

Reducing Alcohol-Related Harm the Night-Time Economy

A Rapid Review of the Evaluation Literature

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Executive Summary

Background

This report provides a systematic rapid review of the evidence base for (a) policing approaches in the context of the night-time economy (NTE); and (b) four specific strategies related to reducing alcohol-related harm in the context of the NTE (one-way door policies, bringing forward closing times, alcohol outlet density, and ensuring readily accessible transport home). This rapid review synthesises studies that assess the impact of either category of intervention on any type of outcome, including: violence, aggression, sexually transmitted diseases, calls-for-service, alcohol consumption and dependence, and hospital admissions.

Systematic Search and Screening Methods

We used two stage approach for identifying eligible studies. First, a search in the Global Policing Database (GPD) was conducted to identified relevant interventions related to police or policing. To meet eligibility for this component of the review, each study needed to meet the following criteria:

- (1) Include a quantitative impact evaluation of a policing intervention related to the NTE, a one-way door policy, approaches relating to establishment closing times, approaches relating to alcohol outlet density, or approaches relating to readily accessible transport home from NTE premises;
- (2) Utilise either a randomised experimental research design, review and/or meta-analytic research design;
- (3) Be conducted or published between 2009 and 2018 inclusive (most recent decade of research in the GPD); and
- (4) Be written in English.

The second stage of the systematic search involved conducting a series of searches across several criminal justice and multidisciplinary sources to capture studies evaluating one-way door policies, adjusting establishment closing times, alcohol outlet densities, or readily accessible transport home from NTE precincts. This second stage captured research between January 2009 and October 2020. Similar to the policing-specific component of the review,

each study needed to be an impact evaluation that (a) used a randomised or quasi-experimental research design, review and/or meta-analytic research design; (b) was written in English; and (c) situated explicitly within the NTE context.

Combined, the searches identified 12,911 records (citations) which were assessed for eligibility in a series of systematic screening stages. A total of eight studies were deemed eligible for the policing component of the review and 114 studies were deemed eligible for the component of the review focused on specific alcohol-harm reduction strategies. This level of attrition is common in systematic reviews of evaluation evidence in criminal justice and allied disciplines and reflects the scarcity of high-quality evaluations of criminal justice interventions across the globe.

Results

The eligible studies were predominantly conducted in Australia and United States, however, other countries represented include: New Zealand, United Kingdom, and Europe (e.g., Switzerland, Netherlands). The corpus of studies consider the impact of eligible interventions on a range of alcohol-related harm outcomes, with most considering violence and aggression. The effectiveness of the interventions was mixed, with some showing promising effects and others showing less equivocal results.

This rapid review provides a comprehensive preliminary understanding of the impact of interventions aiming to address alcohol-related harm associated with the NTE. It should be noted that this review only provides a narrative synthesis of robust impact evaluations of specific interventions in the context of the NTE conducted between 2009 – 2020. Caution must be exercised when comparing the results of the single studies because meta-analysis was not used to quantitatively synthesise the outcome data reported in the component studies.

Key Observations

The key observations from our review include:

- There is a significant lack of randomised control trials both for policing alcohol – related harm and for specific strategies such as one-way door policies, reducing business hours, alcohol outlet density, and safe transport options home.

- Auditing and problem-oriented policing at high-risk establishments may not produce changes in alcohol intoxication, but may reduce violence at premises.
- Increasing licensee awareness and police activity may be effective for reducing alcohol-related sexual offences on problematic weekends and reducing alcohol-related violence on non-problematic weekends, with noted cost-effectiveness.
- Implementing motivational interviewing when individuals are in police custody may reduce holistic measures alcohol dependence.
- Police-enforcement and compliance checks at party venues on university/college campuses may reduce incidents related to intoxication both on- and off-campus, with little displacement to other settings.
- One-way or ‘lock-out’ door policies show mixed effects on alcohol-related harm outcomes, yet this is based on less rigorous quasi-experimental research.
- Reducing business hours for NTE premises may reduce alcohol-related harms, yet this is based on less rigorous quasi-experimental research.
- Higher alcohol outlet densities is generally associated with greater alcohol-related harms, although this conclusion is drawn from a large body of heterogeneous less rigorous quasi-experimental evidence.
- There is very little evidence examining the impact of safe transport options home on alcohol-related harms. The studies included in this review suggest that designated driver programs may reduce drink driving and increase the likelihood of patrons selecting a safe transport option home.
- Caution needs to be exercised when considering the above observations due to the small amount of high-quality evaluation literature.

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1: Review Methodology

1.1 Introduction

The growth of evidence-based policy and practice in criminal justice has led to a growth in experimental research and systematic reviews as a means for identifying best practice. Randomised experiments and systematic reviews are considered the “gold standard” methods in the area of evidence-based policy and practice (Mazerolle & Bennett, 2011). Randomised experiments provide the most robust methods for establishing causality and establishing the impact of an intervention (Blumstein, 2013). Systematic reviews of interventions, which may or may not include a meta-analysis, expand single study evidence by utilising a series of standardised methodological stages to capture and synthesise impact evaluations of interventions (Liberati et al., 2009; Peters et al., 2020). Systematic reviews provide concise and comprehensive summaries of high-quality research evidence and are valuable tools for policy-makers and practitioners aiming to identify interventions that are most effective for particular problems and populations (Wilson & Tanner-Smith, 2014).

While systematic reviews are considered the highest quality evidence, they are time and labour-intensive. As a result, scholars have developed alternative review methodologies to allow for expedited syntheses of empirical literature, including reviews of existing systematic reviews, overviews of reviews, scoping reviews, evidence maps, and rapid reviews (Arksey & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010; Snilstveit et al., 2016; Peters et al., 2020). The review reported here adopts a hybrid approach that draws on a range of review method frameworks. The overall aim is to provide a rapid and broad synthesis of the highest quality available evidence for the effectiveness of specific interventions aiming to reduce alcohol-related harm in the context of night-time economies.

1.2 Review Methodology

This review adopts a hybrid approach that draws on traditional systematic review methodologies and also alternative review methodologies that permit expedited reviews of evaluation literature (Arksey & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010; Snilstveit et al., 2016; Peters et al., 2020). The initial stages of the review process utilised a standard systematic review methodology, beginning with a broad systematic search of academic and grey literature (unpublished) sources. All studies identified by the systematic search were then progressed through standardised sequential screening stages to ascertain whether each study met our pre-specified inclusion criteria. At the point of

inclusion, studies were categorised to establish the breadth and depth of the evaluation literature. From the point of study categorisation, this review adopts a narrative synthesis method which summarises the key characteristics of eligible studies across five intervention categories: (a) policing approaches (including multiagency approaches where police are a partner); (b) one-way door policies; (c) approaches relating to premises closing times; (d) approaches related to alcohol outlet density; and (e) approaches related to accessible transport from night-time economy premises to home. Within each of these sections, the evidence is further categorised by the type of outcome used to evaluate the intervention. For each included study, a synthesis is provided that summarises the (a) nature of the intervention setting (e.g., geographical location); (b) nature of governance structures of multiagency interventions; (c) study participants; (c) specific components of the intervention; (d) type of outcome measures used to evaluate the intervention; and (e) direction and/or size of the intervention's effect on the specified outcome.

1.3 Search Methodology

Policing Interventions

Search Sources

We conducted a systematic search within the Global Policing Database (GPD), housed at the University of the Queensland. The GPD is searchable database designed to capture all published and unpublished experimental and quasi-experimental evaluations of interventions relating to police or policing that have been conducted since 1950. Using innovative systematic review technologies developed at The University of Queensland, the GPD is being compiled by systematically searching, retrieving and screening published and unpublished literature that reports on impact evaluations of interventions relating to police or policing from 1 January 1950. There are no restrictions on the type of policing technique, type of outcome measure or language of the research. A complex search string using a large number of search terms (free-text and controlled vocabulary) and several search fields (e.g., title, abstract, keywords) has been used to search more than 65 databases that collectively cover peer-reviewed and grey literature (see www.gpd.uq.edu.au for a full methodological protocol).

Search Terms

We developed a wide range of search terms to capture relevant literature by drawing on existing research, as well as seeking input from police practitioners and researchers. Because the systematic search underpinning the GPD utilises policing terms, the search terms for this review focused on mental health and co-response models. The following search terms were used to search the title and abstract fields of eligible studies indexed within in the GPD: alcohol* OR liquor* OR intoxicat* OR drunk* OR drink* OR pre-load* OR “side load*” OR inebriate* OR disorder*.

Specific Interventions

Search Sources

The following sources were systematically searched for evidence pertaining to the specific interventions of interest to the New Zealand Police:

- Australian Criminology Database (CINCH, via Informit platform)
- Criminal Justice Abstracts (via EBSCO platform)
- Social Science Citation Index (via Web of Science platform)
- National Criminal Justice Reference Service
- Crimesolutions.gov
- What Works Centre for Crime Reduction Toolkit
(<https://whatworks.college.police.uk/toolkit/Pages/Welcome.aspx>)
- Alcohol.org.nz
- Te Hiringa Hauora/Health Promotion Agency (<https://www.hpa.org.nz/>)

Search Terms

We developed a wide range of search terms to capture relevant literature by drawing on existing research and iterative piloting to ensure an appropriate balance between sensitivity and specificity. Content specific terms were combined with an evaluation filter for each of the specific strategies, which are detailed in Table 1.

Table 1: Search Strategy for Specific Interventions

Intervention Strategy	Content Search Terms	Alcohol Terms	Evaluation Terms	Search Fields and Other Limiters
<i>One-way door</i>	door*			
<i>Hours of operation</i>	((business* NEAR/3 hour*) OR (closing NEAR/3 time*) OR closure* OR lock-out* OR "opening hour*")	alcohol* OR liquor* OR intoxicat* OR drunk* OR drink* OR pre-load* OR "side load*" OR inebriate* OR disorder*	effective* OR efficacy OR eval* OR experiment* OR intervent* OR meta* OR random* OR RCT OR review* OR synthesi* OR trial*	Fields: Title, Abstract, Keywords, Subject Terms Language: English Date: 2010 – 2020
<i>Alcohol outlet density</i>	bar OR bars* OR club OR clubs* OR nightclub* OR pub OR pubs OR store* OR shop* OR outlet*			
<i>Safe transport home</i>	transport* OR car OR cars OR bus OR buses OR taxi OR taxis OR train or trains OR "ride share" OR ride-share			

Note: Content terms applied to Abstract field only

1.4 Criteria for Including Studies in the Review

To be included in this review, each document extracted from the GPD must have satisfied all inclusion criteria, which are outlined in the subsections below.

Research Timeframe

To provide the most up-to-date synthesis of literature, the most recent decade of research was extracted from the GPD to progress through the systematic search and screening process (January 2009 – December 2018). For the supplementary systematic search for the four specific environmentally-focused strategies, the search and inclusion period was January 2010 – October 2020.

Population

The primary purpose of this review was to provide a comprehensive synthesis of the evaluation literature pertaining to policing and other environment-focused strategies to respond to, prevent, or reduce alcohol-related harm linked with the NTE. We anticipated that studies would cover a range of research participants beyond citizens using the NTE. Therefore, the review included studies where the research participants or populations were macro-places (e.g., city-wide areas, states, countries), micro-places (e.g., specific businesses, streets), organisations and practitioners (police and partner organisations), citizens, and offenders (convicted, charged, or arrested).

Types of Interventions

To be eligible for inclusion in the review, each document must have reported on an impact evaluation of either a policing intervention or one of the four specific strategies for responding to, preventing, or reducing alcohol-related harm linked with the NTE. The protocol guiding the compilation of the GPD defines a policing intervention as some kind of a strategy, technique, approach, activity, campaign, training, directive, or funding / organisational change that involves police in some way (other agencies or organisations can be involved). Police involvement is broadly defined as:

- Police initiation, development or leadership
- Police are recipients of the intervention or the intervention is related, focused or targeted to police practices; or
- Delivery or implementation of the intervention by police.

For the purposes of the review, we define the four specific interventions proposed by the New Zealand police as any kind of strategy, technique, approach, activity, campaign, training, directive, or funding / organisational change that focuses on:

1. Directing the flow of traffic into establishments either by (a) directing people through one door and the flow of traffic out of an establishment through another door; or (b) ‘lock out’ or one-way door policies whereby patrons are unable to enter establishments after a particular time; or
2. Reducing the hours of operation for NTE establishment; or
3. The geographical proximity of outlets or businesses linked with the NTE, measured by the number of outlets per km², by population or proximity to other entertainment or sporting venues; or
4. The means on transport for patrons returning home from the NTE (e.g., buses, cars, train, taxis, ride-share services, on foot).

We defined the NTE as any public activity, space, or establishment that operates after work hours that may or may not serve alcohol. We considered the following terminology to be suggestive of the NTE: night clubs, pubs, bars, music/theatre venues (e.g., concerts, festivals), entertainment or leisure precincts (including transport services), liquor licencing, environmental design specific to the NTE (e.g., operating hours, responsible service of alcohol, identification checks, control or adjustment of how patrons use spaces). If the time of day was not specified, and the setting would ordinarily operate afterhours, the study was included. Although important for reducing alcohol-related harm, traffic-focused policing interventions were not considered eligible unless study authors explicitly linked the intervention to the NTE.

Types of Outcomes

To provide a comprehensive synthesis of the evaluation literature pertaining to the NTE, no limits were placed on the type of outcome use to measure the effectiveness of the intervention.

Types of Study Designs

To synthesise the most rigorous research, the review included research designs that allow for reliable conclusions about intervention effectiveness. Specifically, we aimed to include only systematic reviews and randomised experiments, as these designs are considered the “gold standard” for ascertaining intervention effectiveness. However, given the paucity of experimental research for one-way door policies, reducing hours of operations, alcohol outlet density, and means of transport home,

we included quasi-experimental research designs for this component of the review. Eligible comparison conditions/groups include no treatment, placebo, “business-as-usual”, waitlist control, or an alternative treatment.

1.5 Screening and Coding Process

All search results were exported from the GPD into *SysReview*, a Microsoft Access database designed for managing systematic reviews (Higginson & Neville, 2013). Prior to screening, all efforts were made to remove ineligible document types (e.g., book reviews) and duplicate records. The subsections below provide a summary of the screening and coding protocol that was followed for the review.

Title and Abstract Screening

To refine the corpus of documents prior to the more time and resource intensive full-text eligibility screening and coding stages, all records were screened on title and abstract to determine relevancy to the NTE. Trained research staff used a standardised screening companion to screen each record according to whether the record (title and abstract) was (a) unique (i.e., not a duplicate); and (b) focused the NTE. Potentially eligible documents then progressed to the full-text eligibility screening stage.

Full-Text Eligibility Screening

Wherever possible, a full-text electronic version was obtained for all eligible records flowing from the title and abstract screening stage. Trained research staff screened the full-text of each document using a standardised screening tool according to criteria listed below. If documents were not excluded, they were considered eligible for the review and progressed to coding and synthesis.

Full-Text Eligibility Exclusion Criteria

- Document is an ineligible document type (e.g., book review);
- Document is not unique (i.e. not a duplicate);
- Document does not report on an impact evaluation an intervention focused on the NTE;
- Document does not report on an impact evaluation of a policing intervention;
- Document does not report on an impact evaluation of a one-way door policy
- Document does not report on an impact evaluation of adjustments to hours of operation;
- Document does not report on an impact evaluation related to alcohol outlet density;
- Document does not report on an impact evaluation related to transport home from the NTE.

Full-Text Coding

A team of trained research staff coded each eligible study using to standardised guidelines to inform the qualitative syntheses within each review chapter. Specifically, data were extracted for each study according to the following domains:

- Citation information (type of document, publication date, authors etc.);
- Geographical location of the intervention;
- Research design (including comparison condition);
- Type of outcome measure(s) used to evaluate the intervention;
- Population description (e.g., sample size, type of practitioners, type of mental health issues);
- Whether or not the intervention contained a multiagency approach and if so, the specific partners involved and the governance structure used;
- Intervention description (e.g. setting, focus, treatment components, intensity).

1.6 Search and Screening Summary

Policing Interventions

The PRISMA flowchart in Figure 2.1 (Moher et al., 2009) displays the attrition of identified records for the GPD processing and NTE specific screening. The systematic search in the GPD identified 8,065 records (citations) prior to any systematic screening for presence of evaluations of interventions relating to police or policing. Of these 7,890 were written in English and 3,465 were screened as being potentially about police or policing on their titles and abstract. A total of 3,221 full-text English documents were located for final eligible screening in the GPD, with 224 unable to be located through institutional libraries¹. Of the located full-texts, 469 were screened as reporting on a quantitative impact evaluation of an intervention relating to police or policing, and deemed eligible for the GPD. Of these, 98 utilised a RCT design or were a rigorous reviews of interventions relating to police or policing. These studies were imported into *SysReview* to assess their eligibility for this review. Seven studies (reported in nine documents) were evaluations of interventions relating to police or policing, with a focus on the NTE. The three RCTs (reported in four documents) and four reviews (reported in five documents) are summarised in Chapter 2. The focused searches for specific interventions (see next section) also identified an additional RCT focused on policing the NTE,

¹ The vast majority of these records were conference abstracts.

which was also included in this section².

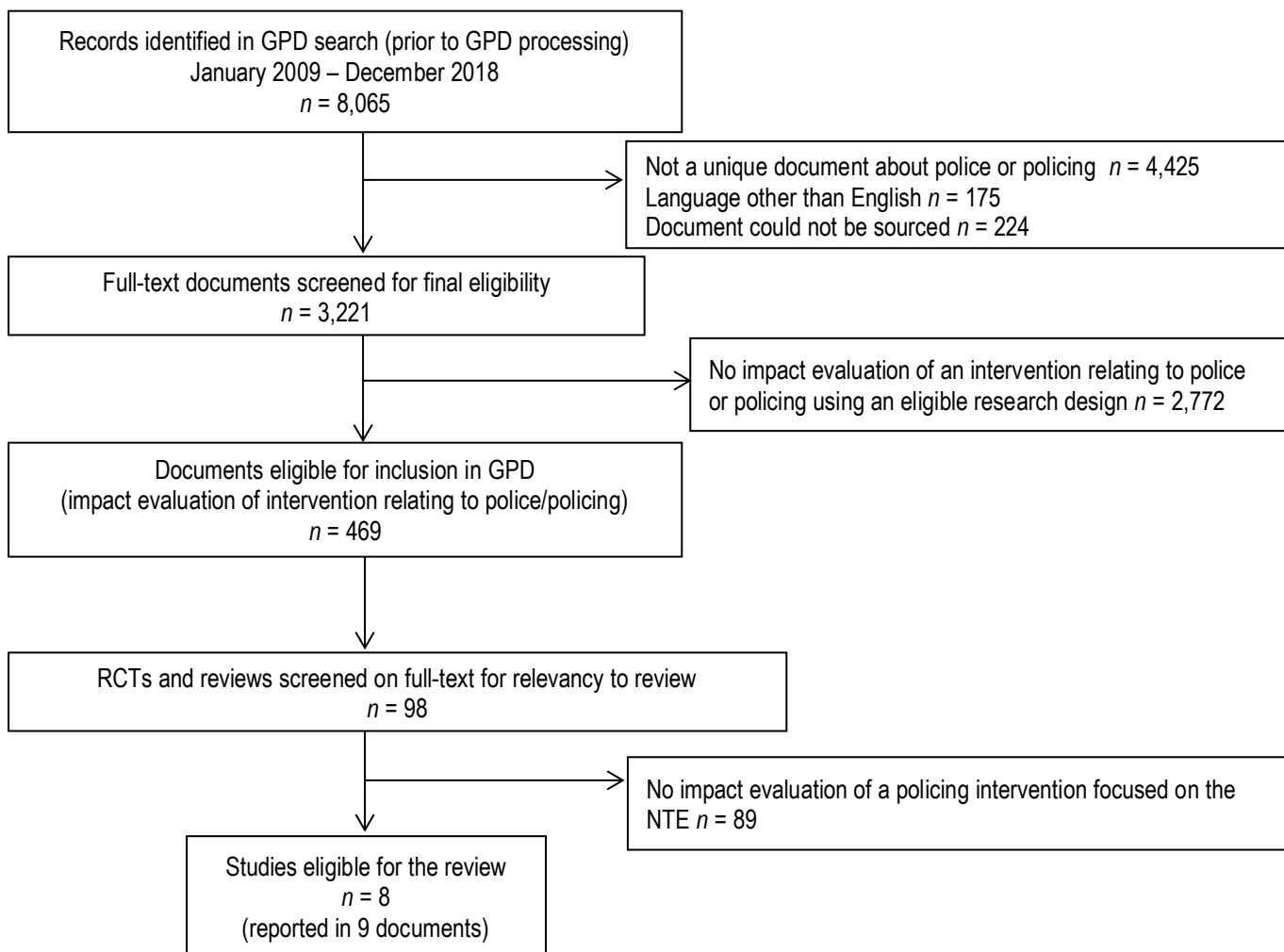


Figure 2.1. PRISMA Flow diagram for GPD search and NTE screening.

Specific Interventions

The PRISMA flowchart in Figure 2.2 (Moher et al., 2009) displays the attrition of identified records (citations) captured by the focused search described in Section 1.3. The systematic search identified 4,846 (citations) after removing duplicates and these were imported into *SysReview* to assess for eligibility after removing duplicates. At the title and abstract screening stage, 1,278 records were assessed as being potentially related to the NTE and progressed to full-text literature retrieval. A total of 1,235 full-text documents could be sourced with 45 unable to be located through institutional libraries³. These 1,235 full-text documents were then assessed for eligibility, with 114 meeting

² This study was not captured by the GPD as there were no policing terms in the title of abstract.

³ The vast majority of these records were conference abstracts.

criteria for inclusion in the review (reported in 119 documents). Of these 7 were impact evaluations on one-way door policies, 26 were impact evaluations of adjusting establishment closing times, 77 were impact evaluations of alcohol outlet density, and 4 were impact evaluations of strategies for patrons' transport from the NTE.

