
The effect of alcohol advertising and marketing on drinking behaviour in young people: A systematic review

Lesley A, Smith¹, David R. Foxcroft²

¹Senior Research Fellow and ²Professor, School of Health and Social Care, Oxford Brookes University, Oxford OX3 0FL, United Kingdom.

Corresponding Author: Dr Lesley Smith, School of Health and Social Care, Oxford Brookes University, Oxford OX3 0FL, United Kingdom

Tel: +44 1865 482670; email: lesleysmith@brookes.ac.uk

Abstract

Background

The effect of alcohol portrayals and advertising on the drinking behaviour of young people is a matter of much debate.

Objectives

To evaluate the relationship between exposure to alcohol advertising and marketing and subsequent drinking behaviour in young people.

Methods

Studies were identified by searches of electronic databases supplemented with hand searches of reference lists of retrieved articles in October 2006. Studies that evaluated exposure to advertising or marketing and drinking at baseline and assessed drinking behaviour at follow-up in young people were selected and reviewed.

Results

Seven cohort studies that followed up more than 13,000 young people age 10 to 26 years old were reviewed. The studies evaluated a range of different alcohol advertisement and marketing exposures including print and broadcast media. Two studies measured the hours of TV and music video viewing. All measured drinking behaviour using a variety of outcome measures. Two studies evaluated drinkers and non-drinkers separately. Baseline non-drinkers were more likely to have become a drinker at follow-up with greater exposure to alcohol advertisements. There was little difference in drinking frequency at follow-up in baseline drinkers. In studies of mixed populations of drinkers and non-drinkers, increased exposure at baseline lead to increased risk of drinking at follow-up. Two studies demonstrated a dose response relationship. The strength of the relationship and degree of controlling for confounding factors varied between studies.

Conclusions

Data from prospective cohort studies suggest that a relationship between amounts of exposure to alcohol advertising or promotional activity at baseline is related to amount of alcohol consumed by young people at follow-up. These findings are in agreement with positive associations reported in cross-sectional surveys. Inferences are limited by the potential influence of residual or unmeasured confounding.

Background

The influence of alcohol marketing and advertising on the drinking behaviour of young people is a matter of much debate with divided opinion depending on vested interests. Whether young people are targeted by alcohol advertisers or not, they are exposed to alcohol advertising on television, in print media, and on radio. Healthcare researchers and workers have shown associations between exposure to alcohol advertising and drinking behaviour in cross-sectional surveys,[1-4] whereas the alcohol and advertising industry use data from econometric studies showing that advertising bans have little impact on overall alcohol consumption[5-7]. More recently, several cohort (longitudinal) studies have been published[8-16].

Several authoritative reviews of the literature on the association of advertising exposure and drinking in young people have been published, or more generally the effects of media on the behaviour and lifestyles of young people[17-27]. However, none use explicit, transparent methodology and these reviews lack critical appraisal of individual study weaknesses in relation to likelihood of bias.

Objectives

To conduct a rapid systematic review of studies evaluating the relationship between advertising and marketing of alcohol and alcohol drinking in young people.

Methods - Eligibility criteria

Types of studies

We considered studies that evaluated the relationship between alcohol advertising or marketing and alcohol use in young people. We included cohort, sometimes called longitudinal, studies where young people's exposure to alcohol advertising or attitudes to alcohol advertising and alcohol drinking behaviour were evaluated at baseline and alcohol drinking outcomes were again evaluated after a given period of time. The rationale for

restricting the review to cohort studies is that they provide the highest level of evidence that is available for evaluation of advertising and marketing exposure and subsequent drinking behaviour. If such studies are well designed, conducted and analysed they can provide supportive evidence for a causal association between a particular exposure and an outcome.

Randomised controlled trials (RCTs), the best design for inferring causality, have not been conducted in this area and are unlikely to be in the future as they are impractical, and it may be unethical to randomise participants or communities to specific advertising and/or marketing strategies in order to evaluate potentially harmful effects. Experimental studies that have been published evaluated a single exposure to advertising of one form or another and evaluated immediate effects on either attitude or liking for the advertisements or drinking behaviour. These experimental studies don't reflect the complexity of the advertising and commercial milieu that people are exposed to in their daily lives, and only evaluate effects post-exposure at a single time-point, so results can not be extrapolated to a different context. We have also excluded cross-sectional, time-series and econometric studies. Cross-sectional surveys measure the association between a particular exposure such as alcohol advertising and drinking behaviour, but do not show whether the exposure preceded the outcome. Reverse causality cannot be ruled out, whereby young people who drink or misuse alcohol are more receptive to alcohol advertising. Time-series studies are also not ideal for showing temporal relationships due to a greater risk of confounding. One other weakness of the time-series studies is that they measure exposure and outcomes at a population level, rather than in individuals, and therefore include all age groups and are not exclusively on young people. Variation in effects in different age groups may be obscured when looking at aggregate population data. Econometric studies which may also use time-series data bring together macroeconomic data with population level data and use statistical modelling to examine relationships between exposure (advertising expenditure) and outcome (alcohol sales). Again these studies are not ideal for this review as they do not specifically look at drinking behaviour in young

people but report aggregate alcohol consumption, and rely on complex equations to model a sophisticated social phenomenon. The observed effect is then highly dependent on the choice of factors that are used in the statistical model.

Types of participants

Studies that included young people of school or college age were included. Studies of participants including young people were excluded if results were not presented separately by age groups or if young people constituted less than 75% of the overall sample.

Types of exposure

Conventional advertising and marketing practices including above and below the line activity, as well as alcohol portrayal in broadcast and print media, for example product placement and depiction of alcohol use. This includes advertising appearing on television, radio, newspapers, billboards, posters etc. or depiction of alcohol use in movies, TV programmes, music videos and song lyrics. Promotional activities include give-aways such as t-shirts, and other items bearing alcohol brand logos.

Types of outcome measures

We were interested in any reported alcohol drinking outcome which included:

- Self-reported alcohol use - frequency quantity measures
- Self-reported use of specific brands of alcohol or type of alcohol e.g. beer, wine or spirit

We excluded studies reporting only intention to drink as an outcome, or attitude to drinking. Studies only reporting awareness and response to advertising that did not measure any effects on drinking were excluded.

Identification of studies

Electronic databases searched were Medline and Embase from their inception to October 2006. Search terms included free text and MESH terms for drinking behaviour and advertising and marketing. The exact search strategies are shown below. Reference lists of retrieved reviews and primary studies were also scanned for additional relevant studies. There was no restriction to language of publication.

Medline (OVID) search strategy

1	Drinking behaviour. Explode all fields
2	Alcohol drinking. Explode all fields
3	Alcohol* OR drink*.ti.ab.mh
4	Alcohol related disorders. Explode all fields
5	1 OR 2 OR 3 OR 4
6	Marketing OR advertising. Explode all fields
7	5 AND 6

Embase (OVID) search strategy

1	Drinking behaviour. Explode all fields
2	Alcohol drinking. Explode all fields
3	Alcohol* OR drink*.ti.ab.mh
4	Abuse OR addiction OR alcoholism. Explode all fields
5	Alcohol related disorders
6	1 OR 2 OR 3 OR 4 OR 5
7	Marketing OR advertising. Explode all fields
8	6 AND 7

Study selection and synthesis

Potentially relevant studies were identified by screening titles and abstracts of retrieved references from the electronic databases. Articles were not selected unless the title or abstract focused on effects of alcohol advertising

or marketing procedures and on drinking behaviour in young people. Where this wasn't clear, the full text of the articles was retrieved for further screening. Each retrieved article was screened for review eligibility according to the inclusion criteria described above. Data from included studies were extracted and summarised as a narrative synthesis, studies not eligible for inclusion were tabulated with reason for exclusion.

The electronic searches identified 915 potentially relevant articles. After screening the titles and abstracts, 115 potentially relevant articles were obtained as full text publications. An additional six articles were identified from screening the reference lists of retrieved articles. After screening each full text article for review eligibility, 112 were excluded leaving nine articles for review inclusion, Figure 1.

