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A Systematic Review of Drink Specials, Drink Special Laws, and Alcohol-Related Outcomes

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Abstract

Purpose of Review

The adverse health and safety consequences of heavy alcohol consumption are a leading problem around the world. While many risk factors have been extensively studied and presented in comprehensive summaries, not all questions regarding risk factors for problematic drinking behaviors have been answered and presented in systematic reviews. As of March 2020, no review has summarized studies assessing the role of promotional price practices at on-premises alcohol outlets, known as drink specials. Also missing was systematic information of policies that

regulated these promotional practices. We aimed to synthesize the available research evidence of the effects that drink specials and drink special laws have on different alcohol-related outcomes.

Recent Findings

Twelve studies examined the effect of drink specials in seven countries between 1978 and 2018. Of these, 11 found a consistent positive association between drink specials and increased alcohol consumption, heavy drinking, and alcohol intoxication. Drink specials also increased reports of driving under the influence, fighting, and unprotected sex. Drink specials were also associated with expectations of higher consumption and modified attitudes and behaviors towards favorable views of drink specials. Effect sizes ranged from 1.80 to 4.43 increased odds for the examined alcohol-related outcomes. The only study examining the effects of a drink special law revealed mixed findings between prohibiting happy hours and three alcohol-related outcomes.

Summary

Drink specials were consistently associated with alcohol-related adverse outcomes, but almost nothing is known about the effects of laws restricting drink specials.

Keywords: Drink special, Drink special laws, Alcohol-related outcomes, Alcohol drinking, Epidemiologic studies, Health policy

Introduction

Alcohol use is prevalent worldwide, with over 2 billion people aged 15 years and older having consumed alcoholic beverages in the previous 12-month period in 2016 [1]. Moreover, excessive alcohol use is a primary risk factor for non-communicable diseases, disability, and mortality. In 2016, 132.6 million combined disability-adjusted life years were due to premature mortality and morbidity from alcohol [1]. In the United States (U.S.), where an estimated 139.8 million people aged 12 years and older consumed alcohol in the past 30 days [2], and 67.1 million engaged in binge drinking in the past month [2], underscores the urgent need for research on factors associated with excessive alcohol consumption. Prior research has demonstrated the relationship between alcohol pricing and alcohol-related outcomes, including alcohol consumption, alcohol abuse, and various health effects [3–6]. Increases in the price of alcoholic beverages also effectively reduce drinking, heavy drinking, alcohol-related violence, and other crime [5, 4]. While discounting alcohol prices, known as drink specials, as a catalyst for heavy drinking has also been

studied [7], no synthesis has summarized these effects to date. Also missing is a summary of studies assessing the effectiveness of policies implemented to counter drink specials. A comprehensive review of studies on drink specials is crucial to inform policy and educate the public.

Fluctuations in the price of alcohol are due to market competition between manufacturers and alcohol sale outlets, changes to tax regulations, as well as other marketing efforts such as on-premises promotions to increase patronage during non-peak hours, so-called drink specials [3]. Drink specials are strategies used to promote price or volume-related discounts at on-premises alcohol outlets. Drink specials encourage heavy alcohol consumption by lowering prices and incentivize drinking copious amounts of alcohol in short periods [7]. Drink specials include tactics such as offering free drinks, multiple servings at one time, multiple servings for a single price, happy hours, and “all you can drink” specials without an increase in price.

As with drink specials, research on the effects that laws regulating drink specials might have on alcohol-related problems is also essential. Drink special laws are those that prohibit or restrict on-premises retailers from using low-price, high-volume drink specials as marketing strategies [8]. As of January 2018, 32 states and D.C. had enacted some form of drink special laws. Twenty-four have prohibited on-premises alcohol outlets from offering unlimited beverages for a fixed price or period, 20 states have banned multiple serving for a single serving price, 18 states have either restricted or banned happy hours, 16 states have banned offering free drinks, 11 states have banned increased volume without an increase in price practices, and five states have prohibited multiples servings at one time. Eighteen states do not impose any restrictions on drink specials. Drink special laws can presumably deter the public from engaging in excessive alcohol use at on-premises alcohol outlets.

Previous studies have assessed the combined effects of different policies and their impact on different alcohol outcomes [9]. However, efforts to consolidate evidence of studies evaluating the effects of drink specials on alcohol-related outcomes are minimal. A research report by the National Highway Traffic Safety Administration on drink specials included only five studies [7]. The report summarized results from an experimental setting [10], a college-aged population survey [11], an assessment of drink special laws in combination with other underage laws [9], and a happy hour ban [12, 13]. However, the report had no details of the search strategy, quality controls for the retrieve records, and limited its focus to one type of drink special law. Despite its limitations, the report concluded that happy hour laws were an important policy strategy for reducing impaired driving, traffic-related outcomes, and other alcohol-related problems. To March 2020, no systematic review has summarized the effects that drink specials or drink special laws on

health-related outcomes. Research in this area has multiple significant policy implications. As numerous states, cities, and localities attempt to prohibit or restrict drink specials, a systematic review of the available scientific evidence, including both domestic and overseas research, will potentially be of great value to policymakers in choosing the best regulatory practices. It is known that reducing the affordability of alcohol by increasing its price is an effective strategy for controlling alcohol consumption and related harms [4, 3]. Given this, we conducted a comprehensive search for literature on the effects that drink specials and drink special laws have on alcohol consumption, binge drinking, and alcohol-related harms.

Methods

The central question of interest was whether drink specials, and drink special laws, affect alcohol consumption, binge drinking, and alcohol-related harms. To answer this research question, we followed the Preferred Reporting Items for Systematic Review and Meta-Analysis protocols – PRISMA-P - a 17-item checklist to facilitate and perform systematic reviews [14]. We registered the protocol for this systematic review at the International Prospective Register of Systematic Reviews (PROSPERO CRD42019132590). We also obtained an IRB review exemption from the Columbia University Human Research Protection Office (IRB-AAAS3958).