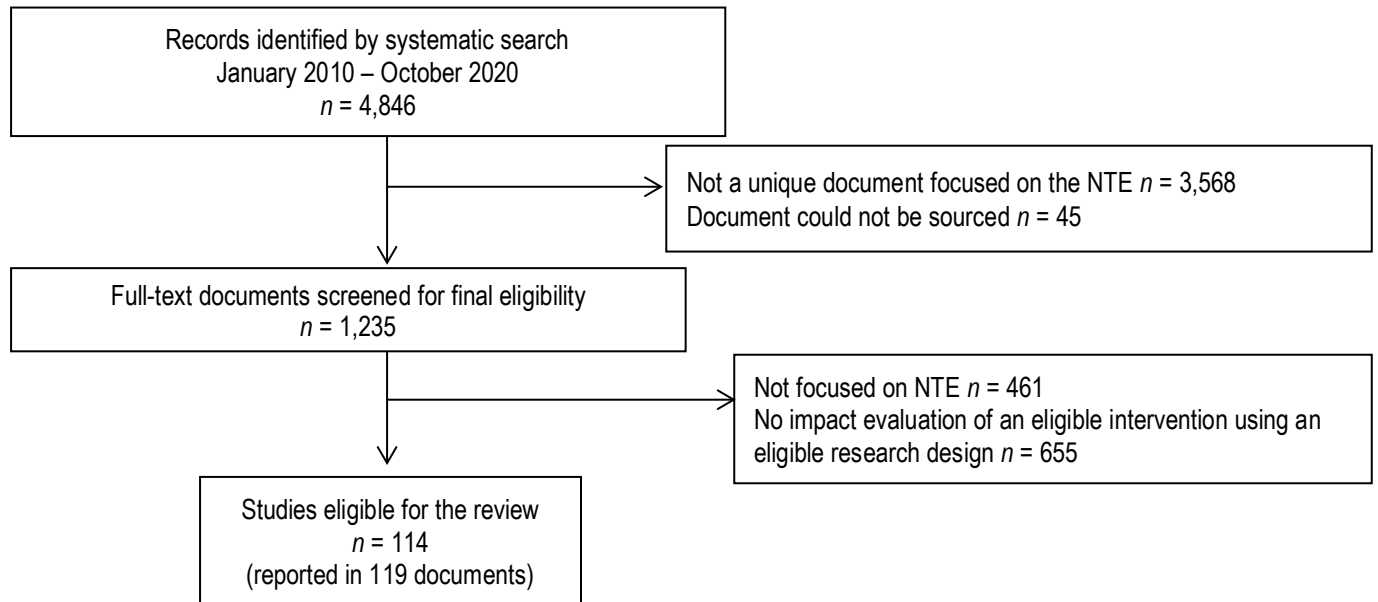


Figure 2.2. PRISMA Flow diagram for the focused systematic search and NTE screening.

1.7 References

- Arksey, H. & O'Malley, L. (2005). Scoping studies: Towards a methodological framework, *International Journal of Social Research Methodology*, 8, 19-32. doi: 10.1080/1364557032000119616
- Farrington, D. P. (2003). Methodological quality standards for evaluation research. *The ANNALS of the American Academy of Political and Social Science*, 587, 49–68. doi: 10.1177/0002716202250789
- Higginson, A., & Eggins, E. (forthcoming). The Campbell Collaboration. In J.C. Barnes and David R. Forde (Eds.), *Encyclopedia of research methods and statistical techniques in criminology and criminal justice*. Wiley.
- Higginson, A., & Neville, R. (2014). *SysReview* [Systematic Review Management Software]. Brisbane, Australia: The University of Queensland.
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5, 1-9. doi: 10.1186/1748-5908-5-69
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., . . . Moher, D. (2009). The PRISMA Statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Annals of Internal Medicine*, 151(4), W65–W94. doi: 10.7326/0003-4819-151-4-200908180-00136
- Moher, D., Liberati, A., Altman, D. G., & The PRISMA Group. (2009). Preferred items for systematic reviews and meta-analysis: The Prisma Statement. *PLoS Med*, 6(7): e1000097. doi:10.1371/journal.pmed1000097
- Peteres, M. D. J., Marie, C., Trticco, A. C., Pollock, D., Munn, Z., Alexander, L. ... Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBIC Evidence Synthesis*, 18(10), 2119-2126.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin.
- Snilstveit, B., Vojtkova, M., Bhavsar, A., Stevenson, J., & Gaarder, M. (2016). Evidence and gap maps: A tool for promoting evidence informed policy and strategic research agendas. *Journal of Clinical Epidemiology*, 79, 120-129. doi: 10.1016/j.jclinepi.2016.05.015
- Wilson, S. J., & Tanner-Smith, E. E. (2014). Meta-analysis in prevention science. In Z. Sloboda & H. Petras (Eds.), *Defining prevention science Defining Prevention Science* (pp. 431–452). New York: Springer.

2: Policing Approaches for the Night-Time Economy

2.1 Introduction

A total of eight studies (reported in nine documents) were impact evaluations or reviews including impact evaluations of policing interventions for responding to, reducing, or preventing alcohol-related harm in night-time economy contexts (NTE). Four were reviews and four were randomised controlled trials (RCTs). Of the RCTs, one study was conducted in Australia and two were conducted in the United Kingdom, and one in the United States. The included studies covered a range of different outcomes for measuring the effectiveness of the intervention, including: intoxication, alcohol-related violence and sexual offences, hazardous drinking, and alcohol dependence symptoms. Overall, each of the three approaches synthesised in Sections 2.2 – 2.4 found mixed effects, depending on the outcome under consideration.

2.2 Reviews Containing Eligible Studies

Four reviews (reported in five documents) examined interventions for preventing, responding to, or reducing alcohol-related harm (Knai et al., 2015; Jones et al., 2010; Jones et al., 2011; Liu et al. 2016; Miller et al., 2015), with Knai et al. (2015) conducting a review of existing reviews. We examined all included studies in these reviews and assessed them according to the eligibility criteria for this review. Combined, the reviews included 71 evaluation studies, yet only 19 of these were evaluations policing interventions in the context of the NTE, two of which were an RCT and one of which was a review. However, the GPD systematic search had already captured the review and one of the RCTs (Navarro et al., 2013) and the other was published outside of this review's timeframe⁴.

2.2 Auditing and Problem-Oriented Solutions for High-Risk Establishments

In order to reduce alcohol intoxication and disorder in licensed premises, a research group in the UK implemented the Licensed Premises Harm Reduction Initiative. This project is outlined in both the protocol for the trial (Moore et al., 2010) and a journal article detailing its results (Moore et al., 2012). Both documents are valuable in that they equally describe in detail what was implemented in practice for this intervention. Specifically, this involved a preparation phase whereby high-risk premises were identified, and audit materials were developed. Underpinned by Routine Activity theory and Broken Windows theory, the main component of the intervention was a premises walk-

⁴ Wiggers, J., Jauncey, M., Considine, R., Daly, J., Kingsland, M., Purss, K., ... & Waites, R. J. (2004). Strategies and outcomes in translating alcohol harm reduction research into practice: the Alcohol Linking Program. *Drug and Alcohol Review*, 23(3), 355-364.

through audit and a face-to-face interview with the manager of the licenced establishment . The audit, which assessed risk factors for intoxication and disorder (e.g., staff, customer behaviour, internal and external physical environment, operational procedures, and security) was then used to inform a tailored action plan with suggested solutions for managers. A second audit was delivered three months later to assess progress and provide additional feedback. A project team from Cardiff University implemented this intervention, with input from local police licensing officers, who assisted the study team to recruit managers from the licensed premises for inclusion in the study.

An exploratory two-armed parallel cluster randomised trial was used to assess the effectiveness of this intervention. The implementers of this UK study targeted four sites with strong existing NTEs. This resulted in a sample of 32 premises from six localities, with 16 allocated to the experimental group, and 16 allocated to the control group. The control premises operated under business-as-usual practices (i.e., normal police and local authority practices, as well as premises management). The results of the statistical analyses reported by Moore et al. (2012) assessed the efficacy of the audit and tailored action plan using measures of police-reported and customer self-reported violence at licensed premises as well as breath alcohol concentration collected by the research team on the street nearby to the premises. The authors found that there was no difference in patron mean blood alcohol levels between the control and experimental groups. When measuring the level of intoxication via alternative means (e.g., staggering gait, slurred speech), there was some evidence of a reduction in subjective drunkenness, although this was not statistically significant. In terms of a reduction in violence, the researchers use a longitudinal model to assess police-recorded violence rates at control and experimental premises across time, finding that there were less recorded incidents at experimental premises.

The results of the process evaluation also shed some interesting insights into implementation components of the intervention. Specifically, the authors state that the true intervention dosage at each premises may vary, as managers were reluctant to implement action plans and engage in the follow-up audits. The intervention lacked some buy-in from premises managers. Further, they found some recommendations in the audit to be too subjective. One specific recommendation for future practice that Moore et al. (2012) put forward is the need for a program advocate and partners to ensure the intervention's authority and alignment with local policy, as well as the need for collaborative partnerships with stakeholders such as the police.

2.3 Increasing Licensee Awareness, Police Activity, and Feedback

In response to the social and economic costs associated with alcohol-related violence and crime

Australia-wide, Navarro and colleagues (2013) implemented and evaluated a multicomponent intervention in the New South Wales NTE to assess its efficacy in reducing violent and sexual offences, as well as its cost effectiveness. The research team recruited 20 New South Wales communities into their prospective matched pairs randomised controlled trial. Around 6% of these communities' populations were young males (experimental = 6.0%, control = 5.9%) and just under 6% were Indigenous (experimental = 5.7%, control = 5.4%). The communities had an average of 11.1 (experimental) and 9.9 (control) pubs and clubs per 10,000 population. These, and other demographics such as rurality and socioeconomic disadvantage, were taken into account when selecting communities for the study and matching them into pairs.

The study focused specifically on “problematic” or target weekends in these communities, as defined by higher than average rates of alcohol-related assaults (average of 3.8 or greater) recorded for particular weekends between 2001 and 2007. The multicomponent intervention, implemented in 10 experimental communities, was a coordinated approach involving the police, local council, local media, alcohol licensees, and liquor accords (which are New South Wales Government-mandated meetings involving key stakeholders). The four components of the intervention were implemented before, during and after the problematic weekends, and are as follows⁵:

1. In the week prior, the mayor sent a letter to the community's alcohol licensees, notifying them that the coming weekend had historically experienced higher rates of alcohol-related crimes. The letter requested licensees' vigilance in terms of responsible service of alcohol and encouraged the timely liaison of security staff with police.
2. In the week prior, the local (print and radio) media featured a story on the issue in order to raise awareness about responsible drinking behaviour. Content in the media was provided by the research team via a media release.
3. On the Friday and Saturday night and early morning, police conducted increased car and foot patrols, with a focus on the central business district and licensed venues.
4. In the week following, data on the number of incidents on the weekend, relative to the average, was provided to community through the local media and to key stakeholders through

⁵ See Table 3 on page 5498 of this article for a specific breakdown of time and money spent by partners for this intervention, which may be useful in replicating such a multicomponent intervention for the night-time economy.

the liquor accord.

The remaining communities ($n = 10$) served as the control group and operated under business-as-usual practices on the problematic weekends. Results of the impact evaluation revealed that, relative to the control group, the experimental communities experienced a 64% reduction in alcohol-related sexual offences on problematic weekends. While the researchers observed no change in the number of alcohol-related assaults between the experimental and control groups for the problematic weekends, they did observe a 19% reduction in alcohol related assaults on non-problematic weekends for the experimental communities, relative to the control communities. While not statistically significant, a similar result was found for alcohol-related sexual offences on non-problematic weekends, which reduced 22% in the experimental communities relative to the controls. In terms of cost effectiveness, the authors found that, with an estimated intervention cost of AUD\$187,905, the net social benefit of the intervention was AUD\$3,938,218. Navarro and colleagues (2013) state that this may only be positive because the model included the value that is placed by communities on reducing alcohol-related harm.

2.4 Motivational Interviewing While in Police Custody

With an interest in reducing the number of hazardous drinkers in the criminal justice system and encouraging them to decrease the amount of alcohol they consume, Tobutt and Milani (2010) conducted a randomised controlled trial to examine the effectiveness of a brief motivational interviewing intervention (MIBI) for intoxicated persons brought into police custody during the evening or night (i.e., likely from the NTE). Participants from a large town in England were recruited for this study if they had been charged and arrested with an alcohol-related offence by police the previous night, were over the age of 18, did not have an alcohol dependency disorder as identified by the Alcohol Use Disorder Identification Test (AUDIT), and agreed to be seen by an alcohol arrest referral worker in the morning. Those randomised to the control group ($n = 7$) received the business-as-usual Brief Interview (BI), which involves an alcohol worker providing simple advice around how to reduce alcohol consumption to a person who is assessed as a harmful or hazardous drinker. Conversely, the experimental group ($n = 5$) received the motivational interviewing alternative (MIBI). While the specific content of the BI and MIBI are not detailed in study report, the authors describe how this intervention is implemented in conjunction with the police, the local drug and alcohol team, and the local user organisation. The four accredited alcohol workers, who visit the police station each morning to provide voluntary support to any arrestees in custody for alcohol-related offences, received additional training as part of this study. This included

a two-day, 15-hour intensive motivational interviewing course and a refresher training day for the administration of the BI and the AUDIT.

The outcome measures used for this study were scores on the AUDIT that measured an individual's frequency of hazardous drinking, alcohol dependence symptoms, and harmful drinking. Results show no statistically significant differences between the BI and MIBI groups across all of these domains. However, they do show a reduction in AUDIT scores for both groups. Specifically, overall mean scores measuring levels of hazardous and harmful drinking and alcohol dependence symptoms decreased for both groups from baseline ($M = 14.6$ for MIBI and $M = 15.13$ for BI) to follow-up ($M = 9.6$ for MIBI and $M = 11.13$ for BI). Results from this evaluation should be interpreted with caution due to the small sample sizes, as well as the homogeneity of the sample demographics (all but one of the participants were male, and most were white British). The authors state that, while promising, this study should be upsized to test its effectiveness with a larger and more diverse sample.

2.5 Police Enforcement and Compliance Checks at Party Venues on College Campuses

Saltz et al. (2010) conducted an RCT to assess the impact of environmental prevention strategies in reducing student intoxication in off-campus settings. The purpose of the study was to aid in the reduction of negative outcomes associated with heavy alcohol consumption such as alcohol-rated violence, sexual assault, hospitalisation, and poor educational outcomes. Baseline data was collected in 2003 from 14 large public university campuses in California, United States. Campuses were matched within university system based on student drinking data collected in the baseline survey. Each campus from the pair was randomised into the control condition ($n = 7$) or the experimental condition ($n = 7$). Campuses assigned to the control condition continued their operations and enforcement as usual. Campuses assigned to the experimental condition received multiple alcohol control measures, such as: DUI checkpoints, police alcohol outlet compliance check operations (e.g. minor decoy operations), and designated "party patrols". The implementation of these interventions were advertised in the campus and local media to increase student awareness of the intervention strategies. The aim of these strategies was to decrease the sale of alcohol to underage students and encourage party hosts to exercise more control over guests and reduce party sizes. The strategies were implemented in 2005 to 2006.

Annual survey data was collected from a random sample of undergraduate students attending the 14 university campuses between 2003 and 2006 ($n = 500 - 1,000$ per year), and contain a range of questions pertaining to students' alcohol consumption. The primary outcome measure was the

number of times students drank to intoxication at six different settings (campus event, residence hall party, Greek party, party at off-campus house, bar/restaurant, outdoor setting). Results indicated that intervention sites had a significant reduction in incidents of intoxication at off-campus parties and in bars/restaurants compared to control sites. Specifically, there were approximately 6,000 fewer incidents of intoxication at off-campus parties and 4,000 fewer incident of intoxication at bars/restaurants during the semester per intervention site relative to the control sites. Importantly, the researchers did not observe any displacement of student intoxication to other settings. However, campuses assigned to the experimental condition differed in their level of intervention implementation and this informs interpretation of the findings. For example, campuses with the highest level of implementation saw the highest reductions in student intoxication.

2.6 References

- Jones, L. H., K. Atkinson, A. M. Bellis, M. A. (2011). Reducing harm in drinking environments: A systematic review of effective approaches. *Health and Place, 17*(2), 508-518.
- Jones, L., Atkinson, A., Hughes, K., Whelan, G., & Bellis, M. A. (2010). *Reducing harm in drinking environments : A systematic review of effective approaches*. Retrieved from: http://www.stap.nl/content/bestanden/literature-study-drinking-environments_1.pdf
- Knai, C., Petticrew, M., Durand, M. A., Eastmure, E., & Mays, N. (2015). Are the Public Health Responsibility Deal alcohol pledges likely to improve public health? An evidence synthesis. *Addiction, 110*(8), 1232-1246.
- Liu, T., Ferris, J., Higginson, A., & Lynham, A. (2016). Systematic review of Australian policing interventions to reduce alcohol-related violence—A maxillofacial perspective. *Addictive Behaviours Reports, 4*, 1-12.
- Miller, P., Curtis, A., Chikritzhs, T., & Toumbourou, J. (2015). *Interventions for reducing alcohol supply, alcohol demand and alcohol-related harm: Final Report* (Monograph Series No. 57). Canberra, ACT: National Drug Law Enforcement Research Fund.
- Moore, S. C., Brennan, I. R., Murphy, S., Byrne, E., Moore, S. N., Shepherd, J. P., & Moore, L. (2010). The reduction of intoxication and disorder in premises licensed to serve alcohol: An exploratory randomised controlled trial. *BMC Public Health, 10*(1), 1-9.
- Moore, S. C., Murphy, S., Moore, S. N., Brennan, I., Byrne, E., Shepherd, J., & Moore, L. (2012). An exploratory randomised controlled trial of a premises-level intervention to reduce alcohol-related harm including violence in the United Kingdom. *BMC Public Health, 12*(1), 1-17.
- Navarro, H. J., Shakeshaft, A., Doran, C. M., & Petrie, D. J. (2013). Does increasing community and liquor licensees' awareness, police activity, and feedback reduce alcohol-related violent crime? A benefit-cost analysis. *International Journal Of Environmental Research And Public Health, 10*(11), 5490-5
- Saltz, R. F., Paschall, M. J., McGaffigan, R. P., & Nygaard, P. M. (2010). Alcohol risk management in college settings: The safer California universities randomized trial. *American Journal of Preventive Medicine, 39*(6), 491-499. doi: 10.1016/j.amepre.2010.08.020506.

Tobutt, C. & Milani, R. (2010). Comparing two counselling styles for hazardous drinkers charged with alcohol-related offences in a police custody suite : Piloting motivational interviewing brief intervention or a standard brief intervention to reduce alcohol consumption. *Advances in Dual Diagnosis*, 3(4). doi: 10.5042/add.2011.0189

3: Specific Strategies for the Night-Time Economy

3.1 Introduction

A total of 111 studies were impact evaluations of one-way door policies, adjusting establishment closing times, density of alcohol outlets, and transport home in the context of the NTE. The studies were conducted in multiple countries, but predominantly in Australia and the United States. The studies a range of different outcomes for measuring the effectiveness of the intervention, including: alcohol-related violence and aggression, calls-for-service, alcohol consumption, and hospital admissions. Each of the four approaches are synthesised in Sections 3.2 – 3.5.

3.2 One-Way Door Policies

We identified six impact evaluations (reported in nine documents) and one systematic review of one-way door policies in the context of the NTE. The systematic review by Taylor et al. (2018) examined studies published between 2003 and 2017 that evaluated interventions introduced into NTEs by a governing body with the aim to reduce harm or patron access to alcohol. Studies were included in Taylor et al. (2018) review if they evaluated the intervention using a pre/post research design with or without a comparison group, and utilised assault or injury rates as the outcome measure. The review authors included a qualitative evidence synthesis pertaining to a number of different interventions, including one-way door policies. Many of their included one-way door studies were also identified by our systematic search and are synthesised below. With regard to this intervention, Taylor et al. (2018) state that the evidence is mixed, with many studies implementing one-way door restrictions alongside changes in closing times and other policies, such that the effect of the one-way door policy itself on assault or injury cannot be isolated. The review authors conclude that interventions examining one-way door policies alone show little long-term effect of this policy on assault and injury.

Five of the studies identified by our systematic search (reported in eight documents; Kypri et al., 2011, 2014; Kypri & Livingstone, 2020; Menéndez et al. 2015, 2016; Mazerolle et al., 2012; Miller et al., 2017; Scott et al., 2017) were impact evaluations of one-way door policies implemented in Victoria, New South Wales and Queensland, Australia. The remaining study was conducted in Whangarei, New Zealand (Cameron et al., 2018). All papers except for one (Scott et al., 2017) used longitudinal time-series research designs with or without comparison groups to assess the impact of various state government policies and one city-based policy (Cameron et al., 2018). The study by

Scott et al. (2017) used a simulation model with an unmatched control group design to assess the impact of one-way door policies but did not utilise a longitudinal model. Most of the studies examined the impact of one-way door policies on police-recorded assaults, violent incidents, and general calls for service. Two papers (Kypri et al., 2011, 2014) examined a 2008 state government policy in Newcastle, New South Wales which involved a range of changes to the NTE regulations in the city, including 1:30am lockouts for pubs. Similarly, three papers (Kypri & Livingston, 2020; Menéndez et al., 2015, 2016) examined a 2014 amendment to state government legislation in New South Wales which restricted lockout times in Kings Cross and Sydney CBD to 1:30am alongside other policy changes such as restrictions on liquor licenses. One study (Mazerolle et al., 2015) examined the impact of a mandatory 3am lockout in two NTE precincts with high alcohol outlet densities, Fortitude Valley and Airlie Beach in Queensland. Another study (Miller et al., 2017) set out to evaluate the impact of the Queensland Government's *Tackling Alcohol-Fuelled Violence* policy which included the removal of 3am lockouts in the state. The final Australian study (Scott et al., 2017) used a simulation model of Melbourne, Victoria to examine the impact of 1am, 2am or 3am lockout times for licensed venues alongside varying times for last drinks. Lastly, the New Zealand study examined policy in Whangarei which specified 1am lockout times accompanied by 3am closing times and patrols by CitySafe officers. See Table 3.1 for a full description of initiatives implemented alongside the one-way door policies at each research site.

Overall, results from the included studies on one-way door policies are generally mixed. Both studies from New South Wales (Kypri et al., 2011, 2014; Kypri & Livingston, 2020; Menéndez et al., 2015, 2016) recorded declines in the number of assaults for the intervention sites compared with the control sites. Notably, the 2008 policies in Newcastle resulted in 33 fewer assaults per quarter, and at a five-year follow-up of the 2014 policy changes in Kings Cross and Sydney CBD, researchers observed a net reduction in assaults, equating to 10 fewer per month relative to the comparison sites. Examining one-way door policies in Queensland, Mazerolle et al. (2012) concluded that while a 3am lockout was effective in reducing violence *within* licensed premises, it had no effect on violence on footpaths and streets *outside* of the premises. Mixed findings were also reported for Whangarei, with Cameron et al. (2018) stating that the intervention might reduce police calls-for-service in the short term, but not the long-term. When comparing Whangarei with the control CBDs of Rotorua, Gisborne and Whanganui, Cameron et al. (2018) found that there may be no statistically significant difference in calls-for-service across the four sites. The included paper by Miller et al. (2017) is a protocol for a study and thus does not report on the results. An additional grey literature search obtained the final report from this project (Miller et al., 2019), which was not captured in our

systematic search. Results from Miller et al. (2019) indicate that a policy which includes removal of specified one-way door practices may contribute to fewer ambulance attendances but may not change other harm outcomes (e.g., emergency department attendances). Finally, results from the simulation model reported by Scott et al. (2017) in Melbourne suggest that, regardless of the time of last drinks, 1am lockout times were the most effective at reducing incidents of verbal aggression (by 17%-25%, depending on closing time) compared to 2am lockouts (16%-18%) and 3am lockouts (10%-11%). Policies with the longest number of hours between the lockout time and the time of last drinks resulted in the least loss of revenue for venues and also the largest reduction in incidents of street-based verbal aggression.