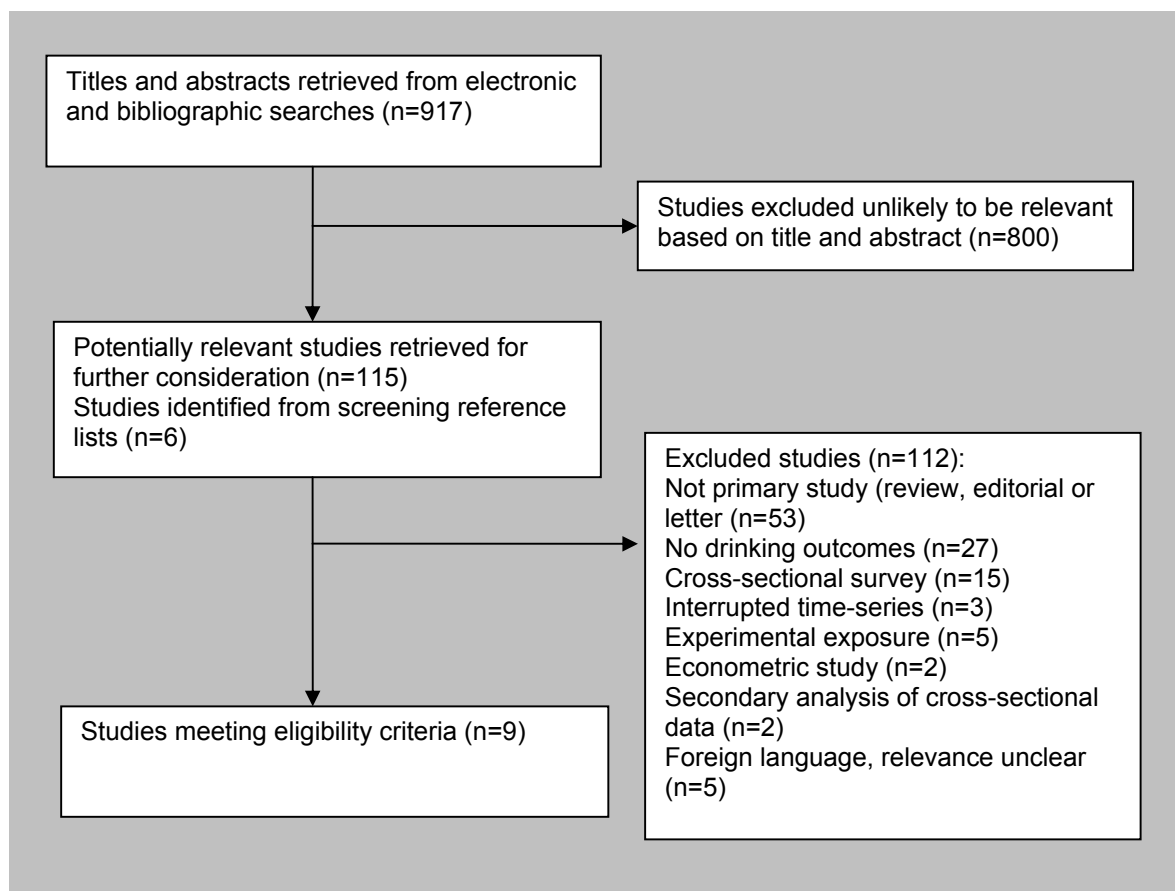


Figure 1 Results of search of electronic databases and hand searching

Results

Description of included studies

Nine publications reporting on seven studies were identified that met the review inclusion criteria[8-16]. The seven studies provided data on 13,255 participants 10 to 26 years old. Characteristics of the included studies are shown in Table 1. Six were prospective cohort studies[11-16], one used a retrospective design for follow-up at age 18 years[10], and also reported data from prospective follow-up at ages 21[9] and 26[8] years. In one study[11] the cohort was part of an RCT of a school-based drug prevention programme, and in another study[10] the cohort was a sub-set of a larger cohort study recruited in 1972 and followed through childhood to early adulthood evaluating growth and development.

The age of participants at baseline interview was 12 to 13 years (7th grade) in three studies[10, 11, 13], 14 to 15 years (9th grade) in one[14], one study[12] recruited a broader age group of youth, 15 to 26 year olds, one study[15] used a mixed age group of first and fourth year secondary school students and one used 10 to 14 year olds (5th to 8th grade)[16].

In five studies participants were followed up once after baseline. Duration of follow-up was one year[13, 15], 18 months[14], 30 months[11] and 13 to 26 months[16]. One study reported outcomes at multiple time-points, six years and nine years and 14 years[8-10]. One study evaluated participants at four time points and present results for follow-up after 21 months taking the multiple time points into account in the analysis[12].

Five studies were conducted in the USA[11-14, 16], one in Belgium[15] and one in New Zealand[8-10].

Each study used disparate measures of exposure; all relied on self-reported measures. One generated a composite score to reflect the amount of exposure to TV beer advertising, magazine alcohol advertising, beer

concession stands and in-store advertising displays[11]. One measured exposure to any alcohol advertising in the past month on each of four media, TV, radio, billboards and magazines[12]. Another classified exposure as watched TV show index to quantify exposure to alcohol ads in specific TV shows in addition to self-reported exposure to alcohol ads[13]. In the retrospective data collection, Connolly[10] evaluated recall of alcohol advertisements from different media, TV, radio, magazines, newspapers and films. Two studies measured exposure as hours of TV and music video viewing[14, 15], and one exposure to alcohol use in popular, contemporary movies[16].

Drinking status was measured in all studies at follow-up. Two studies reported any alcohol use in the past month[12, 13], one study reported alcohol use past year[11], one reported frequency of drinking at specific locations, average and maximum amount alcohol consumed on an occasion[10], one reported lifetime and past 30 days alcohol use[14], one alcohol use while going out[15], and incident alcohol use without parental knowledge[16].

The reasons for excluding 112 articles are given in Appendices 1 and 2; Tables 2 and 3. Articles in Appendix 1; Table 2 are excluded mainly because they were not primary studies but were reviews, letters or editorials on media effects but not necessarily reporting on drinking behaviour of adolescents. Table 2 also includes some foreign language publications which need translation and further assessment which was beyond the scope of this review. Articles in Appendix 2; Table 3 were excluded mainly due to study design issues. Studies were cross-sectional, experimental exposure, time-series or econometric studies.

Table 1: Characteristics included studies

Study	Participants	Exposure	Outcomes
Study: Connolly 1994[10] Design: Retrospective cohort Baseline survey: 1985-86 Follow-up: Six years Location: New Zealand Analysis: Regression analyses with adjustment: gender, current occupation, living situation, socio-economic status. Men and women analysed separately, only participants with no missing data analysed	Sample: n=667, sub-set of larger growth and development cohort study of children recruited in 1972, participants are those who were present for alcohol interviews at age 13, 15 and 18 years Sex: n=251 men, n=184 women (analysed sample 65%) Ethnicity: dns Data collection: Face-to-face interviews age 13 and 15, self-completed questionnaire age 18 years	Number of advertisements recalled, mainly included product advertising and sponsorship by alcohol companies, number of moderation messages recalled, number of alcohol portrayals recalled from entertainment material. Type of media were asked about separately: TV, radio, magazines, newspapers and films	Alcohol consumption: total frequency of drinking at a list of drinking locations, average amount alcohol consumed on an occasion, maximum amount consumed on an occasion,

Study	Participants	Exposure	Outcomes
<p>Study: Casswell 1998[9] Design: Prospective cohort</p> <p>Baseline survey: 1990/91 Follow-up: Three years</p> <p>Location: New Zealand Analysis: Structural equation modeling</p>	<p>Sample: n=630, sub-set of larger growth and development cohort study of children recruited in 1972, participants are those who were beer drinkers at age 18</p> <p>Ethnicity: largely of British ancestry</p> <p>Data collection: computer-based questionnaire and face-to-face supplementary interview by experienced interviewers</p>	<p>Recall of liking of alcohol advertising, brand allegiance assessed by identifying favourite brand of beer</p>	<p>Annual consumption of beer calculated from frequency and quantity at five popular locations (own home, someone else's home, hotel, tavern or bar, sport's clubs and night clubs). Self-reported aggression related to drinking</p>

Study	Participants	Exposure	Outcomes
<p>Study: Casswell 2002[8] Design: Prospective cohort</p> <p>Baseline survey: 1990/91 Follow-up: Eight years</p> <p>Location: New Zealand Analysis: Bayesian analysis using latent class mixture modeling, with imputation for missing data</p>	<p>Sample: n=799, sub-set of larger growth and development cohort study of children recruited in 1972, participants are those who participated in alcohol assessments at age 18, 21 and 26, n=714 analysed (drinkers at each assessment) Ethnicity: largely of British ancestry</p> <p>Data collection: computer-based questionnaire and face-to-face supplementary interview by experienced interviewers</p>	<p>Liking of adverts related to alcohol at age 18 years</p>	<p>Yearly frequency and typical quantity of alcohol consumed at five popular locations (own home, someone else's home, hotel, tavern or bar, sport's clubs and night clubs). Self-reported aggression related to drinking</p>

Study	Participants	Exposure	Outcomes
<p>Study: Stacy 2004[13]</p> <p>Design: Prospective cohort</p> <p>Baseline survey: Spring 2000</p> <p>Follow-up: one year</p> <p>Location: LA, USA</p> <p>Analysis: logistic regression with control for confounders</p>	<p>Sample: 2998 seventh grade students in 20 middle schools, schools randomly selected, 2250 (75%) analysed at follow-up</p> <p>Sex: 51% female</p> <p>Ethnicity: Hispanic 55%, Asian 19%, non-hispanic white 14%, African-american 2%, pacific islander 1%, native American 1%, multi-ethnic 5%, 3% did not report</p> <p>Data collection: self-completed questionnaire administered in class</p>	<p>Watched TV shows index: frequency of specific TV shows viewed and alcohol ad frequency; watched TV sports index created by viewing frequency weighted by average monthly alcohol advertising frequencies; self-reported frequency exposure to alcohol ads rated on a 7-point Likert-type scale; cued recall memory test index calculated as number of recent beer advertisements correctly identified as beer advertisements; draw an event memory test score was number of alcohol advertisements a student could recall across 3 tests</p>	<p>Current alcohol use defined as frequency of at least one drink of beer, wine, wine coolers or liquor in last 30 days; prior use frequency of alcohol in last 6 months and lifetime</p>