Study eligibility

Studies were eligible if they: 1) Assessed alcohol-related outcomes of interest: direct measures of drink consumption (such as the number of drinks), blood alcohol concentration (BAC) levels, attitudes or drinking behaviors towards bars offering drink specials, and traffic-related outcomes (See Appendix 1); 2) Used a cross-sectional or pre-post approach, such as time series, cohorts, or comparison group designs; 2) Presented quantitative data or at least one measure of association (i.e., odds ratios, risk ratios, absolute risk, or correlation coefficients); 3) Were published in the English language; 4) Were peer-reviewed or part of the grey literature examining discounted alcohol prices, restrictions, and alcohol-related harms, such as reports from government or private agencies. No limits on publication date were imposed. Excluded from this review were commentaries, dissertations, conference abstracts, opinion pieces, reviews, congressional testimonials, and studies focusing exclusively on alcohol taxation. The beneficial effects of alcohol taxation have been widely studied [15, 3], and to avoid repeating previous efforts, studies that focused on the effects of alcohol-related taxes were excluded.

Search strategy, data synthesis, and quality assessment

The search strategy was first designed and tested on April 16, 2019. This review included any relevant record published up to April 30, 2019, irrespective of publication date. The comprehensive search included four electronic databases: Embase, Google Scholar, MEDLINE (as a combination of Ovid MEDLINE(R), Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) and PubMed), and Web of Science Core Collection. These four sources are the optimal combination for literature searches in systematic reviews and the minimum requirement of search engines for a reliable recall rate of literature [16]. We searched the databases using titles, abstracts, keywords, Medical Subject Headings (MeSH), and Emtree terms. For more details on the terms and the search strategy used, please see Appendix 1.

Two researchers (VPP and GC) independently screened titles and abstracts of records following the inclusion criteria. Discrepancies in the selection of studies were resolved through discussion. We manually screened the reference list from each relevant study, searching for records that were not identified by our search algorithm. We recorded data on the primary author, publication year, study location, population type, sample size, and findings. When available, we extracted effect sizes, magnitudes, or other measures of association for outcomes examined in each study and reported these in the results section. We divided each article into two categories: drink specials or drink special laws.

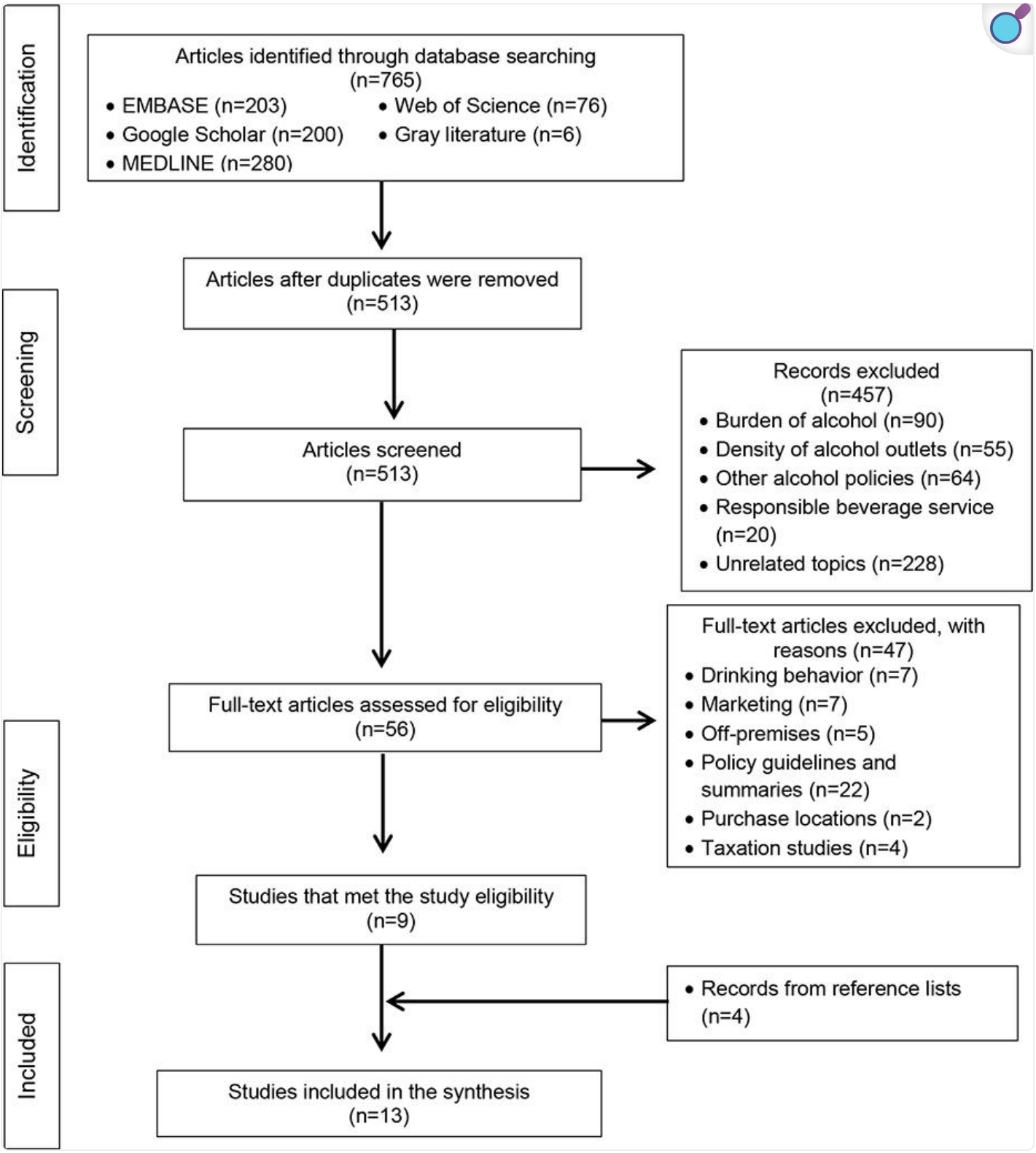
The quality of all included studies was evaluated using the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) [17, 18]. ROBINS-I is a tool for assessing the risk of bias of the estimates from non-randomized studies. The tool includes seven domains: Bias due to confounding, selection of participants into the study, classification of the interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported results.