Echoing the conclusions drawn by Taylor et al. in their 2018 systematic review, given that a majority of our included studies implemented policies and initiatives in tandem with the one-way door restrictions, it is difficult to isolate the effectiveness of this single policy upon outcomes in the NTE. Future research would benefit from understanding whether one-way door policies alone are effective, and whether the timing (e.g., 1am versus 1:30am or 3am) moderates the effectiveness of the policies.

Table 3.1 One-Way Door Policy

Study	Location	Research design and comparator	Intervention	Outcome measures
Kypri et al. (2011; 2014)	Newcastle, NSW, Australia	Unmatched control group with pre-intervention baseline measures and interrupted time-series analysis with a control group Nightlife precinct in nearby Hamilton (no restrictions at time 1, but 1am weekend lockouts in the follow-up study)	Restrictions on pubs in Newcastle CBD implemented in March 2008: <ul style="list-style-type: none"> • Restricted closing times from 5am to 3am and 3:30am • 1:30am lockouts where existing patrons could continue to drink until 3am but no new patrons would be allowed entry • Venues were required to (a) have management plans; (b) have a ‘Responsible Service of Alcohol’ officer onsite between 11pm and closing; (c) cease serving shots at 10pm; cease selling alcohol 30 minutes prior to closing; and (d) disallow drink stockpiling. • Venues were subject to compliance audits • Venues adopted shared radio procedures • All staff were notified of new the conditions 	Police-recorded night-time (10pm – 6am) assaults (excluding domestic violence related incidents)
Kypri & Livingston (2020); Menéndez et al. (2015, 2016)	King Cross and Sydney CBD, NSW, Australia	Interrupted time series with a control group Other city areas/rest of NSW which was not subjected to most of the reforms	Restrictions on licensed venues in Kings Cross and the Sydney CBD in January 2014 (<i>Liquor Amendment Act 2014</i>): <ul style="list-style-type: none"> • 1:30am lockouts at pubs, bars, registered clubs, nightclubs and karaoke bars • Cease serving alcohol at 3am • No new liquor licenses to be granted at any venue • Takeaway alcohol sales cease at 10pm (whole-of-NSW) • Extension of banning orders for identified “trouble makers” • Introduction of risk-based license fee which is contingent on a venue’s license type, trading hours, and compliance history • Face-to-face Responsible Service of Alcohol training (i.e., no online training option) 	Police-recorded assaults (excluding domestic violence related incidents)
Mazerolle et al. (2012)	Fortitude Valley and Airlie Beach, QLD, Australia	Long interrupted time series with no control group	<i>Liquor Amendment Act 2006 (Queensland)</i> : <ul style="list-style-type: none"> • Mandatory 3am lockout • This applied to 140 (Fortitude Valley) and 101 (Airlie Beach) licensed premises over the study period 	Police-recorded violent incidents inside licensed premises or directly outside/on the streets or footpaths
Miller et al. (2017)	Fortitude Valley, Cairns, Townsville,	Protocol for a long interrupted time series study	Queensland Government’s <i>Tackling Alcohol-Fuelled Violence</i> Policy, including ⁶ :	Police, emergency department, ambulance and hospital admission

⁶ Please see Table 1 on page 3 of the article for the full description of initiatives and laws implemented under the policy.

Study	Location	Research design and comparator	Intervention	Outcome measures
	Surfers Paradise, and Toowoomba, QLD, Australia		<ul style="list-style-type: none"> Regular trading ceases at 2am, or 3am for venues in Safe Night Precincts Mandatory ID scanners in Safe Night Precincts Removal of 3am lockouts Provision of 6 extended trading hours permits per Safe Night Precinct 	data. Key outcome variable is number of assault offences during high alcohol hours
Cameron et al. (2018)	Whangarei CBD, New Zealand	<p>Long interrupted time series with a control group</p> <p>Rest of Whangarei (excluding the CBD), and the CBDs of Rotorua, Gisborne, and Whanganui</p>	<p>Whangarei one-way door policy:</p> <ul style="list-style-type: none"> 1am lockout with a 3 am closing time This was followed by the initiation of CitySafe officers conducting regular patrols in the CBD 	Police-recorded calls-for-service, CCTV-observed antisocial behaviour
Scott et al. (2017)	Melbourne, VIC, Australia	Simulation model using unmatched alternatives with no baseline measures	<p>Alternative lockout times alongside different times for last drinks served. Specifically:</p> <ul style="list-style-type: none"> 1am lockouts with either 1am, 2am, 3am or current closing times (not specified, but up to 7am) 2am lockouts with either 2am, 3am or current closing times (not specified, but up to 7am) 3am lockouts with either 3am or current closing times (not specified, but up to 7am) 	Incidents of verbal aggression (public venues; private venues; street-based); loss of public revenue

3.3 Adjusting Closing Times

We identified 20 quasi-experimental evaluations of varying adjustments to business hours in the NTE (reported in 22 documents). Additionally, we identified six reviews that included findings around adjustments to business hours.

The six reviews, summarised in Appendix A, collectively synthesise evidence regarding adjustment to alcohol outlet business hours published up until December 2018 (Kearns et al., 2015; Roche et al., 2015; Wilkinson et al., 2016; Taylor et al., 2018; Nepal et al., 2020; Sherk et al., 2018). None of the included reviews contained meta-analyses, but rather utilised systematic and scoping review search and screening techniques to provide qualitative syntheses of the evidence. By and large, the authors of these reviews concluded that reducing business hours had a beneficial effect for some outcomes, but highlight a dearth of research into the effectiveness of reducing business hours on other outcomes. Indeed, Roche et al. (2015) stated in their review that there was a dearth of high quality studies on the topic in general, and the review by Kearns et al. (2015) concluded that there is limited evidence regarding whether altering alcohol outlet business hours has an effect on rates of intimate partner violence. More recent reviews (Sherk et al., 2018; Wilkinson et al., 2016; Taylor et al., 2018; Nepal et al., 2020) indicate that there may be some robust impact evaluation evidence suggesting a positive effect of adjustments to business hours in the NTE on crime outcomes (e.g., assault, injury, violence) and alcohol-related outcomes (e.g., alcohol consumption or sales).

Table 3.2 synthesises our 20 included studies that evaluated interventions around variations in business hours in the NTE. Overall, the studies were conducted in a wide range of countries, including countries in the UK and Europe, Australia and New Zealand, Africa, Asia, and North and South America. Notably, much of the evidence originates in Australia (Atkinson et al., 2018; Kypri et al., 2011, 2014; Rowland et al., 2015; Zhou et al., 2018; Hobday et al., 2015; Kypri & Livingston, 2020; Menéndez et al., 2015, 2016; Miller et al., 2017; Scott et al., 2017). All of the included interventions were implemented at the macro level, either by varying closing times by geographic location, or by alcohol outlet. Forty-five percent of the studies ($n = 9$) examined interventions or policies which extended business-as-usual trading hours (Grönqvist & Niknami, 2014; Humphreys & Eisner, 2014; de Goeij et al., 2015; Green & Navarro, 2016a; Mentzakis et al., 2013; Rowland et al., 2015; Myran et al., 2019; Hobday et al., 2015; Scott et al., 2017), while 30% ($n = 6$) examined interventions or policies to reduce business-as-usual trading hours (Wicki & Gmel, 2011; Huckle et al., 2020; Kypri et al., 2011, 2014; Green & Navarro, 2016b; Bassols & Castello; Miller et al., 2017). The remaining studies ($n = 5$) compared policies of extension directly to policies of reduction (as

opposed to business-as-usual) or compared sites that mandated certain trading hours with sites that were not mandated to trade within certain hours (Atkinson et al., 2018; Tesch & Hohendorf, 2018; Zhou et al., 2018; Cook et al., 2014; Kypri & Livingston, 2020; Menéndez et al., 2015, 2016). Many of the included studies utilised interrupted time series designs with a control group in order to assess the effect of the change in business hours over time on the outcome measures. Some studies also utilised unmatched control group designs with or without pre-intervention baseline measures. Outcome measures utilised by the studies included police- or self-reported crimes (e.g., assault, verbal aggression, violent crime, property crime), harms resulting from alcohol consumption (e.g., alcohol-related violence, hospitalisations, injuries, worker absenteeism), alcohol consumption itself, public revenue, and drinker life satisfaction.

Qualitatively, evidence from the 20 included studies suggest that more restrictive business hours may be associated with fewer harms both off- and on-premises outlets. For example, in the Swiss study by Wicki & Gmel (2011) a policy which prohibited the sale of alcohol in off-premises outlets between the hours of 9pm and 7am reported a decrease in hospital admissions for Cantons which were subject to the policy relative to those that were not. Similarly, Bassols and Castello (2018) reported less consumption of alcohol for patrons in bars that closed between 2am and 3:30am, compared with patrons in bars that closed at 6am. Inversely, a study from The Netherlands showed that extending business hours by one hour (varied by venue type, with the latest closing time being 6am for night-time venues operating on the weekend) was associated with 34% more alcohol-related injuries (de Goeij et al., 2015). A simulation study using data from Melbourne, Australia (Atkinson et al., 2018) showed that decreasing trading hours for on-premises venues resulted in less alcohol-related violence (by 1.1% for a 1am close compared to the current 5am) and increased trading hours for off-premises bottle shops may increase violence and harms related to alcohol. Tesch and Hohendorf (2018) did not find similar results, and drew the conclusion that, in Germany, restrictive opening hours may result in more violence. While not conducted here, meta-analysis may be useful for providing a clearer overall picture of whether reducing business hours has a positive effect on a range of outcomes.

Table 3.2 Quasi-experimental studies for adjusting closing times

Study	Location	Research design and comparator	Intervention	Outcome measures
Atkinson et al. (2018)	New South Wales, Australia	Simulation model using unmatched alternatives with no baseline measures	<p>Reduction in business hours / Extension of business hours</p> <p>Alternative policies around trading hours for on-license venues compared to the baseline 5am closing time:</p> <ul style="list-style-type: none"> • Early closing time of 3am • Early closing time of 1am <p>Alternative policies around trading hours for bottle shops compared to the baseline 10pm closing time:</p> <ul style="list-style-type: none"> • Extension of business hours to 11pm • Extension of business hours to 12am • Extension of business hours to 2am 	Alcohol-related harms and violence
Grönqvist & Niknami (2014)	6 counties in Sweden: Stockholm, Skåne, Norrbotten, Västerbotten, Västernorrland, and Jämtland	<p>Unmatched control group with pre-intervention baseline measures</p> <p>15 remaining counties in Sweden which were not subject to the policy</p>	<p>Increase in number of operating days per week</p> <p>Abolition of weekend sales restrictions. Legislation introduced in 2000 requiring state-operated alcohol retail outlets to open on Saturdays until 3pm. The 3pm closing time was earlier than the usual weekday closing time (not specified)</p>	Crime (any, violent and property)
Wicki & Gmel (2011)	Geneva, Switzerland	<p>Long interrupted time series with a control group</p> <p>Control group was all other cantons, as they did not receive the policy change</p>	<p>Reduction in business hours</p> <p>Policy introduced in February 2005 prohibiting off-premises sale of alcohol between 9pm and 7am. Also involved the prohibition of the sale of alcohol at video stores and petrol stations. The opening hours within other cantons is not specified (although implied to be longer)</p>	Hospitalisations for acute alcoholic intoxication
Huckle et al. (2020)	New Zealand	Long interrupted time series without a control group	<p>Reduction in business hours</p> <p>National <i>Sale and Supply of Alcohol Act</i> which, from December 2013, prohibited 24 hour alcohol trading. New permitted trading hours were:</p> <ul style="list-style-type: none"> • Between 8am and 4am for on-premises venues • Between 7am and 11pm for off-premises bottle shops 	Police data: Late night assaults
Kypri et al.	Newcastle, NSW, Australia	Unmatched control group with pre-intervention baseline measures and	<p>Reduction in business hours</p>	Police-recorded night-time (10pm

Study	Location	Research design and comparator	Intervention	Outcome measures
(2011; 2014)		interrupted time-series analysis with a control group Nightlife precinct in nearby Hamilton (no restrictions at time 1, but 1am weekend lockouts in the follow-up study)	Restrictions on pubs in Newcastle CBD implemented in March 2008: <ul style="list-style-type: none"> • Restricted closing times from 5am to 3am and 3:30am • 1:30am lockouts where existing patrons could continue to drink until 3am but no new patrons would be allowed entry • Venues were required to (a) have management plans; (b) have a 'Responsible Service of Alcohol' officer onsite between 11pm and closing; (c) cease serving shots at 10pm; cease selling alcohol 30 minutes prior to closing; and (d) disallow drink stockpiling. • Venues were subject to compliance audits • Venues adopted shared radio procedures • All staff were notified of new the conditions 	– 6am) assaults (excluding domestic violence related incidents)
Humphreys & Eisner (2014)	Manchester, United Kingdom	Unmatched control group with pre-intervention baseline measures Compared areas with greater variation in premises closing times with areas that had less variation	Extension of business hours The <i>Licensing Act (2003)</i> removed fixed closing times for licensed outlets. Before the legislation was introduced, opening times for standard licensees were restricted to the hours of 11am to 11pm (or 10:30pm on Sundays), and 11am to 2am (or 3am in London) for special hours certificates. The new system promoted natural staggering by removing legislated business hours. The new business hours of premises included in this study are not specified	Police data: violent crime (night, early morning)
De Goeij et al. (2015)	Amsterdam, Netherlands	Unmatched control group with pre-intervention baseline measures Compared two NTE areas with extended times to three NTE areas that operated business-as-usual opening hours	Extension of business hours Policy introduced in April 2009 allowing alcohol outlets in the NTE to extend closing times by 1 hour on weekends and 2 hours on weeknights (for daytime venues). Previous closing times were: <ul style="list-style-type: none"> • 3am for daytime venues • 4am (weekend) and 3am (weeknight) for evening venues • 5am (weekend) and 4am (weeknight) for night-time venues 	Alcohol related injuries
Green & Navarro Paniagua (2016_a)	England/Wales, United Kingdom	Long interrupted time series without a control group	Extension of business hours The <i>Licensing Act (2003)</i> removed fixed closing times for licensed outlets. Before the legislation was introduced, opening times for standard licensees were restricted to the hours of 11am to 11pm (or 10:30pm on Sundays), and 11am to 2am (or 3am in London) for special hours certificates. The new system promoted natural staggering by removing legislated business	Worker absenteeism (ratio of hours reported absent to contractual hours per week)

Study	Location	Research design and comparator	Intervention	Outcome measures
			hours. The new business hours of premises included in this study are not specified	
Green & Navarro Paniagua (2016_b)	Spain 11 regions implemented the policy	Unmatched control group with baseline intervention measures Comparison group was comprised of 7 regions that did not change opening hours within the study period	Reduction in business hours Licensed venues were required to close at 3am (previously 6am), with actual implementation resulting in natural variation in venue closing times between 2am and 3am	Worker absenteeism (ratio of hours reported absent to contractual hours per week)
Mentzakis et al. (2013)	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine	Unmatched control group without baseline intervention measures Comparison group did not have 24 hour access to the purchase of alcohol	Extension of business hours Self-reported presence of alcohol outlet/s (shops, kiosk, person on street) in the respondent's neighbourhood that sells alcohol 24 hours. Sample were 18,000 survey respondents aged 18 or older	Self-reported life satisfaction, happiness, and alcohol consumption
Tesch & Hohendorf (2018)	Bavaria, Germany	Unmatched control group without baseline intervention measures Compares towns who retained liberal trading hours with those who introduced restrictions on closing times	Reduction in business hours / Extension of business hours Policy change in 2005 which decentralised outlet closing time policy from the state level to the municipal level. Prior to the change, all Bavarian municipalities were required to close at 2am (weekdays) and 3am (weekends). Following the change, municipalities set their own restrictions. <ul style="list-style-type: none"> • Liberal hours: some opted to only close between 5am and 6am for cleaning • Restrictive hours: some opted to reintroduce restrictions spanning 1am to 2am (weekdays) and 3am to 4am (weekends) 	Police data: violent incidents between 2am and 6am
Bassols & Castello (2018)	Spain	Unmatched control group with baseline intervention measures Staggered implementation of intervention	Reduction in business hours Bar closing times were reduced from 6am pre-policy to 2am – 3:30am post-policy (exact time varied by region)	Alcohol consumption, household expenditure in bars
Rowland et al. (2015)	New South Wales, Australia	Unmatched control group without baseline intervention measures Comparison is sports clubs that kept their bar open for less than 4 hours	Extension of business hours Community sports club alcohol management practices. Compared clubs that opened their bars for 4 or greater hours against clubs that opened their bars for less than 4 hours	Risky drinking whilst at the sports club
Zhou et al. (2018)	Newcastle, NSW, and Geelong, VIC, Australia	Unmatched control group without baseline intervention measures	Mandatory trading hour restrictions Newcastle had mandatory trading hour restrictions alongside other policies such as	Self-reported experiences of violence

Study	Location	Research design and comparator	Intervention	Outcome measures
		Comparison site was Geelong which does not have mandatory trading hour restrictions	drink restrictions and other Responsible Service of Alcohol guidelines. The trading hour restriction times are not specified, but the study compares a site with mandatory restrictions and a site without	(witnessing or involvement in)
Myran et al. (2019)	Ontario, Canada	Unmatched control group without baseline intervention measures	Extension of business hours Examined average weekly hours of operation of off premises alcohol outlets, increasing in 10 hour increments	Alcohol-attributable emergency department visits
Hobday et al. (2015)	Perth, WA, Australia	Unmatched control group without baseline intervention measures Compares postcodes by count of off- and on-premises outlets that have permits or do not have permits	Extension of business hours Extended trading permits allowing increased trading hours at some venues. Permits generally extend closing times by 1-2 hours past 12am on Monday – Saturday and by 1-2 hours past 10pm on Sundays	Alcohol related injuries sustained at night
Cook et al. (2014)	Argentina, Belize, Brazil, Costa Rica, Czech Republic, Hungary, India, Kazakhstan, Mexico, Nicaragua, Nigeria, Peru, Sri Lanka, Uganda, Uruguay	Unmatched control group without baseline intervention measures Comparison is countries that do not enforce policies restricting business hours of off-premise alcohol outlets	Mandatory trading hour restrictions Policy that places restrictions – either hours or days – on the business hours of off-premises alcohol outlets Also examines effect of combined policies; this includes policy restricting trading hours, policy restricting outlet density, and policy restricting off-premises retail sales of alcohol	Alcohol consumption
Kypri & Livingston (2020); Menéndez et al. (2015, 2016)	King Cross and Sydney CBD, NSW, Australia	Interrupted time series with a control group Other city areas/rest of NSW which was not subjected to most of the reforms	Mandatory trading hour restrictions Restrictions on licensed venues in Kings Cross and the Sydney CBD in January 2014 (<i>Liquor Amendment Act 2014</i>): <ul style="list-style-type: none">• 1:30am lockouts at pubs, bars, registered clubs, nightclubs and karaoke bars• Cease serving alcohol at 3am• No new liquor licenses to be granted at any venue• Takeaway alcohol sales cease at 10pm (whole-of-NSW)• Extension of banning orders for identified “trouble makers”• Introduction of risk-based license fee which is contingent on a venue’s license type, trading hours, and compliance history• Face-to-face Responsible Service of Alcohol training (i.e., no online training option)	Police-recorded assaults (excluding domestic violence related incidents)
Miller et al. (2017)	Fortitude Valley, Cairns, Townsville, Surfers Paradise, and Toowoomba, QLD, Australia	Protocol for a long interrupted time series study	Reduction in business hours	Police, emergency department, ambulance and hospital

Study	Location	Research design and comparator	Intervention	Outcome measures
			Queensland Government's <i>Tackling Alcohol-Fuelled Violence</i> Policy, including ⁷ : <ul style="list-style-type: none"> • Regular trading ceases at 2am, or 3am for venues in Safe Night Precincts • Mandatory ID scanners in Safe Night Precincts • Removal of 3am lockouts • Provision of 6 extended trading hours permits per Safe Night Precinct 	admission data. Key outcome variable is number of assault offences during high alcohol hours
Scott et al. (2017)	Melbourne, VIC, Australia	Simulation model using unmatched alternatives with no baseline measures	Extension of business hours Alternative lockout times alongside different times for last drinks served. Specifically: <ul style="list-style-type: none"> • 1am lockouts with either 1am, 2am, 3am or current closing times (not specified, but up to 7am) • 2am lockouts with either 2am, 3am or current closing times (not specified, but up to 7am) • 3am lockouts with either 3am or current closing times (not specified, but up to 7am) 	Incidents of verbal aggression (public venues; private venues; street-based); loss of public revenue

⁷ Please see Table 1 on page 3 of the article for the full description of initiatives and laws implemented under the policy.

3.4 Alcohol Outlet Density

We identified 69 quasi-experimental studies and eight reviews that examined outlet density. The eight reviews⁸ identified for the alcohol outlet density section of this report are summarised in Appendix A. Collectively, the reviews synthesise evidence regarding alcohol outlet density that was published up until December 2018, and all contained qualitative syntheses of their results without meta-analysis (Cameron et al., 2012; Kearns et al., 2015; Roche et al., 2015; Taylor et al., 2018; Wilson et al., 2014; Gmel et al., 2016; Johnson et al., 2015; Quigg et al., 2020). The results from these reviews should be treated with caution, as not all utilise rigorous systematic review methodologies and so may have bias. The results from the reviews are mixed, with some authors suggesting that the effect of density is context-specific or depends upon the outlet type (e.g., on or off premises: Cameron et al. 2012; Gmel et al., 2016; Kearns et al., 2015). Yet, overall, a number of authors conclude that higher outlet densities is associated with higher alcohol-related harms, crime, and violence (Quigg et al., 2020; Roche et al., 2015; Taylor et al., 2018).

The 69 included studies assessing the impact of alcohol outlet density are synthesised in Table 3.3. Given the large number of studies, it is not feasible to provide a written summary of each individual study. Therefore, Table 3.3 provides a brief statement of findings for each study, and we provide an brief overview here. Nearly half of the included studies were conducted in the United States (48%, $n = 33$), 11 were conducted in Australia, and the remainder were conducted in Canada, African countries, the United Kingdom, New Zealand, European countries (e.g., Switzerland, Netherlands, Spain), and South American nations (e.g., Brazil). Overwhelming majority ($n = 57$) were research designs using multivariate controls that examined associations between density levels and outcome measures, using control variables to isolate the effect. Four used interrupted time-series analyses and eight were unmatched control groups without baseline measures.