Study	Participants	Exposure	Outcomes
<p>Study: Ellickson 2005[11]</p> <p>Design: Prospective cohort (reported as part of an RCT of a school based drug prevention programme)</p> <p>Baseline survey: Autumn 1997 Follow-up: Spring 2000</p> <p>Location: USA Analysis: Crude and adjusted logistic regression analysis with imputation for missing data points, baseline drinkers (1,206) analysed separately from non-drinkers (1,905), controlled for treatment group, T.V viewing, social bonds, social influences, attitudes, ethnicity and sex</p>	<p>Sample: 3,111 children in 7th grade, 82.3% of original sample, excludes participants with missing data Sex: 50% female Ethnicity: 88% white, 6.3% Native American, 5.4% other</p> <p>Data collection: Self-completed questionnaires administered during school hours supervised by trained staff, make-up sessions and mailed surveys for absentees</p>	<p>Television beer advertising, magazines with alcohol advertisements, beer concession stands, in-store advertisement displays frequency of which determined to generate an overall score for measure of exposure for each of the 4 items</p>	<p>Alcohol use in the past year (none, one to two times, three to ten times, 11-20 times, more than 20 times)</p>

Study	Participants	Exposure	Outcomes
<p>Study: Snyder 2006[12]</p> <p>Design: Prospective cohort</p> <p>Baseline survey: April to July 1999</p> <p>Follow-up: 21 months</p> <p>Location: USA</p> <p>Analysis: multi-level model used for analysis controlling for potential confounders: gender, age, ethnicity, school status, alcohol sales per capita. Analyses performed on whole sample and subgroup younger than 21.</p>	<p>Sample: Random sample youth aged 15 to 26 years from 24 media markets, mean response rates across markets 27%, N=1872, 1173, 787 and 588 at each time point.</p> <p>Sex: 49% female</p> <p>Ethnicity: white=70%, black 11.4%, Hispanic 8.2%</p> <p>Data collection: computer-aided telephone interviewing at four time points during follow-up</p>	<p>1. Self-reported beer or liquor and pre-mixed drink advertising in past month on each of 4 media (TV, radio, billboards and magazines) summed to produce an overall index score</p> <p>2. Market level measures of alcohol advertising expenditure-per-capita index calculated from amount spent on alcohol advertisements on TV, radio, newspapers and billboards in each market in 1999 and 2000.</p>	<p>Any alcoholic beverage drinking frequency past four weeks; average quantity alcohol drank; maximum quantity on any occasion. Alcohol use then quantified as number of alcoholic drinks consumed in last month</p>

Study	Participants	Exposure	Outcomes
<p>Study: Robinson 1998[14] Design: Prospective cohort</p> <p>Baseline survey: October/November 1994 Follow-up: 18 months</p> <p>Location: USA Analysis: Multiple logistic regression adjusted for exposure to other media types, age, sex and ethnicity, baseline drinkers and non-drinkers analysed separately</p>	<p>Sample: n=2,609 (94%) of eligible students participated, 1,583 (61%) assessed at follow-up, of which 1,533 analysed. 9th grade students from 6 public high schools, all students eligible if no special needs and proficient in English language</p> <p>Sex: 50.6% female Ethnicity: Latino 34%, Asian 34%, White 19%, African-American 5%, other 8% Data collection: Pencil and paper self-assessments supervised by trained staff</p>	<p>Weekly total hours of TV, music video and videotape viewing, computer and video game use</p>	<p>Lifetime and past 30 day alcohol use. Lifetime drinking defined as at part of one drink. New onset defined as onset of lifetime drinking among baseline non-drinkers. Maintenance of drinking at follow-up, in baseline drinkers, defined as increase in lifetime drinking plus drinking at least once in past month</p>

Study	Participants	Exposure	Outcomes
<p>Study: Van Den Bulck[15] 2005 Design: Prospective cohort</p> <p>Baseline survey: February 2003 Follow-up: 1 year</p> <p>Location: Belgium Analysis: Multiple regression analyses adjusted for gender, school year, smoking status, and puberty status</p>	<p>Sample: n=3022 students eligible, one school excluded due to prior knowledge about study purpose, 2,546 in final sample, 1,648 students analysed with complete data at both time-points, all 1st and 4th year students at 15 randomly selected secondary schools Sex: 45.4% female Ethnicity: Flemish Age: 52% 1st year, 48% 4th year students Data collection: Self-administered questionnaire</p>	<p>Frequency of music video watching, total TV viewing hours per day</p>	<p>Quantity of alcohol consumption while going out (bar, party or disco etc)</p>

Study	Participants	Exposure	Outcomes
<p>Study: Sargent 2006[16] Design: Cross-sectional survey with prospective follow-up of never drinkers</p> <p>Baseline survey: September 1999 Follow-up: average 17 months (range 12 to 26)</p> <p>Location: USA Analysis: Multiple regression analysis adjusted for: school grade, sex, parent education, school performance, self-esteem, smoking, rebelliousness, sensation seeking and parenting style.</p>	<p>Sample: n=3,577 students who had never tried drinking, 2,406 (67.3%) analysed at follow-up all 5th - 8th grade students at 15 randomly selected middle schools</p> <p>Sex: about 50% female Ethnicity: Mostly white Age: 10 to 14 years Data collection: Computer-assisted telephone interview</p>	<p>Exposure to movie alcohol use in 50 popular contemporary films summarized as a score</p>	<p>Ever had beer, wine or other drink with alcohol that your parents didn't know about?</p>

Methodological quality

One study used a random sample of youth[12], two randomly selected schools and all participants at those schools were invited to participate[13, 15, 16], in one study[14] all participants at six schools were eligible to participate but how schools were selected was not described, one study used the original sample of participants selected for participation in an RCT but excluded those with missing data [11], and one study consisted of a sub-sample of children who had exposure and outcome data available at all follow-up periods[10].

Ascertainment of exposure and outcome data were by self-reported questionnaires in four studies,[11, 13-15] by face-to-face interview in one[10] and computer-aided telephone interview in two[12, 16]. It is possible that the retrospective study was susceptible to recall bias[10]. No blinding procedures of exposure or outcome assessments were reported. In the studies using face-to-face interviews and telephone interviews it is possible that knowledge of exposure status could have influenced outcome assessment. Not all children were non-drinkers at baseline. Two studies reported results for baseline drinkers and non-drinkers separately[11, 14].

All studies suffered, to a greater or lesser extent, from potential attrition bias. Attrition rates varied from 31% to 82%. One study used imputation for missing data[11], all other studies excluded participants with missing data from the analyses.

Results

Connolly (1994)[10] investigated the relationship between alcohol consumption at 18 and alcohol-related mass media communications recalled at ages 13 and 15 years in a New Zealand cohort of young people. Among men, those who recalled more alcohol advertisements at age 15 drank significantly more beer at 18 years, average amount beer consumption $p=0.047$, maximum amount beer consumption $p=0.008$. In women a negative association of alcohol advertisement recall at age 13 years and frequency of drinking beer was found, $p=0.029$. There was no significant effect on wine or spirit consumption in either women or men. Whilst significant relationships were detected, we cannot rule out the possibility they occurred due to chance. The authors reported

results for more than 35 statistical tests and significant findings would be expected to occur due to chance. This coupled with the small sample sizes, 251 men and 184 women, cast some doubt on these findings being real effects. Subsequent publications from this same sample followed up at age 21 and 26 years have been published[8, 9]. In the group that were beer drinkers at 18 years, liking of alcohol advertising and brand allegiance had a positive impact on beer consumed at age 21 years; standardised coefficients were 0.26 and 0.36, respectively. At 26 years, those showing a liking for alcohol advertising at 18 years were more likely to be in a group of heavier drinkers.

Stacy (2004)[13] assessed the impact of exposure to alcohol advertisements on TV on alcohol use in 2,250 12 to 13 years old school children in California followed up for a year. At baseline, 16% reported drinking beer in the past month, 15% reported drinking wine in past month, and 8% reported three-drink episodes in the past month. At follow-up, prevalence was 18% for beer, 20% for wine and 12% for three-drink episodes. At one-year follow-up, each standard deviation increase in TV viewing programmes with alcohol advertisements at baseline was associated with a significant increase in risk of beer use (44%; 95% Confidence Interval (CI): 27% to 61%), wine/liquor use (34%; 95% CI: 17% to 52%) and three-drink episodes (26%; 95% CI: 8% to 48%), controlling for confounding factors possibly related to drinking behaviour. Watched TV sports index was only positively associated with beer drinking, 20% (95% CI: 5% to 37%) with adjustment for confounders, and self-reported frequency of exposure was significantly associated with increased risk of beer drinking, 21% (95% CI: 4% to 41%). Other exposure measures, cued-recall memory test and draw-an-event memory test, did not show significant relationships with any of the outcomes, though most showed effects in the direction of positive associations with one exception, participants scoring one standard deviation above the mean for draw-an-event memory test were significantly, 14% (95% CI: 1% to 25%) less likely to drink beer one year later.

