



Systematic review of Australian policing interventions to reduce alcohol-related violence – A maxillofacial perspective



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ABSTRACT

Alcohol-related violence remains to be a health concern, and the oral and maxillofacial surgeons are routinely exposed to its impact on the victims and the healthcare system. At a community level, various policing interventions have been implemented to address this violent crime in and around licensed premises. Current study sought to examine the effectiveness of these interventions in Australia. Ten eligible studies, that evaluated the impact of 15 Australian policing interventions on reducing alcohol-related violence in the night-time economy, were included in this systematic review. Due to the heterogeneity of the study designs and the insufficiency of the reported data, quantitative meta-analysis of the findings was precluded. Instead, a critical narrative approach was used. Police-recorded assault rate was the primary outcome measured to assess the level of alcohol-related violence, which was influenced by the level of police duties implemented during the intervention period. The overall evidence base to support Australian policing interventions was found to be poor and was limited by the low-quality study design observed in the majority of the included studies. However, there is some evidence to suggest interventions involving proactive policing to be more effective than traditional reactive policing. There was also an increased emphasis on developing policing interventions in collaborative partnerships, demonstrating the synergistic benefits in crime prevention through community partnerships, where communities were encouraged to take ownerships of their own problems and develop targeted responses to alcohol-related violence rather than a one-size-fits-all approach. Further research is required to define their effectiveness with the use of more appropriate and robust methodologies.

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1. Introduction

Violence or interpersonal violence occurring as the result of alcohol intoxication has been well established (Graham & Homel, 2008; Wells & Graham, 2003) and remains a major challenge to all levels of Australian government (Morgan & Mcatamney, 2009). The role of alcohol in maxillofacial injuries is also well recognised, where authors have demonstrated influence of alcohol in 30–60% of all maxillofacial trauma (Edwards, David, Simpson, & Abbott, 1994; Dongas & Hall, 2002; Lee & Antoun, 2009; Lee & Snape, 2008; Verma & Chambers, 2015) and 55–87% of assault-related maxillofacial trauma (Hutchison, Magennis, Shepherd, & Brown, 1998; Laverick, Patel, & Jones, 2008; Lee, Snape,

Steenberg, & Worthington, 2007). Indeed, alcohol is often far more commonly involved when the mechanism of facial injury is alleged assault.

While, to our knowledge, no studies to date have directly examined the correlation between alcohol-related violence and maxillofacial trauma, Hutchison et al. (1998) observed 90% of facial injuries occurring in bars to be associated with alcohol consumption. Importantly, O'meara, Witherspoon, Hapangama, and Hyam (2012) have also found that both alcohol consumption and interpersonal violence to be independent predictors for increased severity of facial fractures. Since the maxillofacial region is one of the easiest targets for assailants to select, clinicians at oral and maxillofacial units are often confronted with the aftermath of weekends' night-outs in their Monday morning trauma clinics.

Therefore, oral and maxillofacial surgery is the lead speciality that not only provides care to the injured of alcohol-related violence but also has the opportunity to facilitate its prevention and the surveillance of strategies implemented locally (Warburton & Shepherd, 2002).

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Unpublished internal data from the Royal Brisbane Hospital, Queensland, Australia, highlighted a 28% rise in the rate of alcohol-related maxillofacial trauma in the same 10-month period from 2010 to 2011 (Borgna, 2011). Similarly, at the Royal Hobart Hospital, Verma and Chambers (2015) observed a significant increase of 12% in the proportion of drunken men among mandibular fractures from 1999 to 2013. While the evidence of these reports are limited by their small sample sizes to suggest a true rising trend of alcohol-related violence, there is general consensus that alcohol-related violence remains to be an ongoing public health concern in the Australian communities (Morgan & Mcatamney, 2009; Miller, Tindall, et al., 2012; Navarro, Shakeshaft, Doran, & Petrie, 2013).