While most studies examined natural variation in outlet density, rather than a prospective policy or environmental design strategy, the studies are useful for informing policy making. The studies assess the impact of density on a range of outcomes, including: sexually transmitted diseases, crimes (especially violent crimes), alcohol price, and alcohol consumption. For studies examining natural

⁸ A number of reviews were screened as eligible for the alcohol outlet density section but were excluded from the synthesis because they included studies already captured by our systematic search. These reviews were Bryden et al. (2012), Sherk et al. (2018), and Siegfried & Parry (2019).

variations in outlet density, higher density tended to be associated with greater harms. For studies that examined specific policies, the pattern was similar with higher densities associated with greater harms (see Cameron et al., 2016; Han & Gorman, 2013; Hobday et al., 2015; Martins et al., 2020; Sharpe et al., 2018; Rossheim et al., 2018).

Table 3.3 Alcohol outlet density

Study	Location	Research design	Intervention	Outcome measures and results
Ortega-García et al. (2020)	Region of Murcia, Spain	Design using multivariate controls	Natural variation in neighbourhood alcohol outlet density (bars/restaurants)	<ul style="list-style-type: none"> Greater density of outlets was associated with higher rates of alcohol consumption in pregnant women (b = 0.007), adjusted for covariates
Breen et al. (2011)	New South Wales, Australia	Design using multivariate controls	Alcohol outlet density, as per number of pubs/clubs, wholesalers and retailers, and other licensed venues per 10,000 population	<ul style="list-style-type: none"> Greater density of pubs and clubs was associated with higher rates of alcohol-related crime (b = 0.05), adjusted for covariates
Raleigh & Galster (2015)	Detroit, Michigan, United States	Design using multivariate controls	Natural variation in number of local businesses licensed: <ul style="list-style-type: none"> To sell alcohol To sell alcohol within 1/4 mile of on- and off-premises liquor vendors To sell alcohol within 1/2 mile of a high school 	<ul style="list-style-type: none"> Greater numbers of licenses to sell alcohol were associated with higher rates of assault (b = 0.237), robbery (b = 0.609), violence (b = 0.476), burglary (b = 0.277), destruction/vandalism (b = 0.388), and drug/narcotic crime (b = 0.579), larceny (b = 0.429), motor vehicle theft (b = 0.213), and property crime (b = 0.335). Greater numbers of licenses to sell alcohol within ¼ mile of on-premises vendors were associated with higher rates of assault (b = 0.101), robbery (b = 0.100, SE = 0.080), violence (b = 0.077), burglary (b = 0.012), destruction/vandalism (b = 0.043), larceny (b = 0.151), motor vehicle theft (b = 0.006), and property crime (b = 0.043), and lower rates of drug/narcotic crime (b = -0.053). Greater numbers of licenses to sell alcohol within ¼ mile of off-premises vendors were associated with higher rates of assault (b = 0.113), robbery (b = 0.635), violence (b = 0.363), burglary (b = 0.172), destruction/vandalism (b = 0.060), drug/narcotic crime (b = 0.643), larceny (b = 0.220), motor vehicle theft (b = 0.091), and property crime (b = 0.169). Greater numbers of licenses to sell alcohol within ½ mile of high schools were associated with higher rates of assault (b = 0.030), robbery (b = 0.201), violence (b = 0.077), larceny (b = 0.052), motor vehicle theft (b = 0.011), and property crime (b = 0.002), and lower rates of burglary (b = -0.033) and drug/narcotic crime (b = -0.076). It was not associated with destruction/vandalism (b = 0.000).
Goldstick et al. (2016)	Flint, Michigan, United States	Design using multivariate controls	Natural variation in number of: <ul style="list-style-type: none"> On-premises outlets within 1/4 mile of home address Package stores within 1/4 mile of home address 	Greater quarter mile density of on-premises alcohol outlets was associated greater likelihood of youth self-reported: <ul style="list-style-type: none"> marijuana use (OR=1.08) combined alcohol and marijuana use (OR=1.14) polysubstance use (OR=1.42) Greater quarter mile density of packaged alcohol outlets was associated with youth self-reported: <ul style="list-style-type: none"> greater likelihood of marijuana use (OR=1.13), lower likelihood of combined alcohol and marijuana use (OR=0.99) and polysubstance use

Study	Location	Research design	Intervention	Outcome measures and results
				(OR=0.95)
McKinney et al. (2012)	United States	Design using multivariate controls	Natural variation in number of off- and on-premises alcohol outlets per 10,000 people in each zip code	Greater alcohol outlet density per 10,000 people per zip code was associated with: <ul style="list-style-type: none"> • greater frequency of binge drinking more than 0 to 3 times per month (OR=1.01, non-sig), • lower frequency of binge drinking greater than or equal to 4 times per month (OR=0.99, non-sig), • No notable change in the likelihood of alcohol related problems being present (OR=1.00, non-sig).
Zhang et al. (2015)	Buckhead, Atlanta, Georgia, United States	Short interrupted time series design with control group	Reduction in alcohol outlet density in Buckhead, Atlanta from 2003-2007 – measured in outlets per census block, compared with two control areas (Midtown and Downtown) that had no such reduction and similar initial outlet density	Alcohol outlet density was associated with: <ul style="list-style-type: none"> • more violent crime in the intervention site before (b = 0.84, SE =0.13, p<.001) and after (b = 0.65, SE =0.12, p<.001) the reduction in outlet density, however the magnitude of this association decreased. • more violent crime in the comparison areas: Pre-intervention: Midtown (b = 0.18, SE =0.05, p = .001), Downtown (b = 0.32, SE =0.08, p = .001). Post-Intervention: Midtown (b = 0.12, SE =0.05, p = .02), Downtown (b = 0.27, however the decrease in the magnitudes of the relationships from pre to post was substantially weaker in the comparison areas than in Buckhead
Parker et al. (2011)	United States (91 cities)	Design using multivariate controls	Density of alcohol outlets in each city throughout time, as measured by number off-site beer, wine, and liquor stores	<ul style="list-style-type: none"> • Greater alcohol outlet density was associated with higher rates of youth homicide for offenders aged 13-17 (b = 22.52, SE =8.20) and offenders aged 18-24 (b = 46.64, SE =8.21), adjusted for covariates
Cederbaum et al. (2015)	Philadelphia, Pennsylvania, United States	Design using multivariate controls	Number of alcohol outlets per 400m	Greater alcohol outlet density was associated with a: <ul style="list-style-type: none"> • greater likelihood of recent mother alcohol use (OR=1.16) • greater likelihood of recent son alcohol use (OR=1.10)
Chen et al. (2010)	California, United States	Design using multivariate controls	The count of active off-premise outlets per roadway mile within each zip code	Greater alcohol outlet density was associated with a: <ul style="list-style-type: none"> • slightly higher frequency of underage drinking (b = 0.0003) • slightly higher frequency of underage excessive drinking (b = 0.0009)
Maimon et al. (2012)	Chicago, Illinois, United States	Design using multivariate controls	Number of bars, alcoholic beverage services and liquor stores in each face block	<ul style="list-style-type: none"> • Greater alcohol outlet density was associated with higher rates of underage drinking (b = 0.255, SE =.118).
Lo et al. (2013)	Alabama, United States	Design using multivariate controls	Number of alcohol outlets (bars, liquor stores, licensed restaurants) per square metre for each school catchment area	Greater alcohol outlet density was associated with: <ul style="list-style-type: none"> • less 30-day marijuana by students use in the urban sample (b = -0.002, SE =.001) • more 30-day marijuana by students use in the rural sample (b = 0.001, SE =0.013) • less 30-day alcohol use by students in both urban (b = -.001, SE =.002) and rural samples (b = .009, SE =.024).
Cameron et	North Island,	Design using	Number of alcohol outlets	<ul style="list-style-type: none"> • Greater club density was associated with higher rates of anti-social behaviour (b = 3.197),

Study	Location	Research design	Intervention	Outcome measures and results
al. (2013)	New Zealand	multivariate controls	per 10,000 people residing in each Census Area Unit. Including: clubs, sports clubs, bottle stores, grocery stores, supermarkets, off-licensed hotels, off-licensed taverns, other off-licensed venues, bars and nightclubs, restaurants and cafes, function centres, other on-licensed, and dual-licensed hotels, restaurants and bars (on- and off-licensed)	<p>dishonesty offences (b = 2.183), drug and alcohol offences (b = 0.026, non-sig), property abuses (b = 0.672, sig), property damage (b = 1.267), violent offences (b = 0.853) and Motor vehicle accidents (b = 0.129), and with lower rates of sexual offences (b = -0.031).</p> <ul style="list-style-type: none"> • Greater bar and nightclub density was associated with higher rates of antisocial behaviour (b = 14.73), dishonesty offences (b = 13.43), drug and alcohol offences (b = 1.335), property abuses (b = 2.395), property damage (b = 2.871), sexual offences (b = 0.321), violent offences (b = 5.311), and motor vehicle accidents (b = 0.511). • Greater "other on-licence density" was associated with higher rates of antisocial behaviour (b = 3.357), dishonesty offences (b = 4.324), drug and alcohol offences (b = 0.0004, non-sig), property abuses (b = 0.779), property damage (b = 0.666), sexual offences (b = 0.004, non-sig), violent offences (b = 0.577), and motor vehicle accidents (b = 0.266). • Greater "other off-licence density" was associated with higher rates of dishonesty offences (b = 6.994), sexual offences (b = 0.008, non-sig), and motor vehicle accidents (b = 0.460), and lower rates of antisocial behaviour (b = -7.817), dishonesty offences (b = -6.994), property abuses (b = -1.610), property damage (b = -0.816) and violent offences (b = -0.758).
Cameron et al. (2016)	North Island, New Zealand	Design using multivariate controls	Number of liquor licenses for 1) clubs, 2) bars/nightclubs, 3) other on-licenses (mostly restaurants/cafes), and 4) off-premises outlets per Census Area Unit	<p>Greater densities of all alcohol outlet types were associated with higher rates of violent events (includes child abuse, crimes against personal privacy, domestic violence, assault, harassment, homicide, intimidation/threat, kidnapping, robbery):</p> <ul style="list-style-type: none"> • licensed clubs (b = 0.840, SE =0.240) • bars/nightclubs (b = 5.282, SE =0.267) • restaurants/cafes (b = 0.562, SE =0.134) • off-licence outlets (b = 0.713, SE =0.273)
Cameron et al. (2019)	New Zealand	Design using multivariate controls	Number of alcohol outlets in each Census Area Unit; from 2007-2014. Including clubs, bottle stores, other off-licenses, bars/nightclubs, restaurants/cafes, other on-licences; and dual-licensed hotels, taverns and restaurants.	<ul style="list-style-type: none"> • Greater density of licensed clubs was associated with more violent events (RR=1.048, SE =0.016), dishonesty offences (RR=1.400, SE =0.132), sexual offences (RR=1.757, SE =0.246) and motor vehicle accidents (RR=1.0005, SE =0.017), and less antisocial behaviour (RR=0.995, SE =0.008), drug and alcohol offences (RR=0.996, SE =0.015), property abuses (RR=0.996, SE =0.015) and property damage (RR=0.995, SE =0.009). • Greater density of bars/nightclubs was associated with more violent events (RR=1.0005, SE =0.003) and antisocial behaviour (RR=1.004, SE =0.002), and less dishonesty offences (RR=0.999, SE =0.003), drug and alcohol offences (RR=0.977, SE =0.011), property abuses (RR=0.992, SE =0.003), property damage (RR=0.991, SE =0.002), sexual offences (RR=0.987, SE =0.004), and motor vehicle accidents (RR=0.993, SE =0.008). • Greater density of "other on-licence" outlets was associated with more drug and alcohol offences (RR=1.005, SE =0.005, non-sig) and sexual offences (RR=1.002, SE =0.003, non-sig) and less violent events (RR=0.948, SE =0.018), antisocial behaviour (RR=0.997, SE =0.002, non-sig), dishonesty offences (RR=0.997, SE =0.002), property abuses (RR=0.999, SE =0.001, non-sig), property damage (RR=0.997, SE =0.001) and motor vehicle accidents (RR=0.918, SE =0.041).

Study	Location	Research design	Intervention	Outcome measures and results
				<ul style="list-style-type: none"> Greater density of off-license (all) outlets was associated with more violent events (RR=1.012, SE =0.004), antisocial behaviour (RR=1.013, SE =0.003), dishonesty offences (RR=1.009, SE =0.007, non-sig), drug and alcohol offences (RR=1.064, SE =0.016), property abuses (RR=1.006, SE =0.005, non-sig), property damage (RR=1.015, SE =0.008), sexual offences (RR=1.019, SE =0.008) and motor vehicle accidents (RR=1.026, SE =0.009).
Morrison et al. (2015)	Melbourne, Victoria, Australia	Design using multivariate controls	Distance to nearest off-premise alcohol outlet (High vs Low)	<ul style="list-style-type: none"> Greater distance between outlets was associated with higher alcohol pricing (b = 0.047). Outlets adjacent to a greater number of chain alcohol outlets were associated with lower alcohol pricing (b = -0.233).
Rowland et al. (2016)	Australia: Victoria Queensland and Western Australia	Design using multivariate controls	Number of licenced alcohol outlets (packaged, general, on-premises and club - not wineries) per 10,000 residents in the Local Government Area (LGA)	<ul style="list-style-type: none"> Greater general outlet density was associated with a lower likelihood of underage confederate alcohol purchase (OR=0.85), as was greater club density (OR=0.78) and on-premises density (OR=0.95). Greater packaged outlet density was associated with a higher likelihood of underage confederate alcohol purchase (OR=1.10), adjusted for covariates.
Theall et al. (2011)	New Orleans, Louisiana, United States	Design using multivariate controls	Number of alcohol outlets (liquor store, on-premises outlet, convenience stores) per 1000 residents in each census tract	<ul style="list-style-type: none"> Greater outlet density was associated with a higher rate of at risk drinking (OR = 1.38)
Fitterer et al. (2018)	Victoria, British Columbia, Canada	Design using multivariate controls	Number of off-premises alcohol licenses per dissemination area, and number of bar seats per dissemination area	<ul style="list-style-type: none"> Greater off-premise outlet density was associated with higher rates of assault and disorder at a factor of 1.1530 (b = 0.1424, SE = 0.13). Greater seat density of bars and pubs was associated with higher rates of assault and disorder at a factor of 1.0009 (b = 0.0009, SE = 0.00). Greater seat density of on-premises outlets was associated with higher rates of assault and disorder at a factor of 1.0002 (b = 0.0002, SE = 0.00). Bars and pubs that were within 300 m of each other had significantly more crime than those spaced further apart.
Cameron et al. (2012)	Manukau City, Auckland, New Zealand	Design using multivariate controls	Number of licensed alcohol outlets per 10,000 resident population in each Census Area Unit	<p>Greater off-licence outlet density was associated with:</p> <ul style="list-style-type: none"> higher rates of violent offences (b = 3.4915), sexual offences (b = 0.3764), drug and alcohol offences (b = 2.6328), property abuses (b = 1.0407), antisocial behaviour (b = 6.846), dishonesty offences (b = 9.8319), traffic offences (b = 6.1031), and motor vehicle accidents (b = 3.7015) lower rates of family violence (b = -4.1620), and property damage (b = -0.8503, non-sig) <p>Greater club/bar density was associated with:</p> <ul style="list-style-type: none"> higher rates of violent offences (b = 2.8859), sexual offences (b = 0.0763, non-sig), drug and alcohol offences (b = 1.5830), property damage (b = 1.2553), property abuses (b = 2.4000),

Study	Location	Research design	Intervention	Outcome measures and results
				<p>antisocial behaviour (b = 12.457), dishonesty offences (b = 25.499), traffic offences (b = 8.6898), and motor vehicle accidents (b = 3.6318, non-sig)</p> <ul style="list-style-type: none"> • lower rates of family violence (b = -0.8152, non-sig) <p>Greater restaurant/cafe density was associated with:</p> <ul style="list-style-type: none"> • higher rates of violent offences (b = 1.8786), family violence (b = 1.7766), sexual offences (b = 0.0105, non-sig), drug and alcohol offences (b = 0.4885, non-sig), property damage (b = 1.2032), property abuses (b = 1.5392), antisocial behaviour (b = 8.5346), dishonesty offences (b = 20.749), traffic offences (b = 9.6859), and motor vehicle accidents (b = 4.5328)
Hobday et al. (2015)	Perth metropolitan area, Western Australia, Australia	Unmatched control group without baseline	Off-premises alcohol outlet density, On-premises alcohol outlet density without extended trading hours, On-premises alcohol outlet density with extended trading hours (1–2 hours past midnight from Mondays to Saturdays or past 10 p.m. on Sundays.)	<ul style="list-style-type: none"> • Greater off-premises alcohol outlet density was associated with a lower risk of night injuries (RR=0.951) and also weekend night injuries (RR=0.961). • Greater on-premises alcohol outlet density (extended trading hours) was associated with a higher risk of night injuries (RR=1.046) and weekend night injuries (RR=1.049). • Greater on-premises alcohol outlet density (without extended trading hours) was associated with a higher risk of night injuries (RR=1.006) and weekend night injuries (RR=1.008).
Rossheim et al. (2018)	Texas, United States	Design using multivariate controls	Number of on- and off-site alcohol sales licences held in each county, by year	<ul style="list-style-type: none"> • Greater on-premises outlet density was associated with greater relative risk of bacterial STI infection (RR=1.024) and HIV infection (RR=1.015). • Greater off-premise outlet density was associated with a lower relative risk of bacterial STI infection (RR=.991) and HIV infection (RR=.991)
Scribner et al. (2011)	United States	Design using multivariate controls	On-premises outlets: Number of bars, taverns and restaurants within 3 miles of the campus boundary per 1,000 students enrolled	<p>Greater on-premises alcohol density was associated with:</p> <ul style="list-style-type: none"> • more drinks consumed when partying (b = 0.0341), • more drinks consumed per week (b = 0.01162), • greater maximum amount of drinks consumed recently (b = 0.006683) • scores on a composite drinking scale comprised of the prior three outcome measures (b = 0.006704), adjusted for covariates
Rossheim et al. (2016)	United States	Design using multivariate controls	Number of on- and off-premises alcohol outlets in each county	<ul style="list-style-type: none"> • Greater on-premises alcohol outlet density was associated with greater HIV prevalence risk (RR=1.0006, SE = 0.0003) • Greater off-premise alcohol outlet density was associated with lower HIV prevalence risk (RR=0.9995, SE = 0.00008)
Hobday et al. (2016)	Perth, WA, Australia	Design using multivariate controls	Number of licensed outlets (onsite and offsite) in each postcode	<ul style="list-style-type: none"> • Greater on-site alcohol outlet density was associated with a greater risk for night injuries in the inner zone (RR=1.008), middle zone (RR=1.003, non-sig) and outer zone (RR=1.021) • Greater off-site alcohol outlet density was associated with a greater risk for night injuries in the middle zone (RR=1.003, non-sig), but a lower risk of injuries in the inner zone

Study	Location	Research design	Intervention	Outcome measures and results
				(RR=0.932) and the outer zone (RR=0.904)
Cook et al. (2014)	Argentina, Belize, Brazil, Costa Rica, Czech Republic, Hungary, India, Kazakhstan, Mexico, Nicaragua, Nigeria, Peru, Sri Lanka, Uganda, Uruguay	Design using multivariate controls	Alcohol outlet density – method of calculation unspecified	<ul style="list-style-type: none"> Greater outlet density was associated with lower usual quantity of alcohol consumed on a typical occasion (b = -0.13), usual frequency of alcohol consumption occasions (b = -0.19), and binge drinking frequency (b = -0.11), and higher rates of current drinking (b = 0.83).
Treno et al. (2013)	British Columbia, Canada	Design using multivariate controls	Number of alcohol outlets (Private liquor stores, government liquor stores, restaurants, and bars) per km of roadway in Local Health Areas	<ul style="list-style-type: none"> Greater restaurant density was associated with higher prices of beer (b = 0.006, SE = 0.022, non-significant), wine (b = 0.030, SE = 0.033, non-significant), spirits (b = 0.017, SE = 0.021), and all alcohol (b = 0.021, SE = 0.022) Greater government liquor store density was associated with higher prices of beer (b = 1.216, SE = 1.098), wine (b = 0.512, SE = 1.642), and all alcohol (b = 0.275, SE = 1.10), but lower prices of spirits (b = -0.108, SE = 1.039) Greater bar density was associated with higher prices of beer (b = 0.029, SE = 0.061) and spirits (b = 0.029, SE = 0.057), and lower prices of wine (b = -0.020, SE = 0.091) and all alcohol (b = -0.009, SE = 0.060) Greater private liquor store density was associated with lower prices of beer (b = -0.454, SE = 0.189), wine (b = 0.439, SE = 0.284), and spirits (b = -0.211, SE = 0.179), and all alcohol (b = -0.377, SE = 0.188)
Trangenstein et al. (2018)	Baltimore, Maryland, United States	Design using multivariate controls	Number of on-premises (n= 519), off-premises (n= 264), and LBD-7 (premises licensed to sell both on- and off-premises, n= 421), per census block group	<ul style="list-style-type: none"> Greater total alcohol outlet SAI (spatial accessibility index) was associated with higher rates of overall violent crime exposure (b = 0.43). Greater on-premises outlet SAI was associated with higher rates of sexual assault (b = 0.15), robbery (b = 0.07) and overall violent crime exposure (b = 0.31), and lower rates of homicide (b = -0.12) and aggravated assault (b = -0.17) Greater off-premises outlet SAI was associated with higher rates of homicide (b = 0.30), aggravated assault (b = 0.25), sexual assault (b = 0.19), robbery (b = 0.20), and overall violent crime exposure (b = 0.45). Greater combined on- and off- premise-licensed outlet (LBD-7) SAI was associated with higher rates of homicide (b = 0.29), aggravated assault (b = 0.41), sexual assault (b = 0.13), robbery (b = 0.28), and overall violent crime exposure (b = 0.43).
Toomey et al.	Minneapolis,	Design using	Number of licensed alcohol	<ul style="list-style-type: none"> Greater total outlet density was associated with higher rates of rape (b = 0.31), robbery (b =

Study	Location	Research design	Intervention	Outcome measures and results
(2012)	Minnesota, United States	multivariate controls	establishments (on- and off-premise) per roadway mile in each neighbourhood	0.32), assault (b = 0.34) and combined crime (b = 0.27). <ul style="list-style-type: none"> Greater on-premises outlet density was associated with higher rates of rape (b = 0.31), robbery (b = 0.30), assault (b = 0.34) and combined crime (b = 0.27). Greater off-premise outlet density was associated with higher rates of rape (b = 0.15) robbery (b = 0.19), assault (b = 0.17) and combined crime (b = 0.11).
Leslie et al. (2015)	Mpumalanga province, South Africa	Unmatched control group without baseline measures	<ul style="list-style-type: none"> Number of alcohol outlets per square kilometre Comparing high outlet density (0.5 outlets/km² above mean) and low outlet density (0.5 outlets/km² below mean) 	<ul style="list-style-type: none"> Heavy Drinking (B = -0.13). Potential problem drinking: a) in tavern drinkers (b = 0.96); b) in non-tavern drinkers (b = -0.36). Greater alcohol outlet density was associated with less heavy drinking, greater potential problem drinking in tavern drinkers, and less potential problem drinking in non-tavern drinkers.
Livingston (2010)	Melbourne, Victoria, Australia	Design using multivariate controls	Outlet density by: <ul style="list-style-type: none"> General licenses On-premises licenses Packaged licenses per 1000 residents of the village 	<ul style="list-style-type: none"> Higher general licence density (b = 2.29) and packaged licence density (b = 1.15) were associated with greater rates of domestic violence. Higher on-premises licence density was associated with lower rates of domestic violence (b = -0.44). Controlling for covariates did not change the effect.
Badland et al. (2016)	Victoria, Australia	Design using multivariate controls	<ul style="list-style-type: none"> Number of on- and off-premise licensed outlets per 1000 persons in each statistical area Presence of 0 or 1 (and greater) on- and off-premises licensed alcohol outlets within various spatial areas/proximities 	Off-License Outlet Density: <ul style="list-style-type: none"> Presence of one or more off-license outlets within 400m was associated with a greater likelihood of poorer self-rated health (OR=1.03, p = 0.87). The presence of one or more off-license outlets within 800m was associated with a greater likelihood of poorer self-rated health (OR=1.24, p<.05). The presence of one or two off-license outlets within 1600m was associated with a greater likelihood of poorer self-rated health (OR=1.11, p = 0.53). The presence of three or more off-license outlets within 1600m was associated with a greater likelihood of poorer self-rated health (OR=1.18, p = 0.32). Collectively, greater off-license outlet density is seen to be associated with poorer self-reported health, adjusted for covariates. On-License Outlet Density: <ul style="list-style-type: none"> Presence of one or more on-license outlets within 400m was associated with a greater likelihood of poorer self-rated health (OR=1.10, p = 0.55). The presence of one or more on-license outlets within 800m was associated with a lower likelihood of poorer self-rated health (OR=0.92, p = 0.38). The presence of one or two on-license outlets within 1600m was associated with a lower likelihood of poorer self-rated health (OR=0.92, p = 0.55).

