (usually advertising) upon some early life drinking behaviours. Thus, taking a precautionary approach, we support recommendations of the WHO in its Global Alcohol Strategy that children and young people should be protected by strengthening advertising regulations (by limiting content to factual information and restricting scope to adult forums only) (World Health Organisation, 2010), as well as guidance from the UK's NICE recommending independent, ongoing monitoring of promotional practices by alcohol producers (National Institute for Clinical and Health Excellence, 2010).

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Alcohol and Alcoholism* online.

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CONFLICT OF INTEREST STATEMENT

None declared.

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