Ellickson (2005)[11] examined the relationship between a range of advertisement exposures over the course of one year and subsequent drinking among US adolescents age 12 to 13 years followed-up for at least two years. Forty-eight per cent non-drinkers

at baseline (n=1,905) initiated drinking by two-year follow-up. For baseline non-drinkers, exposure to in-store beer displays predicted drinking onset at follow-up, odds ratio (OR) 1.42 (p<0.05) adjusted for confounding factors related to drinking behaviour. Exposure to TV beer advertisements, magazines with alcohol advertisements, and in-store advertisement displays all showed positive associations, though none were significant in adjusted analyses, OR 1.05, 1.12 and 1.06, respectively. Confidence intervals were not reported for any of the odds ratios. Among baseline drinkers (n=1,206), 77% reported alcohol use in the past year at follow-up. For baseline drinkers, exposure to magazines with alcohol advertisements and to beer concession stands at sports or music events predicted frequency of drinking at follow-up, regression co-efficient 0.10 and 0.09, (p-value < 0.05), respectively. Exposure to TV beer advertising or in-store advertisement displays were not significant predictors of drinking frequency in analyses adjusted for baseline drinking and multiple control variables, regression co-efficient -0.01 and 0.02, respectively.

Snyder (2006)[12] evaluated the relationship between self-reported advertising exposure to four media (TV, radio, billboards and magazines) and the prevalence of advertising in the same media sources and alcohol consumption in 15 to 26 year olds in 24 media markets in USA. Participants were followed up at four time-points over a 21 month period. Sixty-one per cent had at least one drink in the past month at baseline and consumed an average of 38.5 drinks a month. Participants reported seeing an average of 22.7 alcohol advertisements per month. For each additional advertisement seen, the number of drinks consumed increased by 1% (95% CI: 1% to 2%). Also for each additional dollar per capita spent on advertising the number of alcoholic drinks consumed per month increased by 3% (95% CI: 1% to 5%). In the sub-group of participants aged less than 21 years (60% of sample), who are below the legal drinking age, similar patterns were seen, 1% (95% CI: 0.1% to 2%) and 3% (95% CI: 0.2% to 6%) increase in number of drinks consumed per month for self-reported advertising exposure and advertising expenditure, respectively. All analyses controlled for gender, age, ethnicity, school status and alcohol sales per capita.

Two studies evaluated exposure to TV and music videos and alcohol use in adolescents[14, 15]. In the study by Robinson et al. (1998)[14] the association between hours of TV, music video and videotape viewing, computer and video game use and subsequent alcohol use at 18 months follow-up was investigated in 1,533 14 to 15 year olds from six public high schools in California. During follow-up, 325 (36.2%) baseline non-drinkers began drinking and 322 (50.7%) drinkers continued to drink. In baseline non-drinkers (n=898), onset of drinking was significantly associated with hours of TV viewing at baseline. For each additional hour of TV viewing per day the average increased risk of starting to drink during the next 18 months was 9% (95% CI: 1% to 18%), for each additional hour of music video viewing average increased risk was 31% (95% CI: 17% to 47%). For each additional hour of videotape viewing the average risk decreased, 11% (95% CI: 1% to 21%) in analyses controlling for age, sex, ethnicity and other media use. Computer and video game use was not significantly associated with subsequent onset of drinking, 6% decrease (95% CI: 16% decrease to 5% increase). In baseline drinkers (n=635), there were no significant associations between baseline media use and maintenance of drinking. For each additional viewing hour per day the risk, OR (95% CI), of maintenance of drinking was: 1.01 (0.93, 1.11) for television, 1.05 (0.95, 1.17) for music videos, 0.97 (0.86, 1.10) for videos and 1.00 (0.89, 1.12) for computer or video games.

Van Den Bulck (2005)[15] examined the relationship between television viewing and music video exposure and subsequent alcohol consumption one year later while going out in 2,546 first and fourth year secondary school students in Flanders, Belgium. Only 65% of the original sample with complete data at both time-points was analysed. The majority of students (63.6%) watched music videos at least several times a week, about a third watched daily. Overall television viewing and music video viewing at baseline significantly predicted the amount of alcoholic beverages adolescents consumed while going out at follow-up. Results of a regression model controlling for gender, school year, smoking and pubertal status were reported: R^2 0.568 ($F=230.374$; $df=7.1229$; $p<0.0001$).

Sargent et al. (2006)[16] evaluated the exposure to alcohol use in popular contemporary movies and incident alcohol drinking 13 to 26 months later. Adolescents, 10 to 14 years old, were recruited from 15 randomly selected schools in New Hampshire and Vermont, USA. Never-drinkers at baseline were followed up (n=2,406). Baseline median exposure to alcohol use in 601 movies was 8.6 hours, (inter-quartile range (IQR): 4.6 to 13.5). At follow-up, 14.8% reported having tried alcohol, which was significantly associated with alcohol exposure (viewing hours). OR for incident alcohol use 1.15 (95% CI: 1.06, 1.25) adjusted for school grade, school, gender, parent education, sensation seeking, rebelliousness, self-esteem, school performance, parenting style and smoking experimentation.

Discussion and conclusions

This systematic review of seven cohort studies on over 13,000 participants shows some evidence for an association between prior alcohol advertising and marketing exposure and subsequent alcohol drinking behaviour in young people. All seven studies demonstrated significant effects across a range of different exposure variables and outcome measures. These included exposure to direct advertising using broadcast and print media and indirect methods such as in-store promotions and portrayal of alcohol drinking in films, music videos and TV programmes. The consistency of effect across a heterogeneous group of studies may be considered a strength.

Notably, three studies showed that onset of drinking in adolescent non-drinkers at baseline were significantly associated with exposure. Robinson et al (1998)[14] showed that for each additional hour of TV viewing per day the risk of starting to drink increased by 9% during the following 18 months. Sargent et al. (2006)[16] found that youth with higher exposure to alcohol use depicted in popular movies were more likely to have tried alcohol 13 to 26 months later[16]. Ellickson et al (2005)[11] showed that exposure to in-store beer displays significantly predicted drinking onset two years later. Effects were less clear in baseline drinkers, whilst greater exposure predicted greater

drinking frequency, analyses adjusting for possible confounding factors failed to detect significant relationships.

Two studies demonstrated dose response relationships. In the study by Van Den Bulck (2005)[15] in Flemish school children, increased frequency of TV viewing and music video viewing was highly significantly related to the amount of alcohol consumed while going out. In the study by Snyder et al. (2006)[12] of US individuals aged 15 to 26 years, for each additional advertisement seen the number of drinks consumed increased by 1%, and for each additional dollar spent per capita on alcohol advertisements the number of drinks consumed increased by 3%. Both studies controlled for factors possibly related to drinking behaviour. The other studies categorised drinking outcomes as dichotomous outcomes or used measures that did not allow for dose response relationships to be detected. However, we cannot infer that a simple dose response relationship exists due to the potential influence of unknown or unmeasured baseline confounding factors such as social norms, family history and psychological characteristics.

There are several limitations that should be considered when interpreting the results of this review. Whilst we made an *a priori* decision to only include and review cohort studies which potentially are less likely to suffer from systematic bias than less robust study designs such as cross-sectional surveys or interrupted time series studies, it is nonetheless important to note that cohort studies are also susceptible to bias if not designed and executed using rigorous standards. One phase of one of the studies used retrospective recall of exposure to advertising advertisements which may have introduced recall bias whereby heavier drinkers recall more exposure to advertisements than non-drinkers or lighter drinkers, but where actual exposure levels were little different. One of the biggest threats to the validity of observational studies such as cohort studies is the issue of confounding, whereby the outcome of interest is modified by some other factor or factors in addition to the exposure of interest. Whereas all of the studies controlled for a number of confounding factors possibly related to alcohol drinking behaviour, unmeasured or unknown confounders cannot be adjusted for and it is not possible to know if residual confounding influenced the analysis. For example,

alcohol expectancies, family history, peer influence and personality characteristics may act as confounders in the relationship between exposure to advertising and marketing and subsequent alcohol use. Given the magnitude of the effect sizes shown in these studies, it is possible they were due to residual and unmeasured confounding[28].

Whilst these studies suggest that exposure to advertising and alcohol portrayal in the media increase likelihood of later alcohol consumption, they are unable to inform us how exposure brings about these changes, or what aspects of advertising and marketing are the active components. The extent to which psychological factors determine subsequent behaviours is a worthwhile topic for further study. One study[29] has examined how persuasive alcohol media messages were associated with concurring beliefs and behaviours among youth, concluding that existing exposure based studies do not adequately account for the complex psychological causal mechanisms that may moderate or mediate the relationship between exposure and outcome. However, this analysis is based on cross-sectional data; further studies with longitudinal analyses are desirable. If a better understanding of the relationship of the intermediate steps between exposure and subsequent behaviours can be obtained, then our understanding of the mechanisms of action of alcohol advertising and marketing would be improved. This question, together with lessons learned from the collective experiences of conducting cohort studies[30], should inform the design of future cohort studies.