Study	Location	Research design	Intervention	Outcome measures and results
				<ul style="list-style-type: none"> The presence of three or more on-license outlets within 1600m was associated with a lower likelihood of poorer self-rated health (OR=0.98, p = 0.90). On-license outlet density is associated with both more and less self-reported poor health depending on the distance analysed, adjusted for covariates.
Romano et al. (2015)	United States	Design using multivariate controls	<ul style="list-style-type: none"> Alcohol outlet density Comparing different states' varied jurisdictions (different legislation, interventions and characteristics) 	<p>Greater alcohol outlet density was associated with:</p> <ul style="list-style-type: none"> Greater beer consumption (b = 0.122) Slightly greater rates of teen alcohol-related crashes (b = 0.003)
Fone et al. (2012)	Wales, United Kingdom	Protocol for a study with a research design using multivariate controls	<ul style="list-style-type: none"> Distance from each individual to outlets within 10 minutes' drive/walk Averaged across no. individual residents in each LSOA (Census Lower Super Output Areas) 	<p>Across 2005-2009, change in alcohol consumption (measured using data from annual Welsh Health Surveys):</p> <ul style="list-style-type: none"> alcohol-related hospital admissions (measured by the Patient Episode Database for Wales) Accident & Emergency department attendances between midnight–6am alcohol-related violent crime against the person (as reported in police records) Protocol, no results
Miller et al. (2017)	Queensland, Australia	Protocol for a long interrupted time series study	<ul style="list-style-type: none"> Number of on- and off-premise alcohol outlets per Safe Night Precinct (NSP) One way door/Lockout: No one can enter the establishment/exit and re-enter the establishment after a specified time (1am). Business hours - change in number extended trading hours permits issued by the government (from 12 to 6 per year) 	<ul style="list-style-type: none"> Violent incident rates Protocol, no results
Trangenstein et al. (2020)	Baltimore, Maryland,	Design using multivariate	Number of outlets (on-premises, off-premise,	<p>Reducing alcohol outlet density by one quintile was associated with</p> <ul style="list-style-type: none"> 51 fewer homicides

Study	Location	Research design	Intervention	Outcome measures and results
	United States	controls	combined) per census block unit	<ul style="list-style-type: none"> • A societal economic saving of \$63.7 million • A gain of 764 disability-adjusted life years (DALYs)
Toomey et al. (2012)	Minneapolis, Minnesota, United States	Design using multivariate controls	Number of licensed alcohol establishments (on- and off-premise) per roadway mile in each neighbourhood	<ul style="list-style-type: none"> • The density of all alcohol outlets was associated with higher rates of vandalism (b = 0.26), nuisance (b = 0.50), driving while intoxicated (b = 0.48), public alcohol consumption (b = 0.83) and underage alcohol possession/consumption (b = 0.40). • On-premises outlet density was associated with higher rates of vandalism (b = 0.25), nuisance (b = 0.50), driving while intoxicated (b = 0.47), public alcohol consumption (b = 0.83) and underage alcohol possession/consumption (b = 0.38). • Off-premise outlet density was associated with higher rates of vandalism (b = 0.17), nuisance (b = 0.21), driving while intoxicated (b = 0.28), public alcohol consumption (b = 0.35) and underage alcohol possession/consumption (b = 0.35).
Rosshiem et al. (2015)	United States	Design using multivariate controls	Number of outlets per ZIP code (including on-premises outlets; liquor, beer or wine stores; convenience stores attached to gas stations; & pharmacies)	<ul style="list-style-type: none"> • Greater on-premises outlet density was associated with greater risk of HIV prevalence (RR=1.015, p<0.001), such that each additional on-premises outlet was associated with a 1.5% increase in HIV prevalence. • Greater density of beer/wine/liquor stores was associated with lower risk of HIV prevalence (RR=0.981, p<0.001), such that each additional store was associated with a 1.9% reduction in HIV prevalence. • Greater density of gas stations/convenience stores was associated with lower risk of HIV prevalence (RR=0.990, p = 0.001), such that each additional store was associated with a 1% reduction in HIV prevalence.
Ahern et al. (2015)	New York City, New York, United States	Unmatched control group without baseline measures	Number of alcohol outlets per square mile (density dichotomized as above or below the median, "high" or "low" outlet density)	<ul style="list-style-type: none"> • The risk of self-reported alcohol use disorder was significantly greater in high-alcohol outlet density neighbourhoods (2.20%) than in those with low-alcohol outlet density (1.32%), adjusted for confounders (p<.05).
Bowers et al. (2015)	Bergriver municipality, Western Cape, South Africa	Raw correlational design	Legal and illegal alcohol outlet density (no. of outlets per square km, no. alcohol outlets/person, and no. alcohol outlets/1000 persons)	<ul style="list-style-type: none"> • Illegal alcohol outlet density was positively correlated with social deprivation (measured by South African Index of Multiple Deprivation; takes into account income, employment, education and living environment; r=0.38, p = 0.14) • Legal alcohol outlet density was negatively correlated with deprivation (r=-0.20, p = 0.46)
Furr-Holden et al. (2019)	Baltimore, Maryland, United States	Design using multivariate controls	Number of on- and off-premise outlets per 1000 residents in each community statistical area (CSA)	<p>When adjusting for community disadvantage and violent crime density:</p> <ul style="list-style-type: none"> • Greater liquor store outlet density was associated with lower life expectancy (measured by years a person born in 2011 can expect to live based on 2011 death rates; $\beta = -1.03$)
Roman & Reid (2012)	Washington D.C., United States	Design using multivariate controls	Number of on- and off-premise alcohol outlets (including restaurants,	<p>When controlling for social disorganisation, offender and population demographics, physical environment factors, and other controls:</p> <ul style="list-style-type: none"> • Greater on-premises outlet density was associated with lower rates of domestic violence (as

Study	Location	Research design	Intervention	Outcome measures and results
			stores, taverns, nightclubs, hotels, and multipurpose facilities) according to licensing, per each block group/square mile	<p>measured by calls to police) (b = -0.001)</p> <ul style="list-style-type: none"> Greater off-premise outlet density was associated with higher rates of domestic violence (b = 0.001) <p>During the weekend:</p> <ul style="list-style-type: none"> Greater on-premises outlet density was related to lower rates of domestic violence (b = -0.001) Greater off-premise outlet density was associated with higher rates of domestic violence (b = 0.003) <p>During the weeknights:</p> <ul style="list-style-type: none"> Greater on-premises outlet density was related to lower rates of domestic violence (b = -0.001) Greater off-premise outlet density was associated with higher rates of domestic violence (b = 0.001) <p>Regarding alcohol outlet types:</p> <ul style="list-style-type: none"> Greater density of restaurants (b = -0.001), taverns (b = -0.030, non-sig) and nightclubs (b = -0.009) were associated with lower rates of domestic violence Greater density of stores were associated with higher rates of domestic violence (b = 0.001)
Trangenstein et al. (2019)	Baltimore, Maryland, United States	Design using multivariate controls	<p>Number of alcohol outlets in Baltimore census blocks</p> <ul style="list-style-type: none"> comparing different methods of outlet density measurement, including: raw counts, accessibility, spatial accessibility indexing (SAI), proximity, rates per population 	<ul style="list-style-type: none"> Higher raw count of alcohol outlets was associated with higher counts of violent crime (IRR= 0.98), and lower rates of proximity to nearest violent crime (b = >-0.01), spatial accessibility index (SAI) for 7 nearest violent crimes (b = -0.07), and SAI for violent crimes in 0.25-mile buffer (b = -0.08, non-sig) Higher count of alcohol outlets divided by total population was associated with higher counts of violent crime (IRR= 0.98) and proximity to nearest violent crime (b = 0.02) but lower SAI for 7 nearest violent crimes (b = -0.06) and SAI for violent crimes in 0.25-mile buffer (b = -0.07) Greater outlet density (as measured by count of alcohol outlets divided by area) was associated with higher counts of violent crime (IRR= 1.05), SAI for 7 nearest violent crimes (b = 0.30) and SAI for violent crimes in 0.25-mile buffer (b = 0.34), and lower proximity to nearest violent crime (b = -0.14) Greater outlet density (as measured by count of alcohol outlets divided by total roadway miles) was associated with higher counts of violent crime (IRR= 1.03) and SAI for violent crimes in 0.25-mile buffer (b = 0.02), but lower proximity to nearest violent crime (b = -0.04) and SAI for 7 nearest violent crimes (b = >-0.01) Greater proximity to nearest outlet was associated with higher counts of violent crime (IRR= 0.84) and proximity to nearest violent crime (b = 0.54), and lower SAI for 7 nearest violent crimes (b = -0.74) and SAI for violent crimes in 0.25-mile buffer (b = -0.97) Greater mean distance to 7 nearest outlets was associated with higher counts of violent crime (IRR= 0.80) and proximity to nearest violent crime (b = 0.71), and lower SAI for 7

Study	Location	Research design	Intervention	Outcome measures and results
				<p>nearest violent crimes (b = -0.87) and SAI for violent crimes in 0.25-mile buffer (b = -1.20)</p> <ul style="list-style-type: none"> • Greater SAI for 7 nearest outlets was associated with higher counts of violent crime (IRR= 1.26), SAI for 7 nearest violent crimes (b = 0.84), and SAI for violent crimes in 0.25-mile buffer (b = 1.07), and lower proximity to nearest violent crime (b = -0.52) • Greater SAI for outlets within 0.25 miles was associated with higher counts of violent crime (IRR= 1.08), SAI for 7 nearest violent crimes (b = 0.20) and SAI for violent crimes in 0.25-mile buffer (b = 0.26), and lower proximity to nearest violent crime (b = -0.13)
Quick et al. (2017)	Waterloo, Ontario, Canada	Design using multivariate controls	On- and off-premise alcohol outlet density, per/1000 population and in adjacent dissemination areas (DAs)	<ul style="list-style-type: none"> • Greater numbers of on-premises outlets were associated with higher rates of reported violent crime (b = 0.323, CI: 0.214, 0.430) and greater relative risk of (b(Exp)= 1.381, CI: 1.239, 1.538) of violent crime. • Greater numbers of on-premises outlets in adjacent districts were associated with higher rates of reported violent crime (b = 0.605, CI: 0.336, 0.878) and greater relative risk of (b(Exp)= 1.831, CI: 1.400, 2.406) of violent crime. • Greater numbers of off-premise outlets were associated with higher rates of reported violent crime (b = 1.182, CI: 0.797, 1.569) and greater relative risk of (b(Exp)= 3.261, CI: 2.220, 4.802) of violent crime. • Greater numbers of off-premise outlets in adjacent districts were associated with higher rates of reported violent crime (b = 1.083, CI: 0.170, 2.000) and greater relative risk of (b(Exp)= 2.954, CI: 1.186, 7.389) of violent crime. • Greater off-premise outlet density (per 1000 people) was associated with higher rates of violent crime (b = 0.03, CI: 0.02, 0.04).
De Boni et al. (2013)	Porto Alegre, Brazil	Unmatched control group without baseline measures	<p>Comparing drivers leaving alcohol outlets in:</p> <ul style="list-style-type: none"> • High alcohol outlet density areas= HAOD • Low alcohol outlet density areas= LAOD • Density measured by number of on-site alcohol outlets within census enumeration areas (CEAs) 	<p>Drivers who had drunk in LAOD areas were more likely to be/have:</p> <ul style="list-style-type: none"> • male (78.7% compared to 66.8% in HAOD areas, SE = 0.00, p = .015) • income \leq2500 (57.1%, SE = 7.5, compared to 52.4% in HAOD areas, SE = 6.8, p = 0.578) • A driver's license (90.3%, SE = 2.7 compared to 90.0%, SE = 3.3 in HAOD areas, p = .946) • Intention to drive within an hour after drinking alcohol (59.3%, compared to 46.1% in HAOD; SE = 0.0, p = .003) • Had DUIs in the last 12 months (90.8%, SE = 2.1 compared to 75.0%, SE = 3.7 in HAOD areas; p<.001) • Lifetime DUI accidents (21.1%, SE = 3.8; compared to 15.4%, SE = 2.5 in HAOD areas, p = .135.) • Been a passenger to a DUI driver in their lifetime (89.1%, SE = 2.1) compared to drivers in HAOD areas (82.2%, SE = 3.1), p = .027. • Been breathalysed in their lifetime (9.0%, SE = 2.4) compared to drivers in HAOD areas (5.1%, SE = 3.1), p = .027 • BAC reading under 0.06 (69.3%, SE = 4.9, compared to HAOD 53.4%, SE = 3.8; p = .002) • AUDIT scores under 8 (55.5%, SE = 6.5, compared to HAOD 45.7%, SE = 4.3; p = .402) • Accept a saliva test (78.6%, SE = 4.6, compared to HAOD 71.9%, SE = 3.0; p = .181) • Test negative for cocaine (97.6%, SE = 1.0, compared to HAOD 90.7%. SE = 3.0; p = .086)

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				<ul style="list-style-type: none"> • Test negative for THC (97.2%, SE = 1.6, compared to HAOD 96.7%. SE = 1.5; p = .774) • Test positive for benzodiazepines (4.6%, SE = 2.7, compared to HAOD 1.4%, SE = 0.9; p = .175) • Test negative for ecstasy (99.8%, SE = 0.1, compared to HAOD 99.7%, SE = 0.2; p = .683). <p>Drivers in HAOD areas were more likely to:</p> <ul style="list-style-type: none"> • Favour the zero tolerance law (71.7%, SE = 3.2) than drivers in LAOD areas (63.6%, SE = 6.1), p = .191. • Have binge drunk in the last 12 months (73.3%, SE = 3.0, compared to LAOD areas 64.8%, SE = 7.6; p = .214)
Sharpe et al. (2018)	Southwark, London, United Kingdom	Short interrupted time series design with control group	<ul style="list-style-type: none"> • Implementation of cumulative impact zones (CIZs) into 3 areas in Southwark. • CIZs are a policy available to local government, for discretionary use, whereby alcohol outlet availability may be restricted if the area is deemed to be already saturated. • Ten years of licensing data were observed. 	<p>Compared to controls, areas with CIZ introduced were associated with a greater number of:</p> <ul style="list-style-type: none"> • Applications for alcohol licenses (IRR= 1.10, 95% CI: 0.81, 1.51; p = 0.54) • Licenses issued (IRR= 1.18, 95% CI: 0.86, 1.62; p = .31) • Objections (IRR= 1.09, 95% CI: 0.67, 1.78); p = 0.67) • Proportion of applications objected to (IRR= 1.03, 95% CI: 0.21, 5.10); p = 0.97) <p>Compared to areas without a CIZ, in Peckham CIZ, implementation was associated with:</p> <ul style="list-style-type: none"> • 119% more applications for alcohol licenses than areas without CIZ (IRR 2.19, 95% CI 1.29-3.73, p = 0.004) • 133% more licences being issued (IRR 2.33, 95 %CI 1.31-4.16, p = 0.004) • 92% more objections (IRR 1.92, 95% CI 1.04-3.57, p = 0.04).
Livingston (2011)	Melbourne, Victoria, Australia	Design using multivariate controls	<p>Number of licensed establishments by postcode per 1000 people, including:</p> <ul style="list-style-type: none"> • General licenses • On premise licenses • Packaged sale licenses 	<p>Assault hospitalisations per 1,000 people were positively associated with rates of</p> <ul style="list-style-type: none"> • General licenses (d=0.115, p<0.001) • Packaged licenses (d=0.213, p<0.001) • Negative for on-premises licenses (d=-0.002, p = 0.849) <p>Chronic hospitalisations per 1,000 people were negatively associated with rates of</p> <ul style="list-style-type: none"> • General licenses (d=-0.055, p = 0.219) • Packaged licenses (d=0.874, p<0.001) • On-premises licenses (d=0.071, p = 0.005)
Han & Gorman (2013)	Lubbock, Texas, Australia	Long-interrupted time series	Removal of the prohibition of off-sale alcohol outlets (bottle shops) in Lubbock, examined before and after with time series data	<p>Removal of legislation prohibiting off-sale alcohol outlets, and the related increase in off-sale alcohol outlet density, was associated with slight increases in the rate of:</p> <ul style="list-style-type: none"> • Violent crime (b = 0.41, p = 0.93) • Assault (b = 4.60, p = 0.68).

Study	Location	Research design	Intervention	Outcome measures and results
Iritani et al. (2013)	United States	Design using multivariate controls	Number of alcohol outlets (on-premises and off-premise licenses) per square kilometre in respondents' community	<ul style="list-style-type: none"> The presence of one or more on-premises alcohol outlet density per square kilometre in tract was associated with a higher likelihood of female perpetrated physical intimate partner violence (IPV) versus no IPV (OR=1.26) and sexual only or physical only IPV versus no IPV (OR=1.36). The presence of one or more off-premise alcohol outlet density per square kilometre in tract was associated with a higher likelihood of female perpetrated physical IPV violence versus no IPV (OR=1.35) and sexual only or physical only IPV versus no IPV (OR=1.17).
Ahern et al. (2013)	New York City, New York, United States	Design using multivariate controls	Number of alcohol outlets per square mile	<p>Found a non-linear relationship between alcohol outlet density and self-reported binge drinking (number of times in last 12 a person consumed 4-5 drinks in 2 hours) in that binge drinking prevalence was estimated at:</p> <ul style="list-style-type: none"> 13% if there were 130 alcohol outlets per square mile (sig) 8% if there were 80 alcohol outlets per square mile (sig) 8% if there were 20 outlets per square mile accounting for a range of covariates
Lo et al. (2013)	Alabama, United States	Design using multivariate controls	Number of alcohol outlets (bars, liquor stores, licensed restaurants) per square metre for each school catchment area	Greater alcohol outlet density was associated with slightly less binge drinking (b = -0.002, p<.05), however this relationship became zero in later iterations of the model that included additional covariates.
Pearson et al. (2014)	Auckland, New Zealand	Design using multivariate controls	<p>Access to off-license alcohol outlets</p> <ul style="list-style-type: none"> measured by number of outlets within 3km road network 	Living in high-density area increased the likelihood of being diagnosed with/receiving treatment for alcohol/drug abuse and anxiety/mood disorders compared with the lowest density area (OR=0.77, p = 0.043).
Martins et al. (2020)	Belo Horizonte, Minas Gerais State, Brazil	Design using multivariate controls	Number of outlets licensed to sell alcohol (on-site and off-site) within a 1km radius of each school; stratified in "low", "mean" and "high" outlet density	Compared with areas of high alcohol outlet density (OR=1.00, reference point), areas on the mean level of outlet density (OR=60) and low outlet density (OR=0.32) had a lower likelihood of binge drinking.
Spoerri et al. (2013)	Switzerland	Design using multivariate controls	<ul style="list-style-type: none"> Alcohol outlet density within 1km of residence Distance to closest alcohol outlet 	<ul style="list-style-type: none"> Likelihood of alcohol-related mortality lowered as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.95, HR(f)=0.82), 3-7 outlets (HR(m)=0.84, HR(f)=0.80), 1-2 outlets (HR(m)=0.76, HR(f)=0.67), zero outlets (HR(m)=0.60, HR(f)=0.39). Likelihood of mental and behavioural disorders due to alcohol lowered as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=1.00, HR(f)=0.82), 3-7 outlets (HR(m)=0.87, HR(f)=0.77), 1-2 outlets (HR(m)=0.79, HR(f)=0.57), zero outlets (HR(m)=0.64, HR(f)=0.46).