To tackle alcohol-related violence, strategies have been developed to target the link between alcohol and interpersonal violence on multiple levels. These strategies include federal, state-wide or local policies to reduce the demand of alcohol by alcohol pricing and taxation, or restricting the alcohol supply by manipulation of trading hours and alcohol outlet density, or prevent its associated harm by policing interventions and enforcing licensing regulations (Jones, Hughes, Atkinson, & Bellis, 2011; Midford et al., 2005; Palk, Freeman, & Davey, 2010; Shakeshaft et al., 2012). In the United Kingdom, police patrols and enforcements of licensing laws have been shown to be effective in reducing alcohol-related violence at the community level (Babor et al., 2010). However, the same evidence for policing interventions has not yet been demonstrated in Australia, raising the question of whether targeting the night-time economy is an effective use of police resources (Miller et al., 2011). In order to answer this important question, current study set out with an objective to examine the evidence in policing alcohol-related violence systematically.

2. Objectives

The primary objective of current study is to systematically evaluate the effectiveness of Australian policing interventions in reducing alcohol-related violence by targeting the night-time economy.

3. Background

Studies have consistently found that alcohol-related violence is significantly overrepresented in the night-time economy or in and around licensed premises (Graham & Homel, 2008; Liang & Chikritzhs, 2011; Martin, Freeman, & Davey, 2012; Mcilwain & Homel, 2009). Hotels, clubs and other licensed premises may allow drinkers to remain and continue drinking for extended periods. The typical clustering of these venues encourages the number of drinkers and the level of intoxication to grow at these venues, turning them into a conduit for violence (Livingston, Chikritzhs, & Room, 2007). Indeed, licensed premises are widely considered hotspots for violence and disorder with over 40% of assaults estimated to occur within the proximity of such places (Mcilwain & Homel, 2009). Furthermore, the severity of injury was found to positively correlate to these hotspots where the odds of major trauma were two times higher at licensed premises than at other locations (Dinh, Bein, Roncal, Martiniuk, & Boufous, 2014).

Various environmental factors in licensed venues are known to contribute to alcohol-related social problems, such as license types, trading hours, density of patron movements, entrance queues, number of security staffs and adequacy of other facilities (Doherty & Roche, 2003; Graham, Bernards, Osgood, & Wells, 2012). Police data indicate that only a small handful of venues are responsible for this disproportionately high rate of alcohol-related violence (Donnelly & Briscoe, 2003; Haines & Graham, 2009; Martin et al., 2012). Thus Doherty and Roche (2003) claim “the predictability of violence in these locations offers an opportunity for violence prevention and an enhanced role for police involvement”. An emerging body of research suggests that police are able to do more than just respond to alcohol-related problems (Doherty & Roche, 2003; Fleming, 2008; Graham & Homel, 2008; Mcilwain &

Homel, 2009). Rather, effective policing strategies may actually prevent or reduce the harm caused by alcohol-related violence in and around licensed venues.

Policing approaches to this problem include a comprehensive range of tactics which generally fall into one of the three following categories: front-line strategy; monitoring, regulation and enforcement strategy; and collaborative partnership (Fleming, 2008; Smith, Morgan, & Mcatamney, 2011).

Simply increasing police numbers remains one of the standard ways that police can target alcohol-related violence. Commonly referred to as front-line policing, this strategy focuses on providing a visible police presence to act as a deterrent to potential offenders. By increasing numbers, police can respond faster to alcohol-related violence and prevent incidents from escalating (Smith et al., 2011). Front-line police activities include visible, frequent patrols of entertainment precincts and known hotspots, parking police vehicles in highly visible areas and responding to incidents by issuing on the spot fines or arresting and detaining intoxicated offenders (Fleming, 2008).

Importantly, front-line officers are able to use a large amount of discretion in addressing alcohol-related offences. This allows police to discriminate between potentially violent offenders and those who pose no danger or threat to public safety. Studies have considered whether front-line strategies can reduce the occurrence of alcohol-related violence in and around licensed areas. For example, Hopkins (2004) examined the impact of a policing initiative implemented in Nottinghamshire, England which focused on deploying high visibility policing units in identified ‘hotspot’ licensed premises and surrounding areas. Similarly, Miller et al. (2011) examined the effectiveness of Operation Nightlife 1 in Geelong, where the aim is to maximise police visibility during high-risk hours.