One other serious threat to the validity of these studies was the degree of attrition in some of the studies. Losses to follow-up between assembly of the cohort and follow-up are inevitable but the aim is to keep this to a minimum as attrition bias may be introduced if reasons for missing data or loss to follow-up are related to exposure or outcome. Generalisability of the results is also affected if losses are in one specific subgroup of participants. The subsequent loss of power is also a problem with attrition. Of note, none of the studies reported how they estimated sample sizes required.

Nonetheless, the results of these cohort studies are supported by findings in the cross-sectional surveys which consistently report associations between increased exposure to alcohol advertising or marketing and drinking behaviour, [1-4] intentions to drink[31]

or advertising awareness and liking[3, 32-34]. Cross-sectional studies are vulnerable to reverse causality interpretation whereby the association exists because drinkers are pre-disposed to view and remember alcohol advertisements, rather than alcohol advertisements promoting drinking. Similarly, in one interrupted time-series study countries with advertising bans had lower levels of alcohol consumption and road traffic fatalities[35], others did not demonstrate significant effects[36, 37]. The rationale for the exclusion of these studies is outlined in the methodology. Incorporating their findings into this review would weaken any inferences we can make as these studies are more susceptible to bias, and their exclusion would only be a concern if they showed a strong effect in the opposite direction.

We cannot rule out the possibility of publication bias, whereby studies failing to detect significant relationships were not published, or studies for which selective reporting of only positive associations were published. Of course it is also possible that studies showing positive associations, if sponsored by the alcohol industry or other commercial organisations with a vested interest in advertising or marketing of alcohol, have not been published. Therefore, it is not possible to predict the likely impact of unpublished data on the results of this review. It is also possible that published studies were not found by our search as a fully comprehensive search of multiple databases and other sources was not possible within the scope of the review resources. Attempts, however, were made to locate all available studies by supplementing searches of databases with hand searching reference lists of key reviews and primary studies.

The data from these studies suggest that exposure to alcohol advertising in young people influences their subsequent drinking behaviour. The effect was consistent across studies, a temporal relationship between exposure and drinking initiation was shown, and a dose response between amount of exposure and frequency of drinking was demonstrated. It is certainly plausible that advertising would have an effect on youth consumer behaviour, as has been shown for tobacco[38] and food marketing[39].

Given the large budgets allocated to advertising and promotional activity by the alcohol industry, a paucity of research exists evaluating the effects of this advertising. Further

research exploring the potential causal impact is warranted. The role of mass media as a potential source of influence on alcohol related knowledge and behaviour of young people has been neglected in the UK.

References

1. Wyllie, A., Zhang J. F, and Casswell S, Positive responses to televised beer advertisements associated with drinking and problems reported by 18 to 29-year-olds. *Addiction*, 1998; 93(5):749-760.
2. Wyllie, A., Zhang J. F, and Casswell S, Responses to televised alcohol advertisements associated with drinking behaviour of 10-17-year-olds. *Addiction*, 1998; 93(3):361-371.
3. Aitken, P., Eadie DR, Leathar DS, McNeill RE, and Scott AC, Television advertisements for alcoholic drinks do reinforce under-age drinking. *British Journal of Addiction*, 1988; 83(12):1399-419.
4. Thomsen, S.R. and Rekve D, Entertainment and music magazine reading and binge drinking among a group of juvenile offenders. *International Journal of Adolescent Medicine & Health*, 2006; 18(1):123-131.
5. Waterson MJ, Advertising and alcohol: an analysis of the evidence relating two major aspects of the debate. *Int J Advertising*, 1989; 8(2):111-32.
6. Duffy M, Measuring the contribution of advertising to growth in demand: econometric accounting framework. *Int J Advertising*, 1989; 8(2):95-110.

-
7. Duffy M, Advertising and the consumption of tobacco and alcoholic drink: a system-wide analysis. *Scot J Political Econ*, 1991; 38:369-85.
 8. Casswell, S., Pledger M, and Pratap S, Trajectories of drinking from 18 to 26 years: Identification and prediction. *Addiction*, 1427; 97(11):1427-1437.
 9. Casswell, S. and Zhang J. F, Impact of liking for advertising and brand allegiance on drinking and alcohol-related aggression: a longitudinal study. *Addiction*, 1998; 93(8):1209-17.
 10. Connolly, G.M., Casswell S, Zhang J. F, and Silva P. A, Alcohol in the mass media and drinking by adolescents: a longitudinal study. *Addiction*, 1994; 89(10):1255-63.
 11. Ellickson, P.L., Collins R. L, Hambarsoomians K, and McCaffrey D. F, Does alcohol advertising promote adolescent drinking? Results from a longitudinal assessment. *Addiction*, 2005; 100(2):235-246.
 12. Snyder, L.B., S.M. Milici F. F, Sun H, and Strizhakova Y, Effects of alcohol advertising exposure on drinking among youth. *Archives of Pediatrics & Adolescent Medicine*, 2006; 160(1):18-24.

-
13. Stacy, A.W., Zogg J. B, Unger J. B, and Dent C. W, Exposure to televised alcohol ads and subsequent adolescent alcohol use. *American Journal of Health Behaviour*, 2004; 28(6):498-509.
 14. Robinson, T.N., H.L. Chen, and J.D. Killen, Television and music video exposure and risk of adolescent alcohol use. *Pediatrics*, 1998; 102(5):E54.
 15. van den Bulck, J. and K. Beullens, Television and music video exposure and adolescent alcohol use while going out. *Alcohol Alcohol*, 2005; 40(3):249-53.
 16. Sargent, J.D., T.A. Wills, Stoolmiller M, Gibson J, and X. Gibbons F, Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol*, 2006; 67:54-65.
 17. Hastings, G., Anderson S, Cooke E, and Gordon R. Alcohol marketing and young people's drinking: A review of the research. *Journal of Public Health Policy*, 2005; 26(3):296-311.
 18. Atkin, C.K., Effects of televised alcohol messages on teenage drinking patterns. *Journal of Adolescent Health Care*, 1990; 11(1):10-24.

-
19. Austin, S.B. and Rich M, Consumerism: its impact on the health of adolescents. *Adolescent Medicine State of the Art Reviews*, 2001; 12(3):389-409.
 20. Brown, J.D. and Witherspoon E. M, The mass media and American adolescents' health. *Journal of Adolescent Health*, 2002; 31(6 Suppl):153-70.
 21. Casswell, S., Alcohol brands in young peoples' everyday lives: New developments in marketing. *Alcohol & Alcoholism*, 2004; 39(6):471-476.
 22. Casswell, S. and Maxwell A, Regulation of alcohol marketing: A global view. *Journal of Public Health Policy*, 2005; 26(3):343-358.
 23. Grube, J.W. and Waiters E, Alcohol in the media: content and effects on drinking beliefs and behaviours among youth. *Adolescent Medicine Clinics*, 2005; 16(2):327-43.
 24. Jernigan, D.H., Ostroff J, and Ross C, Alcohol advertising and youth: A measured approach. *Journal of Public Health Policy*, 2005; 26(3):312-325.
 25. Makela, P., Rossow I, and Tryggvesson K, Who drinks more and less when policies change? The evidence from 50 years of Nordic studies. *Nadpublikation*, 2002; 42:17-70.

-
26. Saffer, H., Alcohol advertising and youth. *Journal of Studies on Alcohol*, 2002; 63(SUPPL. 14):173-181.
27. Strasburger, V.C., Alcohol advertising and adolescents. *Paediatric Clinics of North America*, 2002; 49(2):353-376.
28. Fewell, Z., G. Davey Smith, and J.A. Sterne, The impact of residual and unmeasured confounding in epidemiologic studies: a simulation study. *Am J Epidemiol*, 2007; 166(6):646-55.
29. Austin, E.W., M.J. Chen, and J.W. Grube, How does alcohol advertising influence underage drinking? The role of desirability, identification and skepticism. *J Adolesc Health*, 2006; 38(4):376-84.
30. Faden, V.B., N.L. Day, M. Windle, R. Windle, J.W. Grube, B.S. Molina, W.E. Pelham, Jr., E.M. Gnagy, T.K. Wilson, K.M. Jackson, and K.J. Sher, Collecting longitudinal data through childhood, adolescence, and young adulthood: methodological challenges. *Alcohol Clin Exp Res*, 2004; 28(2):330-40.
31. Kelly, K.J. and Edwards R. W, Image advertisements for alcohol products: is their appeal associated with adolescents' intention to consume alcohol? *Adolescence*, 1998; 33(129):47-59.