Results

The four-database search identified 765 records. After removing 252 duplicates, 513 titles and abstracts were screened for eligibility. In the first screening of titles and abstracts, 457 records were removed. The remaining 56 records were then assessed for eligibility criteria. Nine studies met the inclusion criteria (Figure 1). We included four additional studies after reviewing the reference lists of selected records. All the studies were published between 1978 and 2018. Seven studies took place in the United States [10, 19, 20, 11, 21–23] and six in other countries, including Australia [24, 25], Brazil [26], Canada [12], Japan [27], and the Netherlands [28]. Twelve articles addressed drink specials, while only one studied the effects of drink special laws [12] (Table 1). All the studies used cross-sectional designs but one, which used a quasi-experimental design [10].

Most studies evaluated outcomes at the individual level, except for one study that assessed both individual and aggregated data [12]. In the study, the authors collected individual data from patrons inside drinking venues and city-wide local data from the liquor control board and the metropolitan police force.

Figure 1.



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Flowchart of Identification, Screening, Eligibility Review, and Selection of Studies Included in the Systematic Review Relating to the Effects of Drink Specials and Drink Special Laws on Alcohol-Related Outcomes.

Table 1.

Effects of Drink Specials and Drink Special Laws on Alcohol-Related Outcomes from Studies Published From 1978 to 2018

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
DRINK SPECIALS				
Studies that assessed changes to the number or amount of drinks consumed				
Babor, 1978 [10]	Belmont, MA, USA	Adult male volunteers	34	Casual drinkers in the happy hour arm consumed an average of 20.9 drinks per subject, while non-happy hour participants consumed 10.1 drinks per subject during the 20-days study period. Heavy drinkers in the happy hour arm consumed an average of 117.6 drinks per subject, while non-happy hour participants consumed 49.6 drinks per subject during the 20-days study period. Happy hour subjects drank most during the reduced-price period (2–5 pm), while non-happy hour subjects consumed the highest proportion of their alcohol in the evening

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				(8–11 pm). Casual drinkers in the happy hour showed a significantly higher frequency of BAC at the 0.05 threshold at the 4:30 pm reading, while the non-happy hour subjects had very few occasions of BAC above 0.05.
Babor, 1980 [19]	25 miles south of Boston, MA, USA	Regular bar patrons	16	Happy-hour patrons consumed an average of 9.56 drinks per day, while non-happy hour patrons drank 3.73 drinks per day ($p < 0.01$). Happy hour patrons' average daily consumption after the promotional period was significantly higher than that consumed by non-happy hour patrons after 5 pm ($p < 0.05$). Happy hour patrons mean number of drinking episodes and mean number of drinks per episode were 15.0 ± 2.83 and 7.03 ± 14.4, respectively. Non-happy hour patrons mean number of drinking

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				episodes and the mean number of drinks per episode were 10.75 ± 1.22 ($p < 0.01$) and 3.79 ± 4.1 ($p < 0.05$), respectively.
Kuo, 2003 [11]	38 states and Washington DC, USA	Undergraduate students from 118 colleges	10,823	The 118 surveyed colleges were surrounded by 830 on-premises alcohol outlets. The lower average alcohol sale price among on-premises establishments surrounding the college campus, the higher the college binge drinking rate (for single drinks $r=-0.36$, pitchers $r=-0.25$, or the largest volume $r=-0.39$). About 73% of the on-premises locations offered specials on weekends. Beer specials were highly correlated with college binge-drinking rates ($r=0.42$, $p<0.001$). "All you can eat/drink" had a marginal correlation ($r=0.19$, $p=0.04$). Planned alcohol specials in the next 30 days were also

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				significantly correlated (r=0.34, p=0.0002). Campuses with higher on-premises establishment index scores had higher binge-drinking rates (r=0.42, p<0.0001). Higher on-premises index scores were marginally associated with the total number of drinks consumed by the students in the past 30 days (coef. 1.24, p=0.084). The total alcohol environment index score (off- and on-premises score) was positively associated with the total number of drinks consumed by the students.
Van Hoof, 2008 [28]	Five cities in the Netherlands	14 to 17-year-old adolescents in secondary schools	172	Almost one-third of observed on-premises (31%) offered at least one alcohol discount. Adolescents indicated that alcohol discounts had a significant effect on their alcohol consumption. Alcohol discounts did not affect their choice of cafes

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				when going out, nor influence the amount of money spent when going out. The use of alcohol discounts was similar between underage (14–15) and minor (16–17) adolescents. Also, the effects of alcohol discounts on alcohol consumption were similar between underage and minor adolescents. The effects of alcohol discounts on cafes' attractiveness and money spent when going out were also similar between underage and minor adolescents.
Kawaida, 2018 [27]	Kanto area, Japan	Undergraduate and graduate in 35 colleges	511	The amount of drinking was increased 1.8-fold among men and 1.7-fold among women during Nomihodai use (consuming various kinds of drinks within two to three hours at a fixed price), compared with non-use.
Studies that assessed changes to Blood Alcohol Concentrations				
Thombs, 2008 [21]	Southeastern campus	Patrons exiting drinking	291	Patrons who took advantage of drink

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
	community, USA	establishments		specials had 4.38 times the odds of a BAC > 80 mg/dl, compared to patrons who did not take advantage of drink specials. Also, patrons taking advantage of drink specials had 4.25 times the odds of having a BAC > 100 mg/dl.
Thombs, 2009 [22]	Southeastern campus community, USA	Patrons exiting drinking establishments	383	Patrons who took advantage of a drink special were more likely to have arrived at the bar in a less inebriated state. Women were more likely than men to take advantage of a drink special. “All you can drink” had a significant association with exiting patron BAC level. Patrons that either took advantage of a drinking-game or a special that offered reduced prices on specific alcoholic beverages were not statistically associated with exiting patron BAC.
Carlini, 2014 [26]	São Paulo, Brazil	Patrons entering and exiting nightclubs	2,422	“All you can drink” specials were significantly associated with BAC > 0.08% (AOR