Secondly, police can prevent alcohol-related violence by monitoring, regulating, and enforcing liquor laws in licensed premises, particularly in the high-risk areas. Enforcement strategies place the onus on the premise to ensure responsible service of alcohol and provide a safe drinking environment. Through monitoring and enforcement strategies, police can use intelligence sources to increase the perceived risks associated with breaching the legislation and consequently deter operators of licensed premises and their staff from violating the law.

Enforcement strategies can consist of both randomised and targeted interventions (Graham & Homel, 2008). While randomised enforcement strategies include all or most licensed premises within a certain geographic area (e.g. an entertainment precinct), targeted enforcement draws on police intelligence of particularly problematic venues (Graham & Homel, 2008). Enforcement activities can include ‘walk throughs’ of venues to collect information on licensees and their staff, allowing police to monitor a venue’s compliance with liquor licensing legislation. Yet the effectiveness of enforcement strategies is not straightforward and is reliant upon a number of factors including: the frequency of enforcement, the likelihood of detection, the severity of the penalty and the awareness of the enforcement activity (Graham & Homel, 2008). Indirectly, enforcing activities may also lead to changes in the physical and the social features of the licensed drinking environments, such as better management and improved behaviour of servers and patrons (Doherty & Roche, 2003), acting as a barrier to reoccurrence of such violence and discouraging offending by others.

Collaborative partnership strategies acknowledge that the police cannot be solely accountable for preventing alcohol-related violence. Fleming (2008) argues that while police are often called upon to deal with alcohol-related problems, dealing with health or social welfare issues is far beyond their expertise. Thus collaborative strategies allow police to work with and harness the knowledge of a range of different stakeholders including local governments, regulatory authorities, health departments, medical practitioners, premise managements, peak bodies and the wider community (Graham & Homel, 2008). Indeed, this approach applies police resources in a range of interagency partnerships to tackle alcohol-related problems in a holistic way. For

example, community action projects, task and coordination groups, and Liquor Accords, which all develop tailored responses to identified problems and encourage communities to take ownership of their problems (Felson, Berends, Richardson, & Veno, 1997; Hauritz, Homel, McIlwain, Burrows, & Townsley, 1998; Homel, Hauritz, Wortley, McIlwain, & Carvolth, 1997; New South Wales Audit Office, 2008).

Liquor Accords represent a proactive response by police and licensees to improving public safety without relying on enforcement activities (Fleming, 2008). Accords are not enforceable by law but rather voluntary, cooperative agreements which depend upon the self-regulating behaviour of licensees, that may impact on their long-term effectiveness (Graham & Homel, 2008). The accord consists of interventions that are a number of principles and actions agreed by all stakeholders, including agreed levels of security surveillance, utilizing ID scanners at high-risk licensed venues, shared lists of banned patrons, and agreed use of two-way radios with emphasis on contacting police as soon as problem patrons are identified (Miller, Tindall, et al., 2012). In recent years, collaboration between police and other stakeholders has improved significantly and appears to show promising signs (Fleming, 2008). Comprehensive prevention models which incorporate two or more strategies are becoming increasingly popular in preventing alcohol-related violence in the night-time economy (McIlwain & Homel, 2009; Smith et al., 2011). These multifaceted interventions attempt to capitalize on the strengths of each strategy and provide a more holistic approach to solving alcohol-related violence.

Policing alcohol-related violence is core police business and plays an unequivocal role for the treatment of the alcohol-related violence observed in and around licensed premises which can commonly result in maxillofacial trauma. For police to provide the most effective response to alcohol-related violence, it is important to understand its empirical evidence. While several scholars have evaluated these strategies, there remains a need for research to systematically and scientifically identify what strategy or combination of strategies works best. Alongside McIlwain and Homel (2009), we argue that a strong evidence base is necessary in order to advance violence prevention policy in this area and ensure that resources are appropriately allocated to effective rather than symbolic interventions.

Determining the most effective policing interventions in dealing with alcohol-related violence is critical to ensure its best practice. While previous reviews have examined alcohol-related harms in and around licensed premises, research by Doherty and Roche (2003) is dated, and the studies conducted by Brennan, Moore, Byrne, and Murphy (2011) and Jones et al. (2011) do not specifically focus on policing and may not be applicable in Australia. The way police deal with alcohol-related violence in and around licensed premises is continuously evolving (Fleming, 2008). In fact, Fleming (2008) identified three new trends in the way police approach this problem. These include: a shift in the focus of law enforcement efforts from patrons to licensed premises; an increasingly centralised focus of regulation that helps to strengthen knowledge and expertise within the organisation; and a greater emphasis on collaboration through community partnerships (Fleming, 2008). These developments highlight the changing nature of policing interventions targeting alcohol-related violence and provide a clear justification for an up-to-date review focused solely on policing interventions.

The level and the pattern of alcohol consumption have been known to vary widely between countries, primarily between developing and developed countries (Room, Babor, & Rehm, 2005). According to differences in the pattern of drinking, the relative risk for alcohol's role in violence and in injuries has also been found to differ between countries (Rehm et al., 2004). In addition to drinking patterns, there is evidence to suggest that the strength of the relation between alcohol consumption and violence is also mediated by cultural expectations about behaviour while drinking (Room et al., 2005) and the presence of risky drinking culture, where heavy episodic drinking correlates strongly with higher levels of alcohol-related violence than with daily routine

drinking (World Health Organization, 2006). Recognising these inter-country differences, we limited the scope of this study to Australian interventions in order to answer what approaches are working and what are lacking among Australian policing interventions.

4. Methodology

4.1. Search protocol

Search strategy was developed around published literatures and eight databases of MEDLINE, PubMed, Embase, Scopus, Web of Knowledge, Informit, SAGE and CINCH were searched in January 2014 with an update search in September 2015 (Fig. 1). Search terms were used and adapted to each database using the appropriate fields for title/abstract, subject headings and keywords. Search terms were drawn from categories of problem, setting, intervention and outcome:

- 1) *Problem*: alcohol* OR ethanol OR beer* OR wine* OR spirit* OR "home brew" OR "home brews" OR moonshine OR drunk* OR beverage* OR intoxicat* OR liquor* OR booze*
- 2) *Setting*: licensed OR licensee* OR pub* OR publican* OR "nighttime economy" OR bar* OR club* OR venue* OR premise* OR precinct* OR festival* OR event OR events OR tavern* OR "entertainment-district" OR "entertainment district" OR "entertainment-districts" OR "entertainment districts"
- 3) *Intervention*: police OR policing OR accord OR "law enforcement" OR intervention*
- 4) *Outcome*: violen* OR injur* OR harm* OR assault* OR arrest* OR attack* OR fight* OR "king hit" OR punch* OR glass* OR "glasgow smile" OR "alcohol fuelled" OR "alcohol-related" OR "alcohol related" OR "alcohol-related" OR death* OR aggress* OR bash* OR casual* OR "emergency department" OR trauma OR ambulance OR paramedic* OR maxillofacial OR plastic OR surger*

Duplicates of documents found were removed and the remaining documents were screened for eligibility, using screening protocol described below. We conducted further citation searches for eligible tracking and citation harvesting from the references of included studies for comprehensiveness. Citation searches were performed on the following platforms: Web of Science, Scopus and Google Scholar.

4.2. Screening protocol

Documents were screened in two stages, using exclusion and inclusion criteria (Table 1). The first stage was to exclude any title and abstract of each identified document, that were clearly not relevant, while retaining those that were clearly relevant but also those that were possibly relevant to the research question. Documents with titles or abstracts that fit any of the exclusion criteria were removed. Full-text screening was performed to refine the set of retained titles, using inclusion criteria established to answer our research question, except for 28 documents, which were not locatable using the library service at University of Queensland. Studies must satisfy all five criteria to be eligible for data extraction and synthesis.

The definitions for terminology used in these criteria are also listed in Table 1. Due to concerns regarding inter-country differences in alcohol consumption (Room et al., 2005), cultural differences in drinking (Rehm et al., 2004), and the potential that law enforcement practices are not generalisable to all