-
32. Austin, E.W. and Knaus C, Predicting the potential for risky behaviour among those "too young" to drink as the result of appealing advertising. *Journal of Health Communication*, 2000; 5(1):13-27.
33. Casswell, S., Gilmore L. L, Silva P, and Brasch P, What children know about alcohol and how they know it. *British Journal of Addiction*, 1988; 83(2):223-7.
34. Collins, R.L., Schell T, Ellickson P. L, and McCaffrey D, Predictors of beer advertising awareness among eighth graders. *Addiction*, 1297; 98(9):1297-1306.
35. Saffer, H. and N. s Full, Alcohol advertising bans and alcohol abuse: an international perspective.[see comment]. Comment in: *J Health Econ*. 1993 Jul;12(2):213-28; PMID: 10127781. *Journal of Health Economics*, 1991; 10(1):65-79.
36. Ogborne, A.C. and Smart R. G, Will restrictions on alcohol advertising reduce alcohol consumption? *British Journal of Addiction*, 1980; 75(3):293-296.
37. Makowsky, C.R. and Whitehead P. C, Advertising and alcohol sales: a legal impact study. *Journal of Studies on Alcohol*, 1991; 52(6):555-67.

38. Lovato, C., G. Linn, L.F. Stead, and A. Best, Impact of tobacco advertising and promotion on increasing adolescent smoking behaviours. Cochrane Database Syst Rev, 2003; (4):CD003439.

39. Hastings G, M. Stead, L. McDermott, and et al, Review of research of the effects of food promotion to children. Centre for Social Marketing, University of Strathclyde, 2003,:1-218.

Appendix 1

Table 2: Excluded articles

1. Agostinelli G, Grube J. W. Alcohol counter-advertising and the media. A review of recent research. <i>Alcohol Research & Health: the Journal of the National Institute on Alcohol Abuse & Alcoholism</i> 2002;26(1):15-21.	Review of counter-advertising and alcohol
2. Agostinelli G, Grube J. W. Tobacco counter-advertising: a review of the literature and a conceptual model for understanding effects. <i>Journal of Health Communication</i> 2003;8(2):107-27.	Review, counter-advertising and tobacco
3. Aitken PPLDSSAC, s Full N. Ten- to sixteen-year-olds' perceptions of advertisements for alcoholic drinks. <i>Alcohol & Alcoholism</i> 1988;23(6):491-500.	Qualitative interviews with children to assess knowledge and belief about TV advertising including alcohol, no drinking outcomes
4. Alaniz ML. Alcohol availability and targeted advertising in racial/ethnic minority communities. <i>Alcohol Health & Research World</i> 1998;22(4):286-9.	Review describing relationship between advertising and violence in geographic areas
5. Alaniz ML, Wilkes C. Pro-drinking messages and message environments for young adults: the case of alcohol industry advertising in African American, Latino, and Native American communities. <i>Journal of Public Health Policy</i> 1998;19(4):447-72.	Expert opinion and description of advertising practice in US with regard to ethnic minorities
6. Allander E. Alcohol and tonic--a suitable remedy? <i>Lakartidningen</i> 1968;65(6):543-8.	Swedish, no English abstract, content unclear
7. Anonymous. Public health aspects of international production, marketing and distribution of alcoholic beverages. Report of 'informal consultation' held by the World Health Organization (WHO Geneva), 10-12 June 1981. <i>British Journal of Addiction</i> 1982;77(4):349-56.	Report of WHO meeting making recommendations for future research
8. Anonymous. Public health and the sale of alcohol. <i>Flash-Information</i> 1985(3):3-4.	Review
9. Anonymous. Alcohol. Advertising, counteradvertising, and depiction in the public media. Board of Trustees report. <i>Jama</i> 1986;256(11):1485-8.	No primary data
10. Anonymous. Advertising and promotion of alcohol and tobacco products to youth. <i>American Journal of Public Health</i> 1993;83(3):468-72.	Position paper describing problem with recommendations for policy

11. Anonymous. Unethical advertising?--The promille killer and alcohol tester. <i>Blutalkohol</i> 1995;32(3):180-6.	German no English abstract
12. Anonymous. Children, adolescents, and advertising. Committee on Communications, American Academy of Pediatrics.[erratum appears in <i>Pediatrics</i> 1995 May;95(5):708]. <i>Pediatrics</i> 1995;95(2):295-7.	Expert opinion review
13. Anonymous. Radio daze: young people targeted by alcohol ads. <i>Public Health Reports</i> 2003; 118(4):383.	Letter, radio ads and alcohol
14. Atkin CK. Effects of televised alcohol messages on teenage drinking patterns. <i>Journal of Adolescent Health Care</i> 1990;11(1):10-24.	Review
15. Austin EW, Hust S. J. Targeting adolescents? The content and frequency of alcoholic and nonalcoholic beverage ads in magazine and video formats November 1999-April 2000. <i>Journal of Health Communication</i> 2005; 10(8):769-85.	Survey of advertising in magazines and videos, USA
16. Austin SB, Rich M. Consumerism: its impact on the health of adolescents. <i>Adolescent Medicine State of the Art Reviews</i> 2001; 12(3):389-409.	Review of impact of consumerism on health including alcohol advertising
17. Baillie RK. Determining the effects of media portrayals of alcohol: going beyond short term influence. <i>Alcohol & Alcoholism</i> 1996; 31(3):235-42.	Review
18. Barton R. Alcohol promotion on television. <i>World Health Forum</i> 1989; 10(2):181-5.	Survey of alcohol ads on TV, no drinking behavior
19. Barton R, Godfrey S. Un-health promotion: results of a survey of alcohol promotion on television.[erratum appears in <i>Br Med J (Clin Res Ed)</i> 1988 Jul 30;297(6644):343]. <i>British Medical Journal Clinical Research Ed.</i> 1988;296(6636):1593-4.	Survey of TV advertising and alcohol content
20. Bertozzi S, Bristow L. R, Broadaway R. K. Alcohol: Advertising, counteradvertising, and depiction in the public media. <i>Jama</i> 1485;256(11):1485-1488.	Expert report making recommendations about alcohol advertising to American Medical Association
21. Blizzard J. Letter: Effects of advertising on cigarette and alcoholic beverage consumption. <i>Medical Journal of Australia</i> 1975;2(24):919.	Letter, no primary data

22. Boschetti G. Alcohol and tobacco: publicity and sequelae of their abuse. <i>Zeitschrift fur Krankenpflege - Revue Suisse des Infirmieres</i> 1974;67(8-9):332-3.	Italian, no English abstract, editorial, alcohol and tobacco: publicity and sequelae of their abuse
23. Breed W, Wallack L, Grube J. W. Alcohol advertising in college newspapers: a 7-year follow-up. <i>Journal of American College Health</i> 1990;38(6):255-62.	Survey of content of alcohol ads, no drinking outcomes
24. Broderick GJ. Alcohol advertising. <i>Australian Journal of Public Health</i> 1992;16(1):108-9.	Letter no primary data
25. Brown JD, Witherspoon E. M. The mass media and American adolescents' health. <i>Journal of Adolescent Health</i> 2002;31(6 Suppl):153-70.	Review of media effects on teens health in USA
26. Cafiso J, Goodstadt M. S, Garlington W. K, Sheppard M. A. Television portrayal of alcohol and other beverages. <i>Journal of Studies on Alcohol</i> 1982;43(11):1232-43.	Not a clinical study, content analysis of alcohol ads appearing on 3 TV stations
27. Carroll TE, Donovan R. A. Alcohol marketing on the internet: new challenges for harm reduction. <i>Drug & Alcohol Review</i> 2002;21(1):83-91.	Survey of 6 alcohol websites in Australia, not a primary study
28. Carr-Gregg M, Scott J. Health messages on alcohol advertising: a positive or a counterproductive measure? <i>New Zealand Medical Journal</i> 1993;106(954):163-4.	Editorial
29. Cassisi JE, Delehant M, Tsoutsouris J. S, Levin J. Psychophysiological reactivity to alcohol advertising in light and moderate social drinkers. <i>Addictive Behaviors</i> 1998;23(2):267-274.	Experimental study evaluating physiological response to alcohol ads
30. Casswell S. Alcohol brands in young peoples' everyday lives: New developments in marketing. <i>Alcohol & Alcoholism</i> 2004;39(6):471-476.	Review of response of young people to advertising
31. Casswell S. TV advertising of alcohol is not in the interests of public health: <i>Addiction</i> 2005;100(2):258-259.	Comment on Ellickson study, no primary data
32. Casswell S, Maxwell A. Regulation of alcohol marketing: A global view. <i>Journal of Public Health Policy</i> 2005;26(3):343-358.	Review
33. Centers for Disease Control Prevention, Youth exposure to alcohol advertising on radio--United States, June-August 2004. <i>MMWR - Morbidity & Mortality Weekly Report</i> 2006;55(34):937-40	Survey of alcohol ads on radio and youth exposure, no drinking outcomes