Study	Location	Research design	Intervention	Outcome measures and results
				<ul style="list-style-type: none"> • Likelihood of alcoholic liver disease lowered as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.95, HR(f)=0.86), 3-7 outlets (HR(m)=0.83, HR(f)=0.75), 1-2 outlets (HR(m)=0.80, HR(f)=0.71), zero outlets (HR(m)=0.58, HR(f)=0.76). • Likelihood of fibrosis and cirrhosis of the liver lowered as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.87, HR(f)=0.81), 3-7 outlets (HR(m)=0.79, HR(f)=0.77), 1-2 outlets (HR(m)=0.68, HR(f)=0.78), zero outlets (HR(m)=0.52, HR(f)=0.34). • Likelihood of trachea/bronchus/lung cancer lowered as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.94, HR(f)=0.87), 3-7 outlets (HR(m)=0.91, HR(f)=0.82), 1-2 outlets (HR(m)=0.88, HR(f)=0.71), zero outlets (HR(m)=0.79, HR(f)=0.63). • Likelihood of acute myocardial infarction fluctuated as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=1.06, HR(f)=1.04), 3-7 outlets (HR(m)=1.01, HR(f)=1.08), 1-2 outlets (HR(m)=0.98, HR(f)=1.01), zero outlets (HR(m)=0.93, HR(f)=0.99). • Likelihood of stroke fluctuated as alcohol outlet density declined for both males and females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.97, HR(f)=0.99), 3-7 outlets (HR(m)=0.97, HR(f)=1.02), 1-2 outlets (HR(m)=0.94, HR(f)=0.99), zero outlets (HR(m)=1.03, HR(f)=1.08). • Likelihood of all-cause mortality declined as alcohol outlet density declined for males, but not females, with hazard ratios as follows: >17 outlets (HR(m)=1, HR(f)=1, reference points), 8-17 outlets (HR(m)=0.98, HR(f)=1.00), 3-7 outlets (HR(m)=0.97, HR(f)=1.0), 1-2 outlets (HR(m)=0.95, HR(f)=1.00), zero outlets (HR(m)=0.92, HR(f)=0.99).
Brenner et al. (2015)	Forsyth County, NC; New York City, NY; Baltimore, MD; St Paul, MN; Chicago, IL; & Los Angeles, CA, United States	Unmatched control group without baseline measures	Number of alcohol outlets (liquor stores and on-site alcohol outlets) within a one-mile buffer zone surrounding participants' homes	<p>Greater alcohol outlet density was associated with greater prevalence of drinking compared to low density (RR=1.00, reference point) for:</p> <ul style="list-style-type: none"> • men in moderate density areas (RR=1.05) • men in high density areas (RR=0.95) • women in moderate density areas (RR=1.15) • women in high density areas (RR=1.10) • Overall trends for males and females were non-significant <p>Greater alcohol outlet density, compared to low density areas, was associated with greater ratios of drinks per week for:</p> <ul style="list-style-type: none"> • men (moderate density, RR=1.15) • men (high density, RR=1.16) • women in high outlet density areas (RR=1.14) <p>Women in moderate alcohol density areas had slightly lower ratios of drinks per week (RR=0.87) compared with low density areas. The overall trend for men was significant.</p>

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				<p>Greater alcohol outlet density was associated with higher ratios of the most drinks consumed in a day for:</p> <ul style="list-style-type: none"> men in high density areas (RR=1.07) women in moderate (RR=1.07) and high density areas (RR=1.09) <p>Greater outlet density was associated with lower ratios of the most drinks consumed in a day for:</p> <ul style="list-style-type: none"> men in moderate density areas (RR=0.99) Overall trends for males and females were non-significant.
Liang & Chikritzhs (2011)	Western Australia	Design using multivariate controls	<ul style="list-style-type: none"> Number of on- and off-site outlets per local government area 	<p>Greater on-site outlet density was associated with a higher risk of assaults at</p> <ul style="list-style-type: none"> on-site outlets (RR=1.048) assaults at private residences (RR=1.008) assaults at other places (RR=1.027) total assaults (RR=1.021). <p>Greater off-site outlet density was associated with lower:</p> <ul style="list-style-type: none"> risk of assaults at on-site outlets (RR=0.978) assaults at other places (RR=0.990) total assaults (RR=0.999), <p>Greater off-site outlet density was associated with higher:</p> <ul style="list-style-type: none"> risk of assaults at private residences (RR=1.017). <p>Post-hoc analysis found that greater on-site outlet density (IRR=1.033) and off-site outlet density (IRR=1.043) were associated with a higher risk of total assaults.</p>
Reboussin et al. (2011)	Communities within California, Connecticut, Florida, Missouri & New York, United States	Unmatched control group without baseline measures	<ul style="list-style-type: none"> Number of on- and off-site alcohol outlets per square mile within each census tract Census tracts were grouped into First, Second and Third tertiles, with greatest alcohol outlet density (for on- and off-premise outlets respectively) in the third tertile, and lowest density in the first tertile 	<ul style="list-style-type: none"> Increased off-premise outlet density was associated with higher rates of past-30 day drinking within the first (PWOR= 1.16), second (PWOR= 1.11), and third tertile (PWOR= 1.14), the magnitude of clustering did not differ significantly between tertiles. Increased on-premises outlet density was associated with higher rates of past-30 day drinking within the first (PWOR= 1.20), second (PWOR= 1.09), and third tertile (PWOR= 1.11). The magnitude of clustering did not differ significantly between tertiles. Increased off-premise outlet density was associated with higher rates of heavy episodic drinking within the first (PWOR= 1.01), second (PWOR= 1.05), and third tertile (PWOR= 1.08), the magnitude of clustering did not differ significantly between tertiles. Increased on-premises outlet density was associated with higher rates of heavy episodic drinking within the first (PWOR= 1.20) and third tertile (PWOR= 1.11), and lower heavy episodic drinking in the second tertile (PWOR= 1.09). The magnitude of clustering did not differ significantly between tertiles. Increased off-premise outlet density was associated with lower rates of frequent drinking within the first tertile (PWOR= 0.89), and higher rates in the second (PWOR= 1.01) and third tertile (PWOR= 1.31). Magnitude of clustering did not differ significantly between tertiles.

Study	Location	Research design	Intervention	Outcome measures and results
				<ul style="list-style-type: none"> Increased on-premises outlet density was associated with lower rates of frequent drinking within the first (PWOR= 0.87) and second tertile (PWOR= 0.83), and higher rates in the third tertile (PWOR= 2.20). The magnitude of clustering was clustered significantly in the third tertile, relative two the first and second Increased off-premise outlet density was associated with higher rates of nonviolent consequences within the first (PWOR= 1.04, second (PWOR= 1.06) and third tertile (PWOR= 1.14). The magnitude of clustering did not differ significantly between tertiles Increased on-premises outlet density was associated with higher rates of nonviolent consequences within the first (PWOR= 1.05), second (PWOR= 1.07) and third tertile (PWOR= 1.07). Magnitude of clustering did not differ significantly between tertiles Increased off-premise outlet density was associated with lower rates of riding with a drink driver within the first tertile (PWOR= 0.98), unchanged rates in the second tertile (PWOR= 1.00), and higher rates third tertile (PWOR= 1.20). The magnitude of clustering did not differ significantly between tertiles Increased on-premises outlet density was associated with unchanged rates of riding with a drink driver within the first (PWOR= 1.00) and second tertile (PWOR= 1.00), and higher rates in the third tertile (PWOR= 1.10). The magnitude of clustering did not differ significantly between tertiles. Increased off-premise outlet density was associated with higher rates of driving after drinking within the first (PWOR= 1.27), second (PWOR= 1.43), and third tertile (PWOR= 1.44). The magnitude of clustering did not differ significantly between tertiles. Increased on-premises outlet density was associated with higher rates of driving after drinking within the first (PWOR= 1.10), second (PWOR= 1.42), and third tertile (PWOR= 2.10). The magnitude of clustering did not differ significantly between tertiles Increased off-premise outlet density was associated with higher rates of alcohol purchase attempts within the first (PWOR= 1.05), second (PWOR= 1.23), and third tertile (PWOR= 1.79). The magnitude of clustering differed significantly between tertiles Increased on-premises outlet density was associated with higher rates of alcohol purchase attempts within the first (PWOR= 1.20), second (PWOR= 1.15), and third tertile (PWOR= 1.24). The magnitude of clustering did not differ significantly between tertiles Increased off-premise outlet density was associated with lower rates of successful alcohol purchase attempts within the first tertile (PWOR= 0.97), and higher rates in the second (PWOR= 1.11), and third tertile (PWOR= 1.85). The magnitude of clustering differed significantly between tertiles Increased on-premises outlet density was associated with higher rates of successful alcohol purchase attempts within the first (PWOR= 1.11), second (PWOR= 1.05), and third tertile (PWOR= 1.37). Magnitude of clustering did not differ significantly between tertiles
Subbaraman (2020)	United States	Design using multivariate controls	Number of outlets licensed to sell alcohol (on- and off-premise outlets) . Specified	<p>Greater off-premise beer outlet density was associated with higher state-level per capita rates of consumption of</p> <ul style="list-style-type: none"> beer (b = 0.006)

Study	Location	Research design	Intervention	Outcome measures and results
			into off-premise beer, off-premise spirits, and on-premises bars per state and per zip code	<ul style="list-style-type: none"> • wine (b = 0.002) • spirits (b = 0.02) • alcohol overall (b = 0.006) <p>Greater off-premise beer outlet density was also associated with greater volumes of alcohol consumption for</p> <ul style="list-style-type: none"> • white women (b = 0.2) • African American women (b = 0.09) • African American men (b = 0.21) • Hispanic men (b = 0.11) <p>and lower consumption for</p> <ul style="list-style-type: none"> • white men (b = -0.04) • Hispanic women (b = -0.14) <p>Greater off-premise spirit outlet density was associated with higher consumption of</p> <ul style="list-style-type: none"> • beer (b = 0.003) • and lower rates for • wine (b = -0.03) • spirits (b = -0.02) • alcohol overall (b = -0.01) <p>Greater off-premise spirit outlet density was also associated with greater volumes of alcohol consumption for</p> <ul style="list-style-type: none"> • white women (b = 0.04) • African American women (b = 0.14) • Hispanic women (b = 0.22) <p>and lower consumption for</p> <ul style="list-style-type: none"> • white men (b = -0.01) • African American men (b = -0.06) • Hispanic men (b = -0.16). <p>Greater on-premises beer outlet density was associated with lower state-level per capita rates of consumption for</p> <ul style="list-style-type: none"> • beer (b = -0.001), spirits (b = -0.03) • alcohol overall (b = -0.008) <p>and higher rates of consumption for wine (b = 0.04).</p> <p>Greater on-premises spirits outlet density was associated with higher consumption of</p>

Study	Location	Research design	Intervention	Outcome measures and results
				<ul style="list-style-type: none"> • beer (b = 0.01) <p>and lower consumption of</p> <ul style="list-style-type: none"> • wine (b = -0.04) • spirits (b = -0.04) • alcohol overall (b = -0.02) • Greater bar density was also associated with greater volumes of alcohol consumption for • white men (b = 0.17) • African American men (b = 0.06) • Hispanic women (b = 0.07) • Hispanic men (b = 0.2) <p>and lower alcohol consumption for</p> <ul style="list-style-type: none"> • white women (b = -0.09) • African American women (b = -0.09). <p>For white women, greater off-premise beer outlet density was associated with higher rates of:</p> <ul style="list-style-type: none"> • any drinking (b = 1.27) • wine consumption (b = 0.22) • spirits consumption (b = 0.12) <p>while</p> <ul style="list-style-type: none"> • greater off-premise spirit outlet density (b = 0.12) was associated with higher spirits consumption • higher bar density was associated with lower spirits consumption (b = -0.15). <p>For white men, greater bar density was associated with higher rates of</p> <ul style="list-style-type: none"> • any drinking (b = 1.50) • 1+ alcohol-related consequences (b = 1.59) • 2+ alcohol-related consequences (b = 1.91) <ul style="list-style-type: none"> • For Hispanic women, greater bar density was associated with greater rates of any drinking (b = 1.58) • For Hispanic men, greater bar density was associated with higher wine consumption (b = 0.39)
	New South Wales, Queensland, Victoria, Western Australia & Northern	Design using multivariate controls	<ul style="list-style-type: none"> • Number of each type of licensed outlet per 1000 residents within a single postcode • Outlet types: off-premise, on-premise, general, & clubs 	<ul style="list-style-type: none"> • Greater on-premises outlet density was associated with a higher likelihood of past-month alcohol abuse (OR=1.03), risky drinking among all students (OR=1.05) and risky drinking among current drinkers (OR=1.04), adjusted for covariates. • Greater off-premises outlet density was associated with a higher likelihood of past-month alcohol abuse (OR=1.19) and risky drinking among current drinkers (OR=1.05), adjusted for covariates.

Study	Location	Research design	Intervention	Outcome measures and results
Rosenberg et al. (2015)	Territory, Australia Villages in rural Agincourt, South Africa	Design using multivariate controls	<ul style="list-style-type: none"> Number of alcohol outlets per village Combined number of bottle shops & taverns 	<ul style="list-style-type: none"> Women in towns with more alcohol outlets were more likely to demonstrate higher rates of herpes simplex virus 2. For every one-outlet increase in density there was an associated increase in the risk of HSV-2 infection of 8% (OR=1.08). After adjustment for village level and individual covariate this dropped to a non-significant less stable relationship (OR=1.11).
Larsen et al. (2017)	Ontario, Canada	Design using multivariate controls	Number of alcohol outlets (licenced bars and restaurants, along with all beer, wine and liquor stores) per square kilometre within 1.6km of each school ("school neighbourhood")	<ul style="list-style-type: none"> Greater density of alcohol outlets by square kilometre was associated with a higher likelihood of binge drinking (OR=1.446), adjusted for covariates.
Kurland & Johnson (2019)	United Kingdom	Design using multivariate controls	<ul style="list-style-type: none"> Number of alcohol outlets near stadia 	<ul style="list-style-type: none"> Greater density of pubs was associated with higher rates of crime (b = 0.069, SE =.010), adjusted for covariates.
Menting (2018)	The Hague, Rijswijk, & Leidschendam-Voorburg, The Netherlands	Design using multivariate controls	<ul style="list-style-type: none"> Number of alcohol outlets (bars/restaurants/hotels) within each post code 	<ul style="list-style-type: none"> Greater density of bars/restaurants/clubs was associated with a higher likelihood of crime location choice (OR=1.295, SE =0.024), such that more alcohol outlets in an area increased the likelihood that a crime would be committed there.
Nichols et al. (2012)	Luderitz, Namibia	Unmatched control group without baseline measures	<ul style="list-style-type: none"> Number of registered and unregistered shebeens, bars, and bottle stores in each neighbourhood Density per 1,000 residents 	<ul style="list-style-type: none"> For unregistered shebeens, medium (PR=1.46) and high (PR=1.84) density locations had greater HIV prevalence risk than low density locations (PR=1.00, reference point). For registered shebeens, medium density was associated with a lower risk of HIV prevalence (PR=0.92), whereas high density was associated with a greater risk of HIV prevalence (PR=3.02), compared with low density locations (PR=1.00, reference point). For bars, medium density was associated with a lower risk of HIV prevalence (PR=0.59), whereas high density was associated with a greater risk of HIV prevalence (PR=1.71), compared with low density locations (PR=1.00, reference point). For bottle stores, medium outlet density (PR=0.99, non-sig) and high outlet density (PR=0.81) were associated with lower risk of HIV prevalence than low density locations (PR=1.00, reference point). For all drinking establishments, medium outlet density (PR=1.15, non-sig) and high outlet density (PR=1.55) were associated with a greater risk of HIV prevalence than low density locations (PR=1.00, reference point).
Obradors-Rial et al. (2020)	Catalonia, Spain	Unmatched control group without baseline	Number of bars and clubs in town where participants attended high-school	<ul style="list-style-type: none"> Greater density of pubs and nightclubs was associated with a higher risk of risky alcohol consumption among Spanish 10th grade students (OR=0.995).

Study	Location	Research design	Intervention	Outcome measures and results
		measures	Compares rural & urban high-school students	<ul style="list-style-type: none"> This ratio lost statistical significance upon adjustment for covariates (OR=0.999).
Paschall et al. (2013)	California, United States	Design using multivariate controls	Number of outlets per roadway mile	<ul style="list-style-type: none"> Greater bar density was associated with higher rates of past-year heavy drinking (b = 0.075) and past-year alcohol use (b = 0.357).
Scherer et al. (2018)	San Diego County, California, United States	Design using multivariate controls	Alcohol outlet density	<ul style="list-style-type: none"> Greater alcohol outlet density was associated with higher rates of DUI among drivers aged 16-20 (Effect size= 8.8; 8.8% increase)
Morrison et al. (2015)	Melbourne, Victoria, Australia,	Design using multivariate controls	Number of alcohol outlets in a Statistical Area	<ul style="list-style-type: none"> For each additional off-premise alcohol outlet, there was an associated 38% increase in the incidence of intentional injuries (IRR= 1.38) and a 17.8% increase in the incidence unintentional injuries (IRR= 1.178). For each additional independent off-premise alcohol outlet, there was an associated 20.9% increase in the incidence of intentional injuries (IRR= 1.209) and a decrease in the incidence unintentional injuries (IRR= 0.984). For each additional chain off-premise alcohol outlet, there was an associated 35.3% increase in the incidence of intentional injuries (IRR= 1.353) and a 22% increase in the incidence unintentional injuries (IRR= 1.220). Greater drive-through off-premise outlet density was associated with higher incidence rates of intentional injuries (IRR= 1.015) and lower incidence rates of unintentional injuries (IRR= 0.890). For each additional bar, there was an associated 16% increase in the incidence of intentional injuries (IRR= 1.160) and a 0.8% increase in the incidence unintentional injuries (IRR= 1.008). For each additional restaurant, there was an associated 2.1% increase in the incidence of intentional injuries (IRR= 1.021) and a 3.8% increase in the incidence unintentional injuries (IRR= 1.038).
Ponicki et al. (2014)	San Francisco Bay Area, California, United States	Design using multivariate controls	<ul style="list-style-type: none"> Number of outlets within 500m of a given establishment Establishments included were 151 bars or restaurants with bar service 	<ul style="list-style-type: none"> Greater city level outlet density was associated with lower patron activity index scores (b = -0.431), lighting (b = -0.165), bar length (feet) (b = -0.664), seating (b = -17.709), patrons (b = -8.528), servers (b = -1.765), security (b = -0.097), bartenders (b = -0.212), dancing (b = -4.782, p = .004) and patron arrival rate (b = 20.112), and higher proportions of patrons intoxicated (b = 0.855) and noise (b = 0.263). Greater local-outlet density was associated with greater noise (b = 0.009), bar length (feet) (b = 0.024), seating (b = 0.209), patrons (b = 0.445), servers (b = 0.026), security (b = 0.010), bartenders (b = 0.024), dancing (b = 0.005), proportion intoxicated (b = 0.021) and patron arrival rate (b = 1.837), and lower patron activity index scores (b = -0.094), lighting (b = -0.011) and smoking (b = -0.027).
Jones-Webb et al. (2018)	Minneapolis, Madison, Oakland, San	Design using multivariate controls	<ul style="list-style-type: none"> Number of on and off site outlets per square mile 	<ul style="list-style-type: none"> Greater outlet density per square mile was associated with higher rates of vandalism (b = 0.0030), assaults (b = 0.0030) and disorderly conduct (b = 0.004), adjusted for covariates.

Study	Location	Research design	Intervention	Outcome measures and results
	Diego, Sacramento, San Francisco, Chula Vista, Oxard, Spokane and Tacoma, United States		<ul style="list-style-type: none"> Comparing presence and absence of a malt liquor policy 	

3.5 Transport Home

We identified four impact evaluations, comprised of two randomised controlled trials and two quasi-experimental studies, that assessed the impact of transport options home from the NTE. Of the four included studies, three were conducted in Australia (two in New South Wales: Rowland et al., 2015; Kingsland et al., 2015; and one in South Australia, Tasmania and Victoria; Rowland et al., 2012). The final study was conducted in Seattle, Washington, United States (Rivara et al., 2012). Interventions captured within this section include taxi stands (Rivara et al., 2012), accreditation programs for community sporting clubs that require clubs to implement safe transport strategies (Rowland et al., 2012; Kingsland et al., 2015), and designated driver programs (Rowland et al., 2015). See Table 3.4 for a complete summary of study characteristics.

The unmatched control group study by Rivara et al. (2012) compared the business-as-usual communities of Spokane, Washington and Portland, Oregon to a *Last Call* program implemented in Seattle, Washington. This three-pronged intervention involved taxi stands, point-of-sale information to patrons in bars, and a mass media campaign that emphasised a designated driver and safe ride home message. Taxi stands operated from 10:30pm to 3am on Thursday, Friday and Saturday nights within a block or two of the licensed premises. Reminders about the taxi stands were periodically distributed to taxi operators to encourage use, and the stands were signposted as taxi-only zones. The point-of-sale information distributed to patrons was in the form of wallet-sized cards containing the safe transport home message as well as the location of the taxi stands and phone numbers for three local taxi companies. Further, the *Last Call* project team developed coasters for use within the bars that read “Going out? Grab a cab, bus or friend” (p. 56) and posters for the restrooms that encouraged the use of taxis or designated drivers. Using a proxy variable for alcohol-involved crashes (i.e., single vehicle crashes at night time involving drivers aged 21 to 34 years), Rivara et al. (2012) observed a decline in the number of crashes per 100,000 population in the 18 months since implementation of the *Last Call* program, compared to an increase (Portland) and static (Spokane) rates in the comparison communities. Further, regular binge drinkers were 48% more likely to report having used a designated driver and 63% more likely to report having used a taxi in Seattle compared with Portland and Spokane combined.

Designated driver programs are a widely-used strategy designed to reduce the occurrence of alcohol-impaired vehicle driving. A randomised controlled trial by Rowland et al. (2015) used a vignette study to examine the feasibility and acceptability of implementing a designated driver program for community sports club members who celebrated a game win at a licensed venue. The authors recruited participants (81% male, average age 36.29 years) through community sporting clubs in New South Wales, Australia, and randomised them to the designated driver condition ($n = 220$) or a control condition that did not specify transport options home ($n = 170$). The experimental vignette read (p. 10; last line omitted for control participants):

“I would like you to imagine that your sporting team has just played and won a competition game. After the game you and other club members decide to celebrate at a local licensed venue. The venue has live music, and sells meals but is not within walking distance from where you live. *A fellow member of the club agrees to be designated driver.*”

The effectiveness of a designated driver program through their sports club was assessed on participants’ self-reported estimated standard drinks consumed. Chi-square tests showed little difference between control and experimental groups in terms of their intended number of standard

drinks (5.98 and 5.81 respectively, not statistically significant). Additionally, there was little difference between the control and intervention groups in terms of the mean intended number of hours spent drinking (3.45 and 3.41 respectively, statistical significance not reported). Controlling for age, gender, whether they intended to travel home via a friend, taxi or public transport, and whether they were a player, those allocated to the designated driver vignette intended to drink 1.05 fewer standard drinks than those in the control condition. A secondary aim of the study was to assess whether self-selected mode of transport home influenced intended alcohol consumption and intended time to consume alcohol. This was assessed in a multivariate regression model whereby intended use of friend, taxi or public transport was compared against respondents who did not report the intention to use any of these transport options (controlling for experimental condition, age, gender, and whether the respondent was a player). Participants who reported intention to use a transport option home intended to drink 2.34 more drinks than those who did not, and intended to spend less time drinking by 0.58 hours.

While this study does not provide evidence regarding the real-world implementation of a designated driver program for community sports clubs or within licensed premises in the NTE, it provides a starting point to assess such a program's acceptability and feasibility if implemented. Further, it provides some evidence regarding self-selected intention to use alternative transport options. The authors of this study hypothesise that a designated driver program may need to be accompanied by practices that ensure that drink driving behaviours are not simply replaced with other risky behaviours such as higher-risk drinking by non-drivers, especially in light of the finding that suggests those with planned transport options home intended to drink more heavily.