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				= 2.44). In “all you can drink” venues, people drank until the last possible moment, and it was usual to see people holding drinks at closing time.
Studies that assessed changes to attitudes or drinking behaviors				
Christie, 2001 [20]	Southern university, USA	Undergraduate students	189	The attitudes toward the ads, bar, and patronage intentions were favorable for three types of alcohol beverage specials (1, greater discount: $0.50 price; 2, lower discount: $1.50 price; 3, control: reduced prices for appetizers), with more favorable attitudes and intentions towards the largest discount. Consumption expectations for self and others were increased for greater discounts and longer special periods. However, larger discounts did not have stronger effects on attitudes and patronage intentions for binge drinkers than for non-binge drinkers. The average level of

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				estimated consumption for self or others exceeded or approached the binge drinking level for any alcohol special.
Christie, 2001 [20]	Southern university, USA	Undergraduate students	164	The attitudes toward the ad and patronage intentions were favorable for three types of alcohol beverage specials (1, “all you can drink” for a fixed price; 2, any coin, any drink; 3, control: free appetizers and no alcohol-related discounts), but not for management’s concern about customers and expectations of excessive consumption. The “all you can drink” special led to higher consumption perceptions. A message of personal responsibility only changed perceptions related to management’s concern about customers’ safety.
Baldwin, 2014 [23]	Statesboro, GA, USA	Students attending the Georgia Southern University	1,423	Women, underage students, freshman and sophomores, non-student athletes,

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				fraternity members, and non-workers were more likely to report an increased drinking pattern when a happy hour or drink special was present. Also, respondents from higher-income families, living in campus dormitories, alcohol-frequent users, and with lower age when first use alcohol were more likely to increase their drinking pattern when a happy hour was available. Happy hour drinking significantly increased 1.88 times the odds of driving under the influence, 2.18 times the odds of fighting while drinking, and increased alcohol-related problems. Happy hour drinking marginally increased 1.29 the odds of having unprotected sex.
Studies that assessed changes to other types of alcohol-related outcomes				
Stockwell, 1993 [25]	Perth, Western Australia	Household survey of people aged 16 and over	321	The discounting of drinks was significantly correlated (N.B.

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				correlation coefficient = 0.11, $p < 0.05$) with continuing service to intoxicated customers. However, when included in the model examining heavy alcohol consumption, it did not reach a statistical significance.
Coomber, 2016 [24]	Five Australian cities	Licensed venues	62	Only 10% of observed venues had observable alcoholic beverage specials. Observable specials were not associated with the percentage of patrons showing any signs of intoxication, nor the percentage of patrons showing high levels of intoxication.
DRINK SPECIAL LAWS				
Smart, 1986 [12]	Toronto, Canada	Drinking establishments	5	No significant differences were found for alcohol consumption (by amount or type of alcohol) between the pre-ban and post-ban periods. Also, aggregate alcohol consumption data were not different between the study and

First Author, Year (Reference)	Study Location	Population Type	Sample Size	Findings
				comparison (1 year prior) periods. The number of impaired-driving charges was similar in the pre-ban study and pre-ban (proxy) comparison periods. However, fewer impaired-driving charges were found in the post-ban study period compared to the post-ban (proxy) comparison period. Also, a statistically significant decrease was found for the number of charges between the pre-ban and post-ban periods in the study time.

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Abbreviations: AOR, adjusted odds ratio; BAC, Blood alcohol concentration.

Of the 13 studies, 11 met the criteria for serious risk of bias (ROB), one received a low ROB assessment [10], and one received a critical ROB assessment [24] (Appendix 2). Overall, ROB assessments revealed that 11 of the 13 studies had a fair quality but failed to adjust for the pre-defined set of confounders, including non-alcohol drug use, mental illnesses, and alcohol consumption background. Only one study adjusted for these confounders and received a low ROB score [10]. The only study that reported no alcohol-related effects associated with drink specials was also the only study classified with a critical ROB [24].

Drink special exposure definitions

Included studies had a variety of exposure definitions, including beer specials, defined as a 50 cents or $1.50 price on beer for three or nine hours [20], "any coin, and drink" promotion [20], alcoholic beverage promotions, a combination of discounts or free drinks offers [24], on-premises establishment index, which was a combination of beer specials, specials in the following 30 days, and low sale prices [11], drinking games or 50 cents off a pitcher of a popular beer [22], and alcohol price discounts in cafes [28]. Drink specials comprised multiple types of specials, which in some studies, were not clearly defined. For example, drink specials were defined as whether the price of drinks had been discounted [25] or whether patrons "take advantage of any drink specials" [21]. The definitions of "all you can drink" promotions were similar in four of the five studies that examined this practice. These included "patrons pay a fixed value at the entrance allowing them completely unrestricted alcohol consumption inside the establishment" [26], "all you can drink" for a fixed price [20], requiring a nominal admission fee to enter the bar [22], and "Nomihodai" [all you can drink], which enables patrons to consume different types of alcoholic beverages within two to three hours at a fixed price [27]. Only one study assessed the combined effect of "All you can eat/drink" [11]. The definitions for happy hour differed among four studies assessing its effects. It was defined as a 25 cents discount from a 50 cents regular alcohol price for 3 hours [10], a 20 cents discount from a 75 cents regular price for 2 hours [19], or had an ambiguous operationalization [23, 12].

Alcohol consumption outcomes

Five studies examined changes to the number of drinks consumed, making it the most commonly assessed outcome [10, 19, 11, 28, 27]. Drink specials were consistently associated with increased alcohol consumption. In the only quasi-experimental study, volunteers were admitted into a live-in facility in a clinical research ward at McLean Hospital in Massachusetts and assigned to either the intervention or control group based on subjects' schedule availability [10]. Babor et al. defined "causal drinkers" as subjects who identified themselves as "light or fairly light" alcohol users with an average daily consumption of less than 2 oz of alcohol and less than five episodes of "drunkenness" per month. "Heavy drinkers" were people who described themselves as "heavy or fairly heavy" alcohol users who consumed more than 2 oz of alcohol per day and had more than five episodes of "drunkenness" per month. Among "causal drinkers," happy hours doubled the number of drinks consumed during the 3-hours of reduced alcohol prices. For "heavy drinkers," happy hours increased the number of drinks consumed by 2.3 times during the 3-hours of reduced prices. In a second study set at a neighborhood tavern in Boston, happy hour patrons almost tripled the number of drinks per day that they consumed and had an average of five more drinking

episodes and four more drinks per episode than non-happy hour patrons [19]. A third study examined the effects of alcohol price discounting among students from 119 colleges in 38 states and the District of Columbia. Any "beer specials" on Thursdays, Fridays, or Saturdays were associated with higher rates of college binge drinking, particularly "special price" and "all you can eat/drink" at a single price [11]. Two non-US studies reported changes to the amount of alcohol consumed when drink specials were available. The first study reported the effects of alcohol discounts at cafes in five Dutch cities. The availability of alcohol discounts in cafes increased alcohol consumption among adolescents, both underage (14–15 years old) and minor (16–17 years old) adolescents [28]. In the second study, Japanese researchers evaluated users of the Nomihodai system in Japan, which allows customers to drink various kinds of alcoholic beverages within two to three hours at a fixed price. They found that Nomihodai practices increased alcohol consumption for both males and females [27].

Blood alcohol concentration outcomes

Three studies assessed changes to blood alcohol concentration (BAC) levels among bar patrons exiting bars that offered drink specials [21, 22, 26]. In the first study, patrons who exited on-premises alcohol establishments and reported taking advantage of any drink specials were 4.38 times more likely to have a BAC ≥ 0.08% than were those who reported not taking advantage of any drink specials [21]. Also, patrons who reported taking advantage of any drink specials had 4.25 times higher odds of exiting a bar with a BAC ≥ 0.10%. In the second study, which randomly selected patrons exiting on-premises alcohol establishments, taking advantage of drink specials was significantly associated with exiting BAC levels [22]. Specifically, patrons who took advantage of an "all you can drink" promotion had higher BAC levels than those who did not take advantage of any drink specials. It also reported that women were more likely than men to take advantage of drink specials. Drinking-game promotions and reduced prices on specific alcoholic beverages were not associated with alcohol intoxication [22]. In the third study, which took placed in São Paulo, Brazil, "all you can drink" specials increased 2.4 times the odds of exiting a bar with BAC ≥ 0.08% [26].

Attitudes, drinking behavior, and other alcohol-related outcomes

Two papers assessed changes in attitudes or drinking behaviors [20, 23]. The first article by Christie et al. summarized findings from two studies among undergraduate students at a major Southern university in the U.S. [20], which we identified as study A and study B. Study A assessed changes in attitudes towards $0.50 alcohol price, a $1.50 alcohol price, and a control group. Consumption expectations for self and others were higher for the $0.50 alcohol price. Regarding

self-reported drinking status, people categorized as “binge drinkers” believed that promotions were likely to increase their alcohol consumption compared to “non-binge drinkers.” However, when examining the type of promotion, no differences between people categorized as binge and non-binge drinkers were found. Study B reported that attitudes and patronage intentions were favorable towards “all you can drink,” and “any coin, any drink” specials. The “all you can drink” special led to higher consumption perceptions. The second article reported results from 2,349 students attending classes at Georgia Southern University in spring 2012 [23]. The authors reported that drinking behavior was more likely to be modified among women, students under 21, non-athletes, members of Greek-affiliated organizations, more affluent, unemployed students, and students living on campus in the presence of happy hour specials [23]. Students who reported altered drinking due to happy hour specials were more likely to report driving under the influence (odds ratio [OR] = 1.88, 95% confidence intervals [CI] = 1.12, 3.15), fighting while drinking (OR = 2.18, 95% CI = 1.30, 3.65), and increased chances of alcohol-related problems (β = 0.14, p-value <0.01). Changes in drinking due to happy hour specials also increased the odds of engaging “in unprotected sexual intercourse with a stranger while intoxicated (pg. 4)” (OR = 1.29, 95% CI = 0.97, 1.70).

For other alcohol-related outcomes, a household survey study in Perth, Australia, found that licensed premises that offered discounted alcohol prices or permitted over-crowding were significantly correlated with continuing serving drinks to intoxicated customers [25]. While discounting or over-crowding did not directly predict either heavy drinking or increased risk of harm, these two factors were found to interact with types of venues and gender to create high-risk settings for harm. Only one study, which sampled licensed venues in five Australian cities and observed individuals inside venues, reported no association between drink specials and any sign or signs of high intoxication among patrons [24].

Drink special law study

Smart et al. evaluated the effects of December 14, 1984, ban on happy hours in Toronto, Canada [12]. The data were collected between October 1984 and February 1985. For the aggregated data, the authors assessed effects between pre- and post-ban study periods, and a comparison period which covered the same time interval one year prior. The results revealed no association between banning happy hours and changes in consumption of alcohol, by neither individual observation nor aggregated alcohol consumption data. Estimates did show a small decrease in the daily number of impaired-driving charges made by the Metropolitan Toronto Police Force in the study post-ban period compared to the second comparison (post-ban proxy) period. It also reported that the

number of impaired-driving charges decreased between pre- and post-ban study periods, while no changes were observed between the two comparison periods (pre-ban and post-ban proxies).

Discussion

This systematic review examined whether drink specials and drink special laws affect alcohol consumption, binge drinking, and alcohol-related harms. Overall, we found consistent evidence supporting the finding that drink specials were associated with increasing alcohol consumption, heavy drinking, and alcohol intoxication [10, 19, 26, 27, 11, 21, 22]. The evidence also suggested associations between drink specials and reports of driving under the influence, fighting, and unprotected sex [23]. Drink specials were also associated with changes in attitudes, behaviors, and expectations regarding heavy alcohol consumption [23, 20, 25, 28].

A large body of research supports the effects of the increased price of alcoholic beverages, achieved through raising taxes on alcohol or establishing minimal pricing policies, on significantly reducing alcohol consumption and health-related harms and costs [4, 15, 29]. Our findings confirmed the complement: lower alcohol prices lead to increased alcohol consumption. Specifically, lowering alcohol prices through drink specials increased adverse health outcomes and other alcohol-related harms [10, 19, 23, 26, 20, 27, 11, 25, 21, 22, 28]. While the research identified in this review used different methodological approaches, studied different demographic groups, was set in different cities and countries, or examined different outcomes, the results across studies were consistent in supporting the association between on-premises drink specials and harmful outcomes.

All of the studies that evaluated changes to the number of drinks of alcohol found that drink specials, in the form of happy hours [10, 19], beer specials [11], “all you can drink” [27], or other price discounts [28], increased the number of drinks consumed by patrons. In the category of changes to blood alcohol concentration (BAC), all three studies found that people who reported taking advantage of any drink special [21, 22] or that attended establishments where “all you can drink” promotions were available [26, 22], had a higher probability of reaching a BAC equal or above the driving alcohol impairment level of 0.08% [30, 31]. The design used in these three studies was similar, sampling of establishments, random [26, 22], or non-random [21] sampling of entering and exiting patrons, along with BAC measurements using breathalyzers. This research supports the hypothesis that increased affordability of alcohol through drink specials boosts BAC levels. However, none of these studies explored consequences related to higher BACs, such as traffic outcomes. Also missing were assessments of the effects of restricting drink specials on BACs and related harms.

Heavy drinking among the college-aged population has been associated with multiple risk factors. These factors include advertising and placing alcohol outlets near college campuses, both of which are associated with drinking rates [32–37]. The reviewed literature confirmed that advertisements, specifically drink special ads, or the presence of drink specials did influence attitudes and patronage intentions toward higher alcohol consumption among the college-aged population [23, 20]. One study found that discounted alcohol prices were correlated with continuing service to intoxicated customers, and continuing service was correlated with heavy drinking and alcohol intoxication problems [25]. Only one study found no association between observable drink specials and the percentage of patrons showing signs of alcohol intoxication [24]. However, this study based its analysis on subjective outcome measures by reporting the observed number of patrons inside the bar with noticeable signs of intoxication by an external rater. Due to the high probability of errors in the outcome measurements, this study received a high ROB assessment score.

Lastly, we identified a single study addressing the effect of a drink special law. This study found that prohibiting happy hours in 1984 in Toronto, Canada was not associated with changes in consumption of alcohol, by neither individual observations nor aggregated alcohol consumption data [12]. However, the authors reported fewer charges for driving under the influence in the post-ban period, according to data from the Metropolitan Toronto Police force. The reviewed research supports our premise that encouragement of over-consumption by reducing alcohol prices is a potent inducement to drinking large amounts of alcohol in short periods. It also supports that drink specials are associated with adverse health and social consequences, thereby suggesting that laws restricting drink specials could reduce alcohol-related outcomes. However, we only identified a single study assessing a law banning a single drink special in Canada. The lack of evidence supporting the role of drink special laws in reducing alcohol-related outcomes is a substantial gap in the literature, especially in the U.S., where there are laws designed for each of the six drink special practices. Our review highlights the need for research evidence that establishes whether drink special laws are associated with reducing problematic alcohol use and related harms.

Our review has limitations. First, we considered pooling results, using random-effects modeling, for studies that assessed the same type of alcohol discount strategy and outcome measure. However, we were unable to perform a pooled meta-analysis in this systematic review because of the limited number of studies assessing the different outcome measures within each category of alcohol-related problems. Also, the exposure definitions were not consistent across studies within each outcome category. Despite this limitation, the constant association found in 11 studies supports the association between drink specials and alcohol-related problems. Second, the effects of multiple types of drink specials were combined into a single category, were combined with food

promotions, or else were not precisely defined in the exposure operationalization [11, 28, 21, 24, 25]. For example, Kuo et al. [11] studied "all you can drink" specials in combination with "all you can eat" promotions. As such, studies that reported combined effects of different exposures received a lower quality assessment, therefore warranting caution when interpreting the findings. Third, evidence regarding traffic-related outcomes was limited to two studies. A study that included self-reported driving under the influence incidents [23], and a study that included police reports of the number of citations [12]. Given alcohol's role in traffic-adverse outcomes, this is a significant gap that needs to be addressed with more empirical research.

Conclusion

This systematic review summarized the available research evidence for the effects of drink specials and drink special laws on alcohol-related outcomes and harms. Despite considerable variation in exposure and outcomes assessments, studies examining drink specials showed consistency in reporting negative individual-level consequences related to higher alcohol use and heavy drinking. Further research is needed to determine whether regulations of drink specials, in the form of drink special laws, can help to discourage high-risk groups from engaging in problematic drinking behavior, reduce heavy drinking and related harms, and have beneficial effects on decreasing the number of fatalities due to alcohol impairment.

Acknowledgments

Conflict of Interest

Dr. Puac-Polanco reports grants from The National Institute of General Medical Sciences (NIGMS) R25GM062454, during the conduct of the study; Dr. Keyes has testified as an expert witness in litigation against opioid manufacturers and other defendants; Dr. Mauro reports grants from National Institute on Drug Abuse (NIDA) K01DA045224, during the conduct of the study; and Dr. Branas has nothing to disclose. We thank Dr. Gregory Cohen, at Boston University, for his help in the screening of titles, abstracts, and full texts.

List of abbreviations

BAC
: blood alcohol concentration

ROB

risk of bias

APPENDIX 1:

Question:

Do discount alcohol prices and laws regulating discounted alcohol prices, in U.S. and overseas on-premised outlets, affect alcohol consumption, binge drinking, and alcohol-related harms among people aged 16 years or more?

Key concepts:

Alcohol price discounts

Laws against alcohol prices discounts

Consumption outcomes

Binge drinking, or problematic drinking

Alcohol-related harms

Drink specials:

Free beverages

Multiple servings at one time to a customer.

Multiple servings for a single price (e.g., two-for-ones).

Happy hours

Unlimited beverages for a fixed price or period (e.g., “all you can drink,” “beat the clock”)

Increased volume without an increase in price (e.g., double shots for the price of single shots).

Emtree terms and keywords

‘commercial phenomena’ [Emtree]	‘restaurant’ [Emtree]	‘drinking behavior’ [Emtree]
	restaurant* [Keyword]	‘alcohol abuse’ [Emtree]
‘drink specials’ [Keyword]	Bar or Bars [Keyword]	‘traffic accident’ [Emtree]
‘free beverages’ [Keyword]	Club or Clubs [Keyword]	‘car driving’ [Emtree]
‘multiple servings’ [Keyword]	‘Drinking establishment*’ [Keyword]	‘health care cost’ [Emtree]
‘two for one’ [Keyword]	‘On-premise alcohol outlets’ [Keyword]	‘hospital admission’ [Emtree]
‘happy hour’ [Keyword]		‘fatality’ [Emtree]
‘happy hours’ [Keyword]		‘injury’ [Emtree]
‘all you can drink’ [Keyword]		‘alcohol intoxication’ [Emtree]
‘price discount*’ [Keyword]		

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Search Strategy #1

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(‘commercial phenomena’/exp OR ‘drink specials’ OR ‘free beverages’ OR ‘multiple servings’ OR ‘two for one’ OR ‘happy hour’ OR ‘happy hours’ OR ‘all you can drink’ OR ‘price discount*’) AND

(‘restaurant’/exp OR ‘restaurant*’ OR ‘bar’ OR ‘bars’ OR ‘club’ OR ‘clubs’ OR ‘drinking establishment*’ OR ‘on-premise alcohol outlets’) AND

(‘drinking behavior’/exp OR ‘alcohol abuse’/exp OR ‘traffic accident’/exp OR ‘car driving’/exp OR ‘health care cost’/exp OR ‘hospital admission’/exp OR ‘fatality’/exp OR ‘injury’/exp OR ‘alcohol

intoxication’/exp)

Search Strategy Final

(‘commercial phenomena’/exp OR ‘commercial phenomena’ OR ‘drink specials’ OR ‘free beverages’ OR ‘multiple servings’ OR ‘two for one’ OR ‘happy hour’ OR ‘happy hours’ OR ‘all you can drink’ OR ‘price discount*’) AND (‘restaurant’/exp OR ‘restaurant’ OR ‘restaurant*’ OR ‘bar’/exp OR ‘bar’ OR ‘bars’ OR ‘club’ OR ‘clubs’ OR ‘drinking establishment*’ OR ‘on-premise alcohol outlets’) AND (‘drinking behavior’/exp OR ‘drinking behavior’ OR ‘alcohol abuse’/exp OR ‘alcohol abuse’ OR ‘traffic accident’/exp OR ‘traffic accident’ OR ‘car driving’/exp OR ‘car driving’ OR ‘health care cost’/exp OR ‘health care cost’ OR ‘hospital admission’/exp OR ‘hospital admission’ OR ‘fatality’/exp OR ‘fatality’ OR ‘injury’/exp OR ‘injury’ OR ‘alcohol intoxication’/exp OR ‘alcohol intoxication’)

MeSH Terms and keywords

“Commerce”[Mesh]	“Restaurants” [Mesh]	“Alcohol Drinking”[Mesh]
“Marketing”[Mesh]	Restaurant* [Keyword]	“Binge Drinking”[Mesh]
“Direct-to-Consumer Advertising”[Mesh])	Bar or Bars [Keyword]	“Accidents, Traffic”[Mesh]
“Drink specials” [Keyword]	Club or Clubs [Keyword]	“Automobile Driving”[Mesh]
“Free beverages” [Keyword]	Drinking establishment* [Keyword]	“Health Care Costs”[Mesh]
“Multiple servings” [Keyword]	“On-premise alcohol outlets” [Keyword]	“Patient Admission”[Mesh]
“two for one” [Keyword]		“Fatal Outcome”[Mesh]
“happy hour” [Keyword]		“Wounds and Injuries”[Mesh]
“happy hours” [Keyword]		“Alcohol-Related Disorders”[Mesh]
“all you can drink” [Keyword]		“Poisoning”[Mesh])
Price discount* [Keyword]		

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Search Strategy #1

PubMed

(“Commerce”[Mesh] OR “Marketing”[Mesh] OR “Direct-to-Consumer Advertising”[Mesh] OR “drink specials” OR “free beverages” OR “Multiple servings” OR “two for one” OR “happy hour” OR “happy hours” OR “all you can drink” OR price discount*) AND

(“Restaurants”[Mesh] OR restaurant* OR bar OR bars OR club OR clubs OR drinking establishment* OR “On-premise alcohol outlets”) AND

(“Alcohol Drinking”[Mesh] OR “Binge Drinking”[Mesh] OR “Accidents, Traffic”[Mesh] OR “Automobile Driving”[Mesh] OR “Health Care Costs”[Mesh] OR “Patient Admission”[Mesh] OR

“Fatal Outcome”[Mesh] OR “Wounds and Injuries”[Mesh] OR “Alcohol-Related Disorders”[Mesh] OR “Poisoning”[Mesh])

Ovid MEDLINE

Commerce/ or Marketing/ or Direct-to-Consumer Advertising/ or drink special*.mp. or free beverage*.mp. or multiple serving*.mp. or happy hour*.mp. or all you can drink.mp. or price discount*.mp.

and

Restaurants/ or Restaurant*.mp. or bar.mp. or bars.mp. or club.mp. or clubs.mp. or drinking establishment*.mp. or on-premise alcohol outlets.mp.

and

Alcohol Drinking/ or Binge Drinking/ or Accidents, Traffic/ or Automobile Driving/ or Health Care Costs/ or Patient Admission/ or Fatal Outcome/ or “Wounds and Injuries”/ or Alcohol-Related Disorders/ or Poisoning/

Web of Science

TS=((commerce OR marketing OR “direct-to-consumer advertising” OR “drink special*” OR “free beverage*” OR “multiple servings” OR “two for one” OR “happy hour*” OR “all you can drink” OR “price discount*”) AND (restaurant* OR bar OR bars OR club OR clubs OR “drinking establishment*” OR “on-premise alcohol outlet*”) AND (“alcohol drinking” OR “binge drinking” OR accident* OR crash* OR “vehicle driving” OR “car driving” OR “automobile driving” OR “health care costs” OR “patient admission” OR fatal* OR “crash injury” OR “crash injuries” OR “alcohol-related disorders” OR poisoning*))

Google Scholar ()

(“drink specials” OR “happy hour” OR “all you can drink” OR “price discounts”) AND (Restaurant OR bar OR bars OR club OR clubs) AND (“binge drinking” OR accident* OR crash* OR “health care costs” OR “patient admission” OR fatal* OR “crash injuries”)

APPENDIX 2.

Risk of Bias (ROB) Assessment in Studies That Reported the Effects of Drink Specials or Drink Special Laws on Alcohol-Related Outcomes

ROB Criteria Assessed	First Author, Year (Reference)			
	Babor, 1978 [10]	**Babor, 1980 [19]**	**Smart, 1986 [12]**	**Stockwell, 1993 [25]**
Bias due to confounding	Low – Study accounted for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders
Bias in the selection of participants into the study	Low – Subjects who were in good health and who showed no evidence of prior drug addiction, alcohol dependence, or psychiatric abnormalities were classified as either casual or heavy drinkers.	Low - Regular bar patrons were selected based on their known regularity of frequenting a neighborhood tavern	Serious - Establishments were selected to be (1) as heterogeneous as possible, (2) dispersed throughout Metropolitan Toronto and (3) as places where drinking rather than eating was the focus of patrons	Low – Household survey data from a representative sample of adults
Bias in the classification of interventions	Low – Intervention was clearly defined	Low – Intervention was clearly defined	Low – Intervention was clearly defined	Serious – Not clearly defined
Bias due to deviations	Low – No deviation from the	Low – No deviation from	Low – No deviation from	NI

from intended interventions	intended intervention	the intended intervention	the intended intervention	
Bias due to missing data	Low – No missing data were reported	Low – No missing data were reported	NI	NI
Bias in measurement of outcomes	Low – Measurement of outcomes independent of policy	Low – Measurement of outcomes independent of policy	Moderate - Data were collected for each patron at the observed tables with respect to the type and number of alcoholic beverages	NI
Bias in the selection of the reported results	Low – Expected analyses were reported	Low – Expected analyses were reported	Low – Expected analyses were reported	Low – Expected analyses were reported
Overall bias	Low – Adequate adjustment for the relevant confounding domains.	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains

ROB Criteria Assessed	First Author, Year (Reference)			
	Christie, 2001 [20]	**Kuo, 2003 [11]**	**Thombs, 2008 [21]**	**Van Hoof, 2008 [28]**
Bias due to confounding	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders

Bias in the selection of participants into the study	Serious - Undergraduate students who voluntarily participated in the study	Low – Surveyed students at 119 colleges and who responded to mailed questionnaires	Serious – No randomized sample of patrons exiting 15 on-premises establishment.	Low – Surveyed students from secondary schools, observational data of cafes, and content analysis of website information.
Bias in the classification of interventions	Low – Intervention was clearly defined	Serious – Intervention not clearly defined	Serious – Intervention not clearly defined	Serious – Intervention not clearly defined
Bias due to deviations from intended interventions	Low – No deviation from the intended intervention	Low – No deviation from the intended intervention	Low – No deviation from the intended intervention	Low – No deviation from the intended intervention
Bias due to missing data	NI	Serious – 52% response rate	Moderate – 48.5% response rate	NI
Bias in measurement of outcomes	Low – Measurement of outcomes independent of policy	Moderate – Binge-drinking rates based on self-reported data	Low – Measurement of outcomes independent of policy	Low – Measurement of outcomes independent of policy
Bias in the selection of the reported results	Low – Expected analyses were reported	Low – Expected analyses were reported	Low – Expected analyses were reported	Low – Expected analyses were reported
Overall bias	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains

ROB Criteria Assessed	First Author, Year (Reference)			
	Thombs, 2009 [22]	**Baldwin, 2014 [23]**	**Carlini, 2014 [26]**	**Coomber, 2016 [24]**
Bias due to confounding	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders	Serious – No adjustment for relevant confounders
Bias in the selection of participants into the study	Low – Randomized sample of patrons exiting on-premises establishments	Low – surveyed students attending classes	Low - environmental data (characteristics of the nightclub) and individual-level data (patrons of the nightclub)	Critical - licensed venues in five Australian cities were used to estimate the count of the number of patrons in the venue and approximate percentage venue capacity
Bias in the classification of interventions	Low – Intervention was clearly defined	Low – Intervention was clearly defined	Low – Intervention was clearly defined	Serious - Use of any alcoholic beverage promotions within the venue in the past hour was recorded
Bias due to deviations from intended interventions	Low – No deviation from the intended intervention	Low – No deviation from the intended intervention	Low – No deviation from the intended intervention	NI
Bias due to missing data	Moderate – 80.3% response rate	Moderate – 80% representation	Moderate – 60% acceptance rate of nightclubs, 80% entrance	NI

			acceptance rate, 76% follow-up rate	
Bias in measurement of outcomes	Low – Measurement of outcomes independent of policy	Low – Measurement of outcomes independent of policy	Low – Measurement of outcomes independent of policy	Critical – Measurement of outcomes was observations of other patrons inside the bar, with no objective measures regarding intoxication signs.
Bias in the selection of the reported results	Low – Expected analyses were reported	Low – Expected analyses were reported	Low – Expected analyses were reported	Critical
Overall bias	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains	Serious – Fail to adjust for the relevant cofounding domains	Critical Fail to adjust for the relevant cofounding domains and the outcome measures were subjective

ROB Criteria Assessed	First Author, Year (Reference)
	Kawaida, 2018 [27]
Bias due to confounding	Serious – No adjustment for relevant confounders

Bias in the selection of participants into the study	Moderate – self-administered questionnaires of undergraduates
Bias in the classification of interventions	Low – Intervention was clearly defined
Bias due to deviations from intended interventions	Low – No deviation from the intended intervention
Bias due to missing data	Serious – 57.7% response rate
Bias in measurement of outcomes	Low – Measurement of outcomes independent of policy
Bias in the selection of the reported results	Low – Expected analyses were reported
Overall bias	Serious – Fail to adjust for the relevant cofounding domains

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Abbreviations: NI, no information, ROB, risk of bias.

Footnotes

Human and Animal Rights and Informed Consent

This article does not contain any studies with human or animal subjects performed by any of the authors.

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