-
34. Comiti VP. The advertising of alcohol in France. *World Health Forum* 1990;11(3):242-5. Commentary on alcohol advertising in France
35. Cooke E, Hastings G, Wheeler C, Eadie D, Moskalewicz J, K D. Marketing of alcohol to young people: a comparison of the UK and Poland. *European Addiction Research* 2004;10(1):1-7. Descriptive study, no drinking outcomes, describes alcohol market in UK and Poland
36. Cornejo E, Naveillan P, Sandoval M, Sapunar J, Rivera J, Salazar L, Roman R, Gallo C, Riquelme F, C S, et al. Television images related to beverages and their forms of appearance in 3 channels of the metropolitan region of Santiago. *Revista Medica de Chile* 1987;115(7):680-6. Spanish with English abstract, survey of alcohol ads on TV, no drinking outcomes
37. De Foe JR, Breed W. The problem of alcohol advertisements in college newspapers. *Journal of the American College Health Association* 1979;27(4):195-9. Survey of alcohol ads in newspapers and discusses drinking behavior in students
38. Ewert D, Alleyne D. Risk of exposure to outdoor advertising of cigarettes and alcohol. *American Journal of Public Health* 1992;82(6):895-896. Letter, survey of % billboards devoted to alcohol and cigarettes in a given geographic region, not related to drinking outcomes and not specifically in young people
39. Finn TA, Strickland D. E. A content analysis of beverage alcohol advertising. II. Television advertising. *Journal of Studies on Alcohol* 1982;43(9):964-89. Not a clinical study, content analysis of alcohol ads appearing on TV
40. Furnham A, Bergland J, Gunter B. Memory for television advertisements as a function of advertisement-programme congruity. *Applied Cognitive Psychology* 2002;16(5):525-545. No drinking outcomes, evaluates memory of advertisements after experimental exposure
41. Garfield CF, Chung P. J, Rathouz P. J. Alcohol Advertising in Magazines and Adolescent Readership. *Jama* 2003;289(18):2424-2429. No drinking outcomes, evaluates relationship between alcohol advertising and readership
42. Gerbner G, Gross L, Morgan M, Signorielli N. Health and medicine on television. *New England Journal of Medicine* 1981;305(15):901-4. Analysis of content of TV ads
43. Grube JW, Waiters E. Alcohol in the media: content and effects on drinking beliefs and behaviors among youth. *Adolescent Medicine Clinics* 2005;16(2):327-43. Review
44. Grube JW, Wallack L. Television beer advertising and drinking knowledge, beliefs, and intentions among schoolchildren. *American Journal of Public Health* 1994;84(2):254-259. Cross-sectional survey of 10-14 year olds relationship between knowledge and beliefs and awareness of alcohol advertising and intention to drink
-

45. Hastings G, Anderson S, Cooke E, Gordon R. Alcohol marketing and young people's drinking: A review of the research. <i>Journal of Public Health Policy</i> 2005;26(3):296-311.	Review
46. Hingson R. Sex differences in adolescent exposure to alcohol advertising in magazines. <i>Archives of Pediatrics & Adolescent Medicine</i> 2004;158(7):702-704.	Editorial, discussing consequences of underage drinking
47. Jackson MC, Hastings G, Wheeler C, Eadie D, Mackintosh A. M. Marketing alcohol to young people: implications for industry regulation and research policy. <i>Addiction</i> 2000;95 Suppl 4:S597-608.	Review of marketing regulations
48. Jernigan DH. Importance of reducing youth exposure to alcohol advertising. <i>Archives of Pediatrics & Adolescent Medicine</i> 2006;160(1):100-102.	Editorial, no primary data
49. Jernigan DHMJF. Editors' introduction: Alcohol marketing and youth - Public health perspectives. <i>Journal of Public Health Policy</i> 2005;26(3):287-291.	Editorial, introduces papers by authors in that journal issue
50. Jernigan DH, Ostroff J, Ross C. Alcohol advertising and youth: A measured approach. <i>Journal of Public Health Policy</i> 2005;26(3):312-325.	Review of studies quantifying exposure
51. Jernigan DH, Ostroff J, Ross C, O'Hara JA 3rd. Sex differences in adolescent exposure to alcohol advertising in magazines. <i>Archives of Pediatrics & Adolescent Medicine</i> 2004;158(7):629-34.	Survey of opinion to advertisements sought, no drinking outcomes
52. Jones SC, Donovan R. J. Messages in alcohol advertising targeted to youth. <i>Australian & New Zealand Journal of Public Health</i> 2001;25(2):126-31.	Survey of opinion to advertisements sought, no drinking outcomes
53. Kaskutas LA, Greenfield T. K. The role of health consciousness in predicting attention to health warning messages. <i>American Journal of Health Promotion</i> 1997;11(3):186-93.	Cross-sectional survey evaluating health warnings
54. Kennedy C. Examining television as an influence on children's health behaviors. <i>Journal of Pediatric Nursing</i> 2000;15(5):272-81.	Review
55. Lejoyeux M. Alcoholism and advertisement. <i>Psychologie Medicale</i> 1805;21(12):1805-1809.	French, not primary study, looks like a review of advertising and alcohol depiction in films

-
56. Leung AK, Fagan J. E, Cho H, Lim S. H, Robson W. M. Children and television. *American Family Physician* 1994;50(5):909-12. Review, children and TV including advertising
57. Makela P, Rossow I, Tryggvesson K. Who drinks more and less when policies change? The evidence from 50 years of Nordic studies. *Nadpublikation* 2002;42:17-70. Review of effects of policy changes to advertising alcohol in Nordic countries
58. Martin SE, Snyder L. B, Hamilton M, Fleming-Milici F, Slater M. D, Stacy A, Chen M. J, Grube J. W. Alcohol advertising and youth. *Alcoholism: Clinical & Experimental Research* 2002;26(6):900-906. Review presented work from Proceedings of 2001 symposium, research on alcoholism
59. McDermott FT, Trinca G. W. Television advertising of alcoholic liquor. *Medical Journal of Australia* 1983;1(13):623-5. Recommendations from panel experts
60. Montonen M. Alcohol and the media. WHO Regional Publications 1996;European Series. 62:1-165. Review
61. Moore M, Weiss S. Israeli Christian, Druze, and Moslem adolescents' attitudes toward magazine alcohol advertisements. *International Journal of the Addictions* 1992;27(6):735-41. Survey of youths attitudes to alcohol advertisements , no drinking outcomes
62. Mosher JF. Alcohol advertising and public health: an urgent call for action. *American Journal of Public Health* 1994;84(2):180-1. Editorial, no primary data
63. Mosher JF. Transcendental alcohol marketing: rap music and the youth market. *Addiction* 2005;100(9):1203-4. Editorial discussing rap music and alcohol references
64. Mosher JF, Johnsson D. Flavored alcoholic beverages: An international marketing campaign that targets youth. *Journal of Public Health Policy* 2005;26(3):326-342. Review of alcopop market, advertising and drinking prevalence
65. Mosher JF, Wallack L. M. Government regulation of alcohol advertising: protecting industry profits versus promoting the public health. *Journal of Public Health Policy* 1981;2(4):333-53. Not primary study, commentary on proposed reforms of US government alcohol, tobacco and firearms bureau
66. Naveillan P, Cornejo E, Lopez I, Saint-Jean H. Television and alcoholic and non-alcoholic beverages. *Revista de Saude Publica* 1987;21(1):37-43. Spanish, English abstract, survey of alcohol ads on TV
-

67. Partanen J, Montonen M. Alcohol and the mass media. <i>Euro Reports & Studies</i> . Issue 1988;108(pp 1-73):64-17.	Review
68. Resnick MD. Study group report on the impact of televised drinking and alcohol advertising on youth. <i>Journal of Adolescent Health Care</i> 1990;11(1):25-30.	Study group report recommendations for research and policy on alcohol advertising and youth behavior
69. Sabate F. Young people, alcohol and advertising. <i>Gaceta Sanitaria</i> 2003;17(1):88-9.	Spanish, no English abstract
70. Saffer H. Alcohol advertising bans and alcohol abuse: Reply. <i>Journal of Health Economics</i> 1993;12(2):229-234.	Commentary, no new data
71. Saffer H. Alcohol advertising and youth. <i>Journal of Studies on Alcohol</i> 2002;63(SUPPL. 14):173-181.	Review
72. Sarva S. Marketing and the promotion of alcohol to young people: a potent mix. <i>Addiction</i> 2002;97(9):1233-4.	Unavailable, reference not found
73. Schultz DE. Challenges to study on alcohol advertising effects on youth drinking. <i>Archives of Pediatrics & Adolescent Medicine</i> 2006;160(8):857.	Letter in response to Snyder study
74. Singer DG. Alcohol, television, and teenagers. <i>Pediatrics</i> 1985;76(4 Pt 2):668-74.	Not primary study, review of research and expert opinion
75. Smart R. Limitations of study on alcohol advertising effects on youth drinking. <i>Archives of Pediatrics & Adolescent Medicine</i> 2006;160(8):857-8	Letter in response to Snyder study
76. Smart RG. Does alcohol advertising affect overall consumption? A review of empirical studies. <i>Journal of Studies on Alcohol</i> 1988;49(4):314-23.	Review
77. Strasburger VC. Alcohol advertising and adolescents. <i>Pediatric Clinics of North America</i> 2002;49(2):353-376.	Review
78. Strasburger VC. Risky Business: What Primary Care Practitioners Need to Know About the Influence of the Media on Adolescents. <i>Primary Care</i> 2006;33(2):317-348.	Narrative review of media effects on adolescent behavior
79. Strasburger VCDE. Children, adolescents, and the media: Issues and solutions. <i>Pediatrics</i> 1999;103(1):129-139.	Review