Similar to Rowland et al. (2015), the final two studies assessed drinking behaviours by members of Australian community sporting clubs (e.g., Australian Rules football, rugby, soccer). Specifically, these studies examined the impact of the *Good Sports* program, an Australian initiative that aims to promote responsible service of alcohol by community sports clubs by incentivising them to undergo a three-stage accreditation process. Briefly, this involves complying with liquor licensing laws (Stage 1), implementing safe transport options, an alcohol incident register, food options, and banning promotions such as happy hour (Stage 2), and composing a written policy addressing the management and implementation of initiatives to ensure responsible service of alcohol (Stage 3). Within Stage 2, sports clubs were expected to implement between one and 10 of the transport options, which included designated driver programs, taxi vouchers, free club transport, and free snacks and non-alcoholic beverages for designated drivers (See Table 3.4 for complete list of transport alternatives). One included study, Rowland et al. (2012) used an unmatched control group research design to compare sports clubs' use of different transport options within Stage 2, and the other, Kingsland et al. (2015) conducted a randomised controlled trial to assess whether project support provisions would assist sports clubs with implementing the *Good Sports* program.

Rowland et al. (2012) sampled survey respondents ($n = 1,968$) from clubs that had only implemented Stage 1 ($n = 65$) and clubs that had implemented Stage 2 ($n = 48$) from Victoria, South Australia, and Tasmania. These authors aimed to examine the effectiveness of the number of transport options implemented on drink driving. Probability of self-reported likelihood of drink driving decreased for survey participants as the total number of safe transport strategies implemented by their club increased, specifically when clubs implemented between four and 10 options. Similarly, participants who were members of Stage 2 clubs (implementing anywhere between one and 10 transport options) were statistically significantly less likely to drink drive than those who were members of Stage 1 clubs (implementing zero transport options).

In a separate paper on the same *Good Sports* program, Kingsland et al. (2015) conducted a randomised controlled trial whereby experimental football clubs ($n = 42$) received project support to assist with the implementation of the program and control clubs ($n = 45$) did not receive any additional support around implementation at any of the three stages. The authors provide a detailed description of the project support strategies alongside the key theoretical frameworks for these. Briefly, the project includes provision of a project support officer, some funding, some merchandising, an audit, online training, and other training materials. These strategies were assessed to determine whether they had an impact on the number of *Good Sports* items implemented. At follow-up, 88% of clubs randomised to the intervention condition reported implementing 13 or more of the 16 *Good Sports* interventions compared with 65% of control clubs. Additional analyses revealed that experimental clubs that were larger or located in higher socioeconomic areas were also more likely than control clubs with these characteristics to implement 13 or more of the 16 *Good Sports* interventions. While not directly measuring transport options, this is suggestive that sports clubs that are provided with additional implementation support are likely to be implementing a greater number of transport alternatives within the *Good Sports* program.

In sum, there is a very small pool of evidence around the efficacy of transport options home in the NTE. Only one of our included studies (Rivara et al., 2012) evaluated a transport intervention that was deliberately implemented within a NTE setting. The remaining studies assessed the feasibility of a transport option (Rowland et al., 2015) and an accreditation process to encourage more transport options at community sports clubs that are licensed to serve alcohol (Rowland et al., 2012; Kingsland et al., 2015). Results show that the latter intervention may be promising for reducing drink driving, but future evaluations should assess its effectiveness within different NTE settings such as pubs, bars or nightclubs. Additionally, research may benefit from evaluations of the designated driver program, given the feasibility study's finding that they may be somewhat useful in reducing binge drinking. Lastly, we note that our systematic search resulted in no high-quality impact evaluations regarding the frequency, cost or extended operating hours of public transport options such as buses, trams, or trains, and this may also be an area requiring future examination.

Table 3.4 Transport Options Home

Study	Research design	Location and Participants	Intervention	Outcome measures
Rowland et al. (2012)	Unmatched control group without baseline measures Groups implementing different transport strategies were compared	Victoria, South Australia and Tasmania, Australia 1,968 members of 65 Stage 1 accredited and 48 Stage 2 accredited Australian Football League clubs	Good Sports Program. Three-stage alcohol accreditation program for community sports clubs, involving: <ul style="list-style-type: none"> • Stage 1: compliance with liquor licensing laws, alcohol is served within specified hours, drunk persons are not allowed to enter the premises. • Stage 2: responsible service of alcohol guidelines, alcohol incident register, food options are available, no happy hours, cheap drink promotions, etc., smoke-free indoor areas, and transport strategies (see below). • Stage 3: written policy addressing bar management, responsible service of alcohol, food, safe transport, underage drinking, noncompliance, promotion of the policy, and policy review. <p>At Stage 2, clubs are required to implement at least one but encouraged to implement 4-10 transport strategies, including:</p> <ul style="list-style-type: none"> • Free taxi calls and free club transport • Displaying taxi numbers • Taxi vouchers • Key register • Designated driver program (with or without free snacks and free non-alcoholic drinks for drivers) • Free snacks and/or non-alcoholic drinks for bar servers 	Probability of drink driving
Kingsland et al. (2015)	Randomised controlled trial Control group implemented the Good Sports Program business-as-usual	New South Wales, Australia Football clubs (Australian Rules, Rugby League, Rugby Union, or soccer) with over 40 members that sold alcohol. Treatment clubs $n = 42$ and control clubs $n = 45$	Support strategies for clubs in implementing the Good Sports Program (described by Rowland et al. (2012) above). Support strategies included: <ul style="list-style-type: none"> • Project officer support • AUD\$500 as an implementation cost recovery payment • Incentives for accreditation such as merchandise • Hardcopy and digital resource kits • Observational performance audits during games • Program newsletters • Online training for staff regarding responsible service of alcohol • Letters of support from key state sporting organisations 	Portion of clubs implementing 13 or more of the 16 practices within the Good Sports Program
Rivara et al. (2012)	Unmatched control group with baseline measures Control communities	Seattle, Washington, United States Persons aged 21 to 34 years ($n = 300$)	Last Call program: multifaceted social marketing campaign to increase the use of designated drivers and safe rides home among 21–34 year olds. Components: <ul style="list-style-type: none"> • Use of taxi stands to promote taxi use. The state Department of Transportation assigned taxi stand locations generally within a block of the NTE, with the permission of adjacent landlords. Stands operated Thursday to 	Prevalence of drink driving; use of designated drivers or safe ride home programs

Study	Research design	Location and Participants	Intervention	Outcome measures
	(Spokane, Washington and Portland, Oregon) operated business-as-usual		<p>Saturday between the hours of 11:30pm and 3am. Reminders were sent to taxi operators to encourage use of the stand, and a yellow sign signalled “taxi cabs only”</p> <ul style="list-style-type: none"> • Point-of-sale information to patrons at partner bars • A mass media campaign to support the designated driver/safe ride home message 	
Rowland et al. (2015)	<p>Randomised controlled trial</p> <p>Control group did not have access to a designated driver</p>	<p>New South Wales, Australia</p> <p>Sports club members from 72 clubs (<i>n</i> = 170 control group; <i>n</i> = 220 intervention group)</p>	<p>Vignette study with a scenario whereby the participant went to a licensed premises with their sporting team to celebrate a competition win. In the experimental group, the vignette stated that a member of their sports club would act as the designated driver. While not explicitly stated, this is conceptualised around the feasibility of community sporting clubs to provide a designated driver program for members.</p>	<p>Mean alcohol consumption (standard drinks); mean time spent consuming alcohol (hours)</p>

3.6 References

- Ahern, J., Balzer, L., & Galea, S. (2015). The roles of outlet density and norms in alcohol use disorder. *Drug & Alcohol Dependence*, *151*(1), 144-150. doi: 10.1016/j.drugalcdep.2015.03.014
- Ahern, J., Margerison-Zilko, C., Hubbard, A., & Galea, S. (2013). Alcohol outlets and binge drinking in urban neighbourhoods: The implications of nonlinearity for intervention and policy. *American Journal of Public Health*, *103*(4), 81-87. doi: 10.2105/ajph.2012.301203
- Atkinson, J.-A., Prodan, A., Livingston, M., Knowles, D., O'Donnell, E., Room, R., ... & Wiggers, J. (2018). Impacts of licensed premises trading hour policies on alcohol-related harms. *Addiction*, *113*(7), 1244-1251. doi:10.1111/add.14178
- Azar, D., White, V., Coomber, K., Faulkner, A., Livingston, M., Chikritzhs, T., ... & Wakefield, M. (2016). The association between alcohol outlet density and alcohol use among urban and regional Australian adolescents. *Addiction*, *111*(1), 65-72. doi: [10.1111/add.13143](https://doi.org/10.1111/add.13143)
- Badland, H., Mavoa, S., Livingston, M., David, S., & Giles-Corti, B. (2016). Testing spatial measures of alcohol outlet density with self-rated health in the Australian context: Implications for policy and practice. *Drug & Alcohol Review*, *35*(3), 298-306. doi: [10.1111/dar.12341](https://doi.org/10.1111/dar.12341)
- Bassols, N. M., & Castello, J. V. (2018). Bar opening hours, alcohol consumption and workplace accidents. *Labour Economics*, *53*, 172-181. doi:10.1016/j.labeco.2018.04.011
- Bowers, Y., Rendall-Mkosi, K., Davids, A., Nel, E., Jacobs, N., & London, L. (2014). Liquor outlet density, deprivation and implications for foetal alcohol syndrome prevention in the Bergriver municipality in the Western Cape, South Africa. *South African Geographical Journal*, *96*(2), 153-165. doi: 10.1080/03736245.2014.901186
- Breen, C., Shakeshaft, A., Slade, T., Love, S., D'Este, C., & Mattick, R. P. (2011). Do community characteristics predict alcohol-related crime? *Alcohol & Alcoholism*, *46*(4), 464-470. doi: 10.1093/alcalc/agr040
- Brenner, A. B., Diez Roux, A. V., Barrientos-Gutierrez, T., & Borrell, L. N. (2015). Associations of alcohol availability and neighbourhood socioeconomic characteristics with drinking: Cross-sectional results from the Multi-Ethnic Study of Atherosclerosis (MESA). *Substance Use & Misuse*, *50*(12), 1606-1617. doi: 10.3109/10826084.2015.1027927

- Bryden, A., Roberts, B., McKee, M., & Petticrew, M (2012). A systematic review of the influence on alcohol use of community level availability and marketing of alcohol. *Health & Place*, 18(2), 349-357. doi:10.1016/j.healthplace.2011.11.003
- Cameron, M. B., J. Cochrane, W. Robertson, N. (2018). *An evaluation of the Whangarei one-way door policy*. Wellington: Health Promotion Agency.
- Cameron, M. P., Cochrane, W. R., & Livingston, M. (2016). *The relationship between alcohol outlets and harm*. Wellington: Health Promotion Agency.
- Cameron, M. P., Cochrane, W. R., Gordon, C. P., & Livingston, M. (2013). *The locally specific impacts of alcohol outlet density in the North Island of New Zealand 2006-2011*. Wellington: Health Promotion Agency.
- Cameron, M. P., Cochrane, W., McNeill, K., Melbourne, P., Morrison, S. L., & Robertson, N. (2012). *The impacts of liquor outlets in Manukau City. Report No. 1: A review of the international academic literature and New Zealand media reports*. Wellington, New Zealand: Alcohol Advisory council of New Zealand.
- Cameron, M. P., Cochrane, W., McNeill, K., Melbourne, P., Morrison, S. L., & Robertson, N. (2012). *A spatial econometric analysis of selected impacts of liquor outlet density in Manukau City: The impacts of liquor outlets in Manukau City Report No. 4*. Wellington: Alcohol Advisory Council of New Zealand.
- Cameron, M., Cochrane, W., Gordon, C., & Livingston, M. (2016). Alcohol outlet density and violence: A geographically weighted regression approach. *Drug & Alcohol Review*, 35(3), 280-288. doi: [10.1111/dar.12295](https://doi.org/10.1111/dar.12295)
- Cederbaum, J. A., Petering, R., Hutchinson, M. K., He, A. S., Wilson, J. P., Jemmott III, J. B., & Jemmott, L. S. (2015). Alcohol outlet density and related use in an urban Black population in Philadelphia public housing communities. *Health & Place*, 31(1), 31-38. doi: 10.1016/j.healthplace.2014.10.007
- Chen, M. J., Grube, J. W., & Gruenewald, P. J. (2010). Community alcohol outlet density and underage drinking. *Addiction*, 105(2), 270-278. doi: 10.1111/j.1360-0443.2009.02772.x
- Cook, W. K., Bond, J., & Greenfield, T. K. (2014). Are alcohol policies associated with alcohol consumption in low- and middle-income countries? *Addiction*, 109, 1081-1090.

- De Boni, R., Pechansky, F., Silva, P. L. D. N., De Vasconcellos, M. T. L., & Bastos, F. I. (2013). Is the prevalence of driving after drinking higher in entertainment areas? *Alcohol & Alcoholism*, 48(3), 356-362. doi: 10.1093/alcalc/ags126
- de Goeij, M. C. M., Veldhuizen, E. M., Buster, M. C. A., & Kunst, A. E. (2015). The impact of extended closing times of alcohol outlets on alcohol-related injuries in the nightlife areas of Amsterdam: a controlled before-and-after evaluation. *Addiction*, 110(6), 955-964. doi:10.1111/add.12886
- Fitterer, J. L., Nelson, T. A., & Stockwell, T. (2018). The negative effects of alcohol establishment size and proximity on the frequency of violent and disorder crime across block groups of Victoria, British Columbia. *ISPRS International Journal of Geo-Information*, 7(8), 297- 308. doi: [10.3390/ijgi7080297](https://doi.org/10.3390/ijgi7080297)
- Fone, D., Dunstan, F., White, J., Webster, C., Rodgers, S., Lee, S., ... & Sivarajasingam, V. (2012). Change in alcohol outlet density and alcohol-related harm to population health (CHALICE). *BMC Public Health*, 12(1), 1-10.
- Furr-Holden, C. D. M., Nesoff, E. D., Nelson, V., Milam, A. J., Smart, M., Lacey, K., ... & Leaf, P. J. (2019). Understanding the relationship between alcohol outlet density and life expectancy in Baltimore City: The role of community violence and community disadvantage. *Journal of Community Psychology*, 47(1), 63-75. doi: [10.1002/jcop.22099](https://doi.org/10.1002/jcop.22099)
- Gmel, G., Holmes, J., & Studer, J. (2016). Are alcohol outlet densities strongly associated with alcohol-related outcomes? A critical review of recent evidence. *Drug & Alcohol Review*, 35(1), 40-54. doi: 10.1111/dar.12304
- Goldstick, J. E., Stoddard, S. A., Carter, P. M., Zimmerman, M. A., Walton, M. A., & Cunningham, R. M. (2016). Characteristic substance misuse profiles among youth entering an urban emergency department: Neighbourhood correlates and behavioural comorbidities. *The American Journal of Drug & Alcohol Abuse*, 42(6), 671-681. doi: 10.1080/00952990.2016.1174707
- Green, C. P., & Paniagua, M. N. (2016). Play hard, shirk hard? The effect of bar hours regulation on worker absence. *Oxford Bulletin of Economics and Statistics*, 78(2), 248-264. doi:10.1111/obes.12106

- Grönqvist, H., & Niknami, S. (2014). Alcohol availability and crime: Lessons from liberalized weekend sales restrictions. *Journal of Urban Economics*, *81*, 77-84.
doi:10.1016/j.jue.2014.03.001
- Han, D., & Gorman, D. M. (2013). Evaluating the effects of the introduction of off-sale alcohol outlets on violent crime. *Alcohol & Alcoholism*, *48*(3), 370-374. doi: 10.1093/alcalc/agt015
- Hobday, M., Chikritzhs, T., Liang, W., & Meuleners, L. (2015). The effect of alcohol outlets, sales and trading hours on alcohol-related injuries presenting at emergency departments in Perth, Australia, from 2002 to 2010. *Addiction*, *110*(12), 1901-1909. doi: 10.1111/add.13063
- Hobday, M., Meuleners, L., Liang, W., Gilmore, W., & Chikritzhs, T. (2016). Associations between alcohol outlets and emergency department injury presentations: Effects of distance from the central business district. *Australian & New Zealand Journal of Public Health*, *40*(1), 43-48.
doi: 10.1111/1753-6405.12492
- Huckle, T., Parker, K., Mavoa, S., & Casswell, S. (2020). Reduction in late-night violence following the introduction of National New Zealand trading hour restrictions. *Alcoholism: Clinical and Experimental Research*, *44*(3), 722-728. doi:10.1111/acer.14285
- Humphreys, D. K., & Eiser, M. P. (2014). Do flexible alcohol trading hours reduce violence? A theory-based natural experiment in alcohol policy. *Social Science & Medicine*, *102*, 1-9.
doi:10.1016/j.socscimed.2013.11.038
- Iritani, B. J., Waller, M. W., Halpern, C. T., Moracco, K. E., Christ, S. L., & Flewelling, R. L. (2013). Alcohol outlet density and young women's perpetration of violence toward male intimate partners. *Journal of Family Violence*, *28*(5), 459-470. doi: 10.1007/s10896-013-9516-y
- Johnson, R. M., Parker, E. M., Rinehart, J., Nail, J., & Rotthman, E. F. (2015). Neighbourhood factors and dating violence among youth: A systematic review. *American Journal of Preventative Medicine*, *49*(3), 458-466. doi:10.1016/j.amepre.2015.05.020
- Jones-Webb, R., McKee, P., Joshi, S., Erickson, D., Toomey, T., & Nelson, T. (2018). Is restricting sales of malt liquor beverages effective in reducing crime in urban areas? *Journal of Studies on Alcohol & Drugs*, *79*(6), 826-834. doi: 10.15288/jsad.2018.79.826

- Kearns, M. C., Reidy, D. E., & Valle, L. A. (2015). The role of alcohol policies in preventing intimate partner violence: A review of the literature. *Journal of Studies on Alcohol & Drugs*, 76(1), 21-30. doi:10.15288/jsad.2015.76.21
- Kingsland, M., Wolfenden, L., Tindall, J., Rowland, B., Sidey, M., McElduff, P., & Wiggers, J. H. (2015). Improving the implementation of responsible alcohol management practices by community sporting clubs: A randomised controlled trial. *Drug and Alcohol Review*, 34(4), 447-457. doi:10.1111/dar.12252
- Kurland, J., & Johnson, S. D. (2019). The influence of Stadia and the built environment on the spatial distribution of crime. *Journal of Quantitative Criminology*, 1-31. doi:10.1007/s10940-019-09440-x
- Kypri, K. J., C. McElduff, P. Barker, D. (2011). Effects of restricting pub closing times on night-time assaults in an Australian city. *Addiction*, 106(2), 303-310. doi: 10.1111/j.1360-0443.2010.03125.x
- Kypri, K., & Livingston, M. (2020). Incidence of assault in Sydney, Australia, throughout 5 years of alcohol trading hour restrictions: Controlled before-and-after study. *Addiction*, 115(11), 2045-2054. doi: 10.1111/add.15025
- Kypri, K., McElduff, P., & Miller, P. (2014). Restrictions in pub closing times and lockouts in Newcastle, Australia five years on. *Drug and Alcohol Review*, 33(3), 323-326. doi: 10.1111/dar.12123
- Larsen, K., To, T., Irving, H. M., Boak, A., Hamilton, H. A., Mann, R. E., ... & Faulkner, G. E. (2017). Smoking and binge-drinking among adolescents, Ontario, Canada: Does the school neighbourhood matter? *Health & Place*, 47(1), 108-114. doi: 10.1016/j.healthplace.2017.08.003
- Leslie, H. H., Ahern, J., Pettifor, A. E., Twine, R., Kahn, K., Gómez-Olivé, F. X., & Lippman, S. A. (2015). Collective efficacy, alcohol outlet density, and young men's alcohol use in rural South Africa. *Health & Place*, 34, 190-198. doi: 10.1016/j.healthplace.2015.
- Liang, W., & Chikritzhs, T. (2011). Revealing the link between licensed outlets and violence: Counting venues versus measuring alcohol availability. *Drug & Alcohol Review*, 30(5), 524-535. doi: [10.1111/j.1465-3362.2010.00281.x](https://doi.org/10.1111/j.1465-3362.2010.00281.x)

- Livingston, M. (2010). The ecology of domestic violence: The role of alcohol outlet density. *Geospatial Health*, 5(1), 139-149. doi: 10.4081/gh.2010.194
- Livingston, M. (2011). Alcohol outlet density and harm: Comparing the impacts on violence and chronic harms. *Drug & Alcohol Review*, 30(5), 515-523. doi: 10.1111/j.1465-3362.2010.00251.x
- Lo, C. C., Weber, J., & Cheng, T. C. (2013). A spatial analysis of student binge drinking, alcohol-outlet density, and social disadvantages. *American Journal on Addictions*, 22(4), 391-401. doi: 10.1111/j.1521-0391.2013.12022.x
- Lo, C. C., Weber, J., & Cheng, T. C. (2013). Urban–rural differentials: A spatial analysis of Alabama students' recent alcohol use and marijuana use. *American Journal on Addictions*, 22(3), 188-196. doi: 10.1111/j.1521-0391.2012.12023.x
- Maimon, D., & Browning, C. R. (2012). Underage drinking, alcohol sales and collective efficacy: Informal control and opportunity in the study of alcohol use. *Social Science Research*, 41(4), 977-990. doi: 10.1016/j.ssresearch.2012.01.009
- Martins, J. G., Guimarães, M. O., Jorge, K. O., Silva, C. J. D. P., Ferreira, R. C., Pordeus, I. A., ... & Zarzar, P. M. P. D. A. (2019). Binge drinking, alcohol outlet density and associated factors: A multilevel analysis among adolescents in Belo Horizonte, Minas Gerais State, Brazil. *Cadernos de Saúde Pública*, 36(1), 1-13. doi: 10.1590/0102-311X00052119
- Mazerolle, L., White, G., Ransley, J., & Ferguson, P. (2012). Violence in and around entertainment districts: A longitudinal analysis of the impact of late-night lockout legislation. *Law & Policy*, 34(1), 56-79. doi: 10.1111/j.1467-9930.2011.00353.x
- McKinney, C. M., Chartier, K. G., Caetano, R., & Harris, T. R. (2012). Alcohol availability and neighbourhood poverty and their relationship to binge drinking and related problems among drinkers in committed relationships. *Journal of Interpersonal Violence*, 27(13), 2703-2727. doi: [10.1177/0886260512436396](https://doi.org/10.1177/0886260512436396)
- Menéndez, P., Kyprí, K., & Weatherburn, D. (2017). The effect of liquor licensing restrictions on assault: A quasi- experimental study in Sydney, Australia. *Addiction*, 112(2), 261-268. doi: 10.1111/add.13621

- Menéndez, P., Weatherburn, D., Kypri, K., & Fitzgerald, J. (2015). *Lockouts and last drinks: The impact of the January 2014 liquor licence reforms on assaults in NSW, Australia*. (Crime and Justice Bulletin No 183). Sydney: NSW Bureau of Crime Statistics and Research.
- Menting, B. (2018). Awareness× opportunity: Testing interactions between activity nodes and criminal opportunity in predicting crime location choice. *The British Journal of Criminology*, 58(5), 1171-1192. doi: 10.1093/bjc/azx049
- Mentzakis, E., Suhrcke, M., Roberts, B., Murphy, A., & McKee, M. (2013). Estimating the causal effect of alcohol consumption on well-being for a cross-section of 9 former Soviet Union countries. *Social Science & Medicine*, 89, 1-7. doi:10.1016/j.socscimed.2013.04.01
- Miller, P. G., Ferris, J., Coomber, K., Zahnow, R., Carah, N., Jiang, H., ... Najman, J. (2017). Queensland Alcohol-related violence and Night Time Economy Monitoring project (QUANTEM): A study protocol. *BMC Public Health*, 17(789), 1-12. doi: 10.1186/s12889-017-4811-9
- Miller, P., Coomber, K., Ferris, J., Burn, M., Vakidis, V., Livingston, M. ... Najman, J. (2019). *Queensland alcohol-related violence and night time economy monitoring (QUANTEM): Final report (April 2019)*. Geelong, Australia: Deakin University. Retrieved from <https://www.publications.qld.gov.au/dataset/quantem-report/resource/bff18db2-8891-4532-8661-9d86f8ac0c76>
- Morrison, C., Ponicki, W. R., & Smith, K. (2015). Social disadvantage and exposure to lower priced alcohol in off-premise outlets. *Drug & Alcohol Review*, 34(4), 375-378. doi: 10.1111/dar.12256
- Morrison, C., Smith, K., Gruenewald, P. J., Ponicki, W. R., Lee, J. P., & Cameron, P. (2016). Relating off-premises alcohol outlet density to intentional and unintentional injuries. *Addiction*, 111(1), 56-64. doi: 10.1111/add.13098
- Myran, D. T., Chen, J. T., Giesbrecht, N., & Rees, V. W. (2019). The association between alcohol access and alcohol-attributable emergency department visits in Ontario, Canada. *Addiction*, 114(7), 1183-1191. doi:10.1111/add.14597
- Nepal, S., Kypri, K., Tekelab, T., Hodder, R. K., Attia, J., Bagade, T., ... & Miller, P. (2020). Effects of extensions and restrictions in alcohol trading hours on the incidence of assault and

unintentional injury: Systematic review. *Journal of Studies on Alcohol and Drugs*, 81(1), 5-23.