80. Strickland DE, Finn T. A, Lambert M. D. A content analysis of beverage alcohol advertising. I. Magazine advertising. <i>Journal of Studies on Alcohol</i> 1982;43(7):655-82.	Not a clinical study, content analysis of alcohol ads appearing in magazines
81. Villani S. Impact of media on children and adolescents: A 10-year review of research. <i>Journal of the American Academy of Child & Adolescent Psychiatry</i> 2001;40(4):392-401.	Review
82. Waxer PH. Alcohol consumption in television programming in three English-speaking cultures. <i>Alcohol & Alcoholism</i> 1992;27(2):195-200.	Survey of drinking in TV programmes and national prevalence of alcohol related harm
83. Weiss S, Moore M. Cultural differences in the perception of magazine alcohol advertisements by Israeli Jewish, Moslem, Druze and Christian high school students. <i>Drug & Alcohol Dependence</i> 1990;26(2):209-15.	Survey of student's attitudes to alcohol advertising
84. Wyllie ACSSJ, s Full N. The response of New Zealand boys to corporate and sponsorship alcohol advertising on television. <i>British Journal of Addiction</i> 1989;84(6):639-46.	Survey of response to advertisement, no drinking outcomes
85. Young DJ. Alcohol advertising bans and alcohol abuse. <i>Journal of Health Economics</i> 1993;12(2):213-228.	Comment on Saffer 1991 study, no primary data

Appendix 2

Table 3: Excluded studies

Reference	Reason for exclusion
1. Adlaf EM, Kohn PM. Alcohol advertising, consumption and abuse: A covariance-structural modeling look at Strickland's data. <i>British Journal of Addiction</i> 1989;84(7):749-757.	Secondary analysis of Strickland 1983 cross-sectional survey
2. Aitken P, Eadie DR, Leather DS, McNeill RE, Scott AC. Television advertisements for alcoholic drinks do reinforce under-age drinking. <i>British Journal of Addiction</i> 1988;83(12):1399-419.	Cross-sectional survey examining relationship between awareness of alcohol advertising and alcohol use in children
3. Austin EW, Chen M. J, Grube J. W. How does alcohol advertising influence underage drinking? The role of desirability, identification and skepticism. <i>Journal of Adolescent Health</i> 2006;38(4):376-384.	Cross-sectional survey evaluating attitudes towards alcohol advertising and alcohol use in children
4. Austin EW, Knaus C. Predicting the potential for risky behavior among those "too young" to drink as the result of appealing advertising. <i>Journal of Health Communication</i> 2000;5(1):13-27.	Cross-sectional survey examining attitudes to alcohol advertising and pre-drinking and risky behavior in children
5. Casswell S, Gilmore L. L, Silva P, Brasch P. What children know about alcohol and how they know it. <i>British Journal of Addiction</i> 1988;83(2):223-7.	Cross sectional survey exploring children's attitudes and knowledge of alcohol and source of that knowledge, no drinking outcomes
6. Collins RL, Schell T, Ellickson P. L, McCaffrey D. Predictors of beer advertising awareness among eighth graders. <i>Addiction</i> 1997;98(9):1297-1306.	Cross-sectional survey evaluating association of exposure to advertising and awareness of advertising and drinking in children
7. Dunn ME, Yniguez R. M. Experimental demonstration of the influence of alcohol advertising on the activation of alcohol expectancies in memory among fourth- and fifth-grade children. <i>Experimental & Clinical Psychopharmacology</i> 1999;7(4):473-83.	Experimental exposure to alcohol advertisements in videos and attitudes to alcohol post-exposure in children
8. Fleming K, Thorson E, Atkin C. K. Alcohol advertising exposure and perceptions: links with alcohol expectancies and intentions to drink or drinking in under aged youth and young adults. <i>Journal of Health Communication</i> 2004;9(1):3-29.	Secondary analysis of cross-sectional survey

Reference	Reason for exclusion
9. Kelly KJ, Edwards R. W. Image advertisements for alcohol products: is their appeal associated with adolescents' intention to consume alcohol? <i>Adolescence</i> 1998;33(129):47-59.	Cross sectional survey examining association of drinking and intention to drink alcohol and advertisement preferences in children
10. Kohn PM, Smart R. G. The impact of television advertising on alcohol consumption: an experiment. <i>Journal of Studies on Alcohol</i> 1984;45(4):295-301.	Experimental exposure to alcohol ads and effects on drinking patterns
11. Kohn PM, Smart R. G. Wine, women, suspiciousness and advertising. <i>Journal of Studies on Alcohol</i> 1987;48(2):161-6.	Experiment in focus group setting measuring consumption of wine and viewing alcohol ads
12. Kuo M, Wechsler H, Greenberg P, Lee H. The marketing of alcohol to college students: The role of low prices and special promotions. <i>American Journal of Preventive Medicine</i> 2003;25(3):204-211.	Cross sectional survey measuring association of drinking and environmental alcohol exposure in college students
13. Makowsky CR, Whitehead P. C. Advertising and alcohol sales: a legal impact study. <i>Journal of Studies on Alcohol</i> 1991;52(6):555-67.	Interrupted time-series evaluating the effects of change on advertising legislation on sales of alcohol
14. McCarty D, Ewing J. A. Alcohol consumption while viewing alcoholic beverage advertising. <i>International Journal of the Addictions</i> 1983;18(7):1011-8.	Experimental exposure to alcohol ads and effects on drinking patterns
15. McCLURE, A. C., Dal CIN, S., Gibson, J. & SARGENT, J. D. (2006) Ownership of alcohol-branded merchandise and initiation of teen drinking, <i>Am J Prev Med</i> , 30, 277-83.	Cross-sectional analysis within a longitudinal study
16. Ogborne AC, Smart R. G. Will restrictions on alcohol advertising reduce alcohol consumption? <i>British Journal of Addiction</i> 1980;75(3):293-296.	Interrupted time-series exploring relationship between advertising ban and alcohol sales
17. Saffer H. Alcohol advertising bans and alcohol abuse: An international perspective. <i>Journal of Health Economics</i> 1991;10(1):65-79.	Interrupted time-series evaluating effects of advertising bans and alcohol consumption
18. Saffer H, Dave D. Alcohol advertising and alcohol consumption by adolescents. <i>Health Economics</i> 2006;15(6):617-637.	Econometric study evaluating aggregate alcohol advertising variables on adolescent drinking taken from cross-sectional and longitudinal studies
19. Smart RG, Cutler R. E. The alcohol advertising ban in British Columbia: problems and effects on beverage consumption. <i>British Journal of Addiction to Alcohol & Other Drugs</i> 1976;71(1):13-21.	Econometric study, effects of ban on advertising in British Columbia and effects on sales and consumption of alcohol

Reference	Reason for exclusion
20. Sobell LC, Sobell M. B, Riley D. M, Klajner F, Leo G. I, Pavan D, Cancilla A. Effect of television programming and advertising on alcohol consumption in normal drinkers. <i>Journal of Studies on Alcohol</i> 1986;47(4):333-40.	Experimental exposure to alcohol advertising and drinking behavior
21. Strickland D. E. Advertising exposure, alcohol consumption and misuse of alcohol in: Grant M, Plant M, Willaims A (Eds) <i>Economics and Alcohol: consumption and controls</i> . New York: Gardner Press, 1983.	Cross-sectional survey
22. Thomsen SR, Rekve D. Entertainment and music magazine reading and binge drinking among a group of juvenile offenders. <i>International Journal of Adolescent Medicine & Health</i> 2006;18(1):123-131	Cross sectional survey measuring association of exposure to entertainment and music magazines and binge drinking in juvenile offenders
23. Unger JB, Johnson C. A, Rohrbach L. A. Recognition and liking of tobacco and alcohol advertisements among adolescents: Relationships with susceptibility to substance use. <i>Preventive Medicine</i> 1995;24(5):461-466.	Cross-sectional survey measuring attitudes to alcohol and cigarette advertising and current alcohol and cigarette use in children
24. Van den Bulck J, Beullens K, Mulder J. Television and music video exposure and adolescent 'alcopop' use. <i>Int J Adolesc Med Health</i> 2006;18(1):107-14.	Cross-sectional survey
25. Waxer PH. Alcohol consumption in television programming in three English-speaking cultures. <i>Alcohol & Alcoholism</i> 1992;27(2):195-200.	Survey of drinking in TV programmes and national prevalence of alcohol related harm
26. Wyllie A, Zhang J. F, Casswell S. Positive responses to televised beer advertisements associated with drinking and problems reported by 18 to 29-year-olds. <i>Addiction</i> 1998;93(5):749-760.	Cross sectional survey measuring association of responses to alcohol advertisements and drinking behavior in young adults
27. Wyllie A, Zhang J. F, Casswell S. Responses to televised alcohol advertisements associated with drinking behavior of 10-17-year-olds. <i>Addiction</i> 1998;93(3):361-371.	Cross sectional survey measuring association of responses to alcohol advertisements and drinking behavior in children