- Nichols, B. E., Nkalamo, D., & Whitcomb, B. W. (2012). Density of drinking establishments and HIV prevalence in a migrant town in Namibia. *AIDS & Behaviour*, 16(4), 829-834. doi: 10.1007/s10461-011-9956-4
- Obradors-Rial, N., Ariza, C., Contente, X., & Muntaner, C. (2020). School and town factors associated with risky alcohol consumption among Catalan adolescents. *Alcohol*, 82(1), 71-79. doi: 10.1016/j.alcohol.2019.04.005
- Ortega-García, J. A., López-Hernández, F. A., Funes, M. L. A., Saucó, M. F. S., & Ramis, R. (2020). My partner and my neighbourhood: The built environment and social networks' impact on alcohol consumption during early pregnancy. *Health & Place*, 61(1), 1-8. doi:10.1016/j.healthplace.2019.102239
- Parker, R. N., Williams, K. R., McCaffree, K. J., Acensio, E. K., Browne, A., Strom, K. J., & Barrick, K. (2011). Alcohol availability and youth homicide in the 91 largest US cities, 1984-2006. *Drug & Alcohol Review*, 30(5), 505-514. doi: 10.1111/j.1465-3362.2011.0033
- Paschall, M. J., Lipperman-Kreda, S., & Grube, J. W. (2014). Effects of the local alcohol environment on adolescents' drinking behaviours and beliefs. *Addiction*, 109(3), 407-416. doi:10.1111/add.12397
- Pearson, A. L., Bowie, C., & Thornton, L. E. (2014). Is access to alcohol associated with alcohol/substance abuse among people diagnosed with anxiety/mood disorder? *Public Health*, 128(11), 968-976. doi: 10.1016/j.puhe.2014.07.008
- Ponicki, W. R., Gruenewald, P. J., Remer, L. G., Martin, S. E., & Treno, A. J. (2014). Assessing the validity of on-premise alcohol license data in six communities in California: Operating characteristics and outlet densities. *Substance Use & Misuse*, 49(1-2), 51-58. doi: 10.3109/10826084.2013.817429
- Quick, M., Law, J., & Luan, H. (2017). The influence of on-premise and off-premise alcohol outlets on reported violent crime in the region of Waterloo, Ontario: Applying Bayesian spatial modeling to inform land use planning and policy. *Applied Spatial Analysis & Policy*, 10(3), 435-454. doi: 10.1007/s12061-016-9191-5

- Quigg, Z., Bigland, C., Hughes, K., Duch, M., & Juan, M. (2020). Sexual violence and nightlife: A systematic literature review. *Aggression & Violent Behaviour, 51*(1), 1-10.
doi:10.1016/j.avb.2020.101363
- Raleigh, E., & Galster, G. (2015). Neighbourhood disinvestment, abandonment, and crime dynamics. *Journal of Urban Affairs, 37*(4), 367-396. doi: 10.1111/juaf.12102
- Reboussin, B. A., Song, E. Y., & Wolfson, M. (2011). The impact of alcohol outlet density on the geographic clustering of underage drinking behaviours within census tracts. *Alcoholism: Clinical & Experimental Research, 35*(8), 1541-1549. doi: 10.1111/j.1530-0277
- Rivara, F. P., Boisvert, D., Relyea-Chew, A., & Gomez, T. (2012). Last Call: Decreasing drunk driving among 21-34-year-old bar patrons. *International Journal of Injury Control and Safety Promotion, 19*(1), 53-61. doi:10.1080/17457300.2011.603150
- Roche, A., Kostadinov, V., Fischer, J., Nicholas, R., O'Rourke, K., Pidd, K., & Trifonoff, A. (2015). Addressing inequities in alcohol consumption and related harms. *Health Promotion International, 30*(S2), 20-35. doi:10.1093/heapro/dav030
- Roman, C. G., & Reid, S. E. (2012). Assessing the relationship between alcohol outlets and domestic violence: Routine activities and the neighbourhood environment. *Violence & Victims, 27*(5), 811-828. doi: 10.1891/0886-6708.27.5.811
- Romano, E., Scherer, M., Fell, J., & Taylor, E. (2015). A comprehensive examination of US laws enacted to reduce alcohol-related crashes among underage drivers. *Journal of Safety Research, 55*(1), 213-221. doi: 10.1016/j.jsr.2015.08.001
- Rosenberg, M., Pettifor, A., Lippman, S. A., Thirumurthy, H., Emch, M., Miller, W. C., ... & Tollman, S. (2015). Relationship between community-level alcohol outlet accessibility and individual-level herpes simplex virus type 2 infection among young women in South Africa. *Sexually Transmitted Diseases, 42*(5), 259-265. doi: 10.1097/OLQ.0000000000000263
- Rosshem, M. E., Krall, J. R., Painter, J. E., Thombs, D. L., Stephenson, C. J., Suzuki, S., ... & Wagenaar, A. C. (2018). Alcohol retail sales licenses and sexually transmitted infections in Texas counties, 2008-2015. *The American Journal of Drug & Alcohol Abuse, 44*(6), 678-685. doi: 10.1080/00952990.2018.1477944

- Rossheim, M. E., Thombs, D. L., & Suzuki, S. (2015). Bars and nightclubs associated with higher HIV prevalence. *Drug & Alcohol Dependence*, *155*(1), 31-36. doi: 10.1016/j.drugalcdep.2015.08.024
- Rossheim, M. E., Thombs, D. L., & Suzuki, S. (2016). Association between alcohol outlets and HIV prevalence in US counties. *Journal of Studies on Alcohol & Drugs*, *77*(6), 898-903. doi: 10.15288/jsad.2016.77.898
- Rowland, B. C., Hall, J. K., Kremer, P. J., Miller, P. G., & Toumbourou, J. W. (2017). Underage purchasing of alcohol from packaged liquor outlets: An Australian study. *Health Promotion International*, *32*(5), 790-799. doi: 10.1093/heapro/daw007
- Rowland, B. C., Wofenden, L., Doods, P., Kingsland, M., Gillham, K. E., & Wiggers, J. H. (2015). The impact of a hypothetical designated driver program on intended alcohol-related behavior: an RCT. *Health Promotion International*, *30*(1), 7-15. doi:10.1093/heapro/dau07
- Rowland, B., Tindall, J., Wolfenden, L., Gillham, K., Ramsden, R., & Wiggers, J. (2015). Alcohol management practices in community football clubs: Association with risky drinking at the club and overall hazardous alcohol consumption. *Drug and Alcohol Review*, *34*(4), 438-446. doi:10.1111/dar.12210
- Rowland, B., Toumbourou, J. W., & Allen, F. (2012). Reducing alcohol-impaired driving in community sports clubs: Evaluating the Good Sports Program. *Journal of Studies on Alcohol and Drugs*, *73*(2), 316-327. doi:10.15288/jsad.2012.73.316
- Scherer, M., Romano, E., Caldwell, S., & Taylor, E. (2018). The impact of retail beverage service training and social host laws on adolescents' DUI rates in San Diego County, California. *Traffic Injury Prevention*, *19*(2), 111-117. doi: 10.1080/15389588.2017.1350268
- Scott, N., Livingston, M., Reporter, I., & Dietze, P. (2017). Using simulation modelling to examine the impact of venue lockout and last-drink policies on drinking-related harms and costs to licensees. *Australian and New Zealand Journal of Public Health*, *41*(3), 243-247. doi: 10.1111/1753-6405.12640
- Scribner, R. A., Theall, K. P., Mason, K., Simonsen, N., Schneider, S. K., Towvim, L. G., & Dejong, W. (2011). Alcohol prevention on college campuses: The moderating effect of the alcohol environment on the effectiveness of social norms marketing campaigns. *Journal of Studies on Alcohol & Drugs*, *72*(2), 232-239. doi: [10.15288/jsad.2011.72.232](https://doi.org/10.15288/jsad.2011.72.232)

- Sharpe, C. A., Poots, A. J., Watt, H., Franklin, D., & Pinder, R. J. (2018). Controlling alcohol availability through local policy: An observational study to evaluate Cumulative Impact Zones in a London borough. *Journal of Public Health*, *40*(3), 260-268. doi: [10.1093/pubmed/fox167](https://doi.org/10.1093/pubmed/fox167)
- Sherk, A., Stockwell, T., Chikritzhs, T., Andréasson, S., Angus, C., Gripenberg, J., ... & Wood, J. (2018). Alcohol consumption and the physical availability of take-away alcohol: Systematic reviews and meta-analyses of the days and hours of sale and outlet density. *Journal of Studies on Alcohol and Drugs*, *79*(1), 58-67.
- Siegfried, N., & Parry, C. (2019). Do alcohol control policies work? An umbrella review and quality assessment of systematic reviews of alcohol control interventions (2006-2017). *PloS One*, *14*(4), 1-23. doi:10.1371/journal.pone.0214865
- Spoerri, A., Zwahlen, M., Panczak, R., Egger, M., & Huss, A. (2013). Alcohol-selling outlets and mortality in Switzerland — the Swiss National Cohort. *Addiction*, *108*(9), 1603-1611. doi: 10.1111/add.12218
- Subbaraman, M. S., Mulia, N., Kerr, W. C., Patterson, D., Karriker-Jaffe, K. J., & Greenfield, T. K. (2020). Relationships between US state alcohol policies and alcohol outcomes: Differences by gender and race/ethnicity. *Addiction*, *115*(7), 1285-1294. doi: 10.1111/add.14937
- Taylor, N., Miller, P., Coomber, K., Mayshak, R., Zahnow, R., Patafio, B., ... Ferris, J. (2018). A mapping review of evaluations of alcohol policy restrictions targeting alcohol-related harm in night-time entertainment precincts. *International Journal of Drug Policy*, *62*(1), 1-13. doi: 10.1016/j.drugpo.2018.09.012
- Tesch, F., & Hohendorf, L. (2018). Do changes in bar opening hours influence violence in the night? Evidence from 13 Bavarian towns. *Journal of Drug Issues*, *48*(2), 295-306. doi:10.1177/0022042617753146
- Theall, K. P., Lancaster, B. P., Lynch, S., Haines, R. T., Scribner, S., Scribner, R., & Kishore, V. (2011). The neighbourhood alcohol environment and at-risk drinking among African-Americans. *Alcoholism: Clinical & Experimental Research*, *35*(5), 996-1003. doi: [10.1111/j.1530-0277.2010.01430.x](https://doi.org/10.1111/j.1530-0277.2010.01430.x)
- Toomey, T. L., Erickson, D. J., Carlin, B. P., Lenk, K. M., Quick, H. S., Jones, A. M., & Harwood, E. M. (2012). The association between density of alcohol establishments and violent crime

within urban neighbourhoods. *Alcoholism: Clinical & Experimental Research*, 36(8), 1468-1473. doi: [10.1111/j.1530-0277.2012.01753.x](https://doi.org/10.1111/j.1530-0277.2012.01753.x)

- Toomey, T. L., Erickson, D. J., Carlin, B. P., Quick, H. S., Harwood, E. M., Lenk, K. M., & Ecklund, A. M. (2012). Is the density of alcohol establishments related to nonviolent crime? *Journal of Studies on Alcohol & Drugs*, 73(1), 21-25. doi: 10.15288/jsad.2012.73.21
- Trangenstein, P. J., Curriero, F. C., Webster, D., Jennings, J. M., Latkin, C., Eck, R., & Jernigan, D. H. (2018). Outlet type, access to alcohol, and violent crime. *Alcoholism: Clinical & Experimental Research*, 42(11), 2234-2245. doi: 10.1111/acer.13880
- Trangenstein, P. J., Curriero, F. C., Webster, D., Jennings, J. M., Latkin, C., Eck, R., & Jernigan, D. H. (2018). Methods for evaluating the association between alcohol outlet density and violent crime. *Alcoholism: Clinical & Experimental Research*, 42(11), 2234-2245. doi:10.1111/acer.14119
- Trangenstein, P. J., Eck, R. H., Lu, Y., Webster, D., Jennings, J. M., Latkin, C., ... & Jernigan, D. H. (2020). The violence prevention potential of reducing alcohol outlet access in Baltimore, Maryland. *Journal of Studies on Alcohol & Drugs*, 81(1), 24-33. doi: 10.15288/jsad.2020.81.24
- Treno, A. J., Ponicki, W. R., Stockwell, T., Macdonald, S., Gruenewald, P. J., Zhao, J., ... & Greer, A. (2013). Alcohol outlet densities and alcohol price: The British Columbia experiment in the partial privatization of alcohol sales off-premise. *Alcoholism: Clinical & Experimental Research*, 37(5), 854-859. doi: [10.1111/acer.12065](https://doi.org/10.1111/acer.12065)
- Wicki, M., & Gmel, G. (2011). Hospital admission rates for alcoholic intoxication after policy changes in the canton of Geneva, Switzerland. *Drug and Alcohol Dependence*, 118(2-3), 209-215. doi:10.1016/j.drugalcdep.2011.03.020
- Wilkinson, C., Livingston, M., & Room, R. (2016). Impacts of changes to trading hours of liquor licences on alcohol-related harm: A systematic review 2005–2015. *Public Health Research and Practice*, 26(4):e2641644, 1-7. doi:10.17061/phrp2641644
- Wilson, I. M., Graham, K., & Taft, A. (2014). Alcohol interventions, alcohol policy and intimate partner violence: a systematic review. *BMC Public Health*, 14(1), 1-11. doi: 10.1186/1471-2458-14-881

- Zhang, X., Hatcher, B., Clarkson, L., Holt, J., Bagchi, S., Kanny, D., & Brewer, R. D. (2015). Changes in density of on-premises alcohol outlets and impact on violent crime, Atlanta, Georgia, 1997-2007. *Preventing Chronic Disease, 12*(1), 1-8. doi: 10.5888/pcd12.140317
- Zhou, J., Droste, N., Curtis, A., Zinkiewicz, L., & Miller, P. (2018). Playing it safe: Patron safety strategies and experience of violence in night-time entertainment districts. *Drug and Alcohol Review, 37*(3), 340-347. doi:10.1111/dar.12570

4: Appendix A

Table 4.1 Summary of reviews with eligible studies for business hours and outlet density strategies

Study	Specific strategies	Inclusion criteria for review	Authors' conclusions regarding change in business hours	Authors' conclusions regarding alcohol outlet density
Cameron et al. (2012)	Alcohol outlet density	<ul style="list-style-type: none"> • Date range: Not specified – 2012 • Quantitative impact evaluations of outlet density on “some outcome variable” (p. 3) • Natural experiments relating to how alcohol was sold 		Mixed results, with most relationships between density and the outcome variables being context-specific. many studies had weaker research designs. Studies with more robust research designs overall showed some negative effect of greater alcohol outlet density.
Kearns et al. (2015)	Adjustment to business hours Alcohol outlet density	<ul style="list-style-type: none"> • Date range: Not specified • Quantitative studies examining the impact of alcohol related policies on intimate partner violence as the outcome measure 	Research examining the impact of adjustments to business hours on intimate partner violence is scarce, and the authors of this review did not draw any conclusions regarding whether business times increase or decrease incidents of intimate partner violence. They do hypothesise that restricting hours of sale of alcohol may act to displace violence rather than stop it.	Qualitative synthesis of review results suggests that greater alcohol outlet density appears to be associated with rates of intimate partner violence. There is some variation in results when examining outlet type (off-premises versus on-premises). Controlling for sociodemographic characteristics, US studies have shown an association between greater alcohol outlet density and higher rates of violent crime.
Roche et al. (2015)	Adjustment to business hours Alcohol outlet density	<ul style="list-style-type: none"> • Date range: 2000 – 2014 • Systematic reviews, experimental studies and policy/program evaluations • Included strategies for reducing inequities in alcohol use and associated harms 	Authors state that this area requires further research and do not synthesise any studies pertaining to adjustment of business hours.	Authors provide qualitative synthesis stating that increased alcohol outlet density is associated with greater harms and neighbourhood inequity.
Wilkinson et al. (2016)	Adjustment to business hours	<ul style="list-style-type: none"> • Date range: 2005 – 2015 • Impact evaluations assessing changes in alcohol outlet trading hours 	Qualitative summary indicates that robust studies from Australia, Norway, Canada, and the US have shown that reducing trading hours can reduce violence.	
Taylor et al. (2018)	Adjustment to business hours Alcohol outlet density	<ul style="list-style-type: none"> • Date range: 2003 – 2017 • Population: people in NTEs • Intervention: introduced by a governing body and be aimed at reducing harm in 	Authors conclude that while two studies found mixed evidence around the efficacy of adjusting business hours to reduce alcohol-related harm, most studies they	Qualitative synthesis indicates that no included studies examined deliberate policies regarding outlet density; rather they focused on natural variation in density. Eighty-nine percent of this review’s included studies

Study	Specific strategies	Inclusion criteria for review	Authors' conclusions regarding change in business hours	Authors' conclusions regarding alcohol outlet density
		<p>NTEs by restricting access to alcohol</p> <ul style="list-style-type: none"> • Comparison: pre/post studies or studies with a comparison site that either did not implement the intervention or implemented differing levels of the intervention • Outcome: assault or injury rates 	synthesised show a strong empirical link between increased business hours and increased harm.	found that greater outlet density correlated with greater crime and violence. Some of the evidence is mixed, with authors commenting that sociodemographic factors in communities need to be taken into account.
Nepal et al. (2020)	Adjustment to business hours	<ul style="list-style-type: none"> • Date range: No limit – December 2018 • Intervention: extensions or restrictions in trading hours at alcohol outlets (both on and off premises) • Population: whole population within study locality • Studies using a counterfactual (RCTs, matched and unmatched control group designs, interrupted time series) • Outcomes: violence, injury, drink driving, alcohol related hospitalisation 	Qualitative synthesis of results concludes that studies examining extended business hours generally resulted in greater alcohol related crime, whereas studies examining more restrictive business hours generally resulted in lesser alcohol related crime.	
Sherk et al. (2018)	Adjustment to business hours	<ul style="list-style-type: none"> • Date range: 1991 – February 2016 • Intervention: explicitly studied hours or days of sale or outlet density • Outcome: per capita alcohol consumption • Design: pre/post natural experiments with or without control groups 	Three studies within this review met the inclusion criteria for our review. One (Grönqvist & Niknami, 2014) was identified by our systematic search. The others, briefly synthesised by the review authors, found a positive relationship between Sunday trading and increased alcohol consumption, and a positive relationship between later evening trading hours and increased alcohol sales.	
Wilson et al. (2014)	Alcohol outlet density	<ul style="list-style-type: none"> • Date range: January 1992 – March 2013 • Intervention: aimed to reduce alcohol consumption • Outcome: intimate partner violence • Research designs: RCTS, interrupted time series 		The authors qualitatively synthesise three quasi-experimental studies which meet the criteria for our review. The Australian study found a positive association between density of off-premises alcohol outlets and intimate partner violence. The two US studies showed mixed results, with some analyses indicating an association between off-premises density and intimate partner violence while other analyses indicating the relationship on existed for on-premises outlets.

Study	Specific strategies	Inclusion criteria for review	Authors' conclusions regarding change in business hours	Authors' conclusions regarding alcohol outlet density
Gmel et al. (2016)	Alcohol outlet density	<ul style="list-style-type: none"> • Date range: 2008 – 2014 • Intervention: objective measure of outlet density • Outcome: crime or violence • Population: adult population (no subpopulations) 		Qualitative synthesis discusses how there is a great deal of heterogeneity in findings around alcohol outlet density. The authors conclude that results may differ by whether a study delineates outlet type (i.e., off- or on-premises). Results of this review also pointed to the potential that a reduction in density in one locality simply moves individuals to another locality.
Johnson et al. (2015)	Alcohol outlet density	<ul style="list-style-type: none"> • Date range: 2005 – 2015 • Intervention: neighbourhood factors (e.g., outlet density, socioeconomic factors, community-level factors) • Population: 60%+ of population needed to be aged 26 years or above • US-only samples • Outcome: domestic violence 		The authors qualitatively synthesised four studies regarding neighbourhood level alcohol outlet density, concluding that greater density was associated with perpetration of physical domestic violence but not victimisation.
Quigg et al. (2020)	Alcohol outlet density	<ul style="list-style-type: none"> • Date range: 1970 – December 2018 • Interventions to prevent or respond to nightlife related sexual violence 		Qualitative synthesis of results indicates that higher density of on-premises alcohol outlets may be associated with higher levels of sexual violence. Venue-level factors may mediate this relationship (e.g., drink promotions). The authors conclude that their review found little evidence to inform practice regarding what works for sexual violence in the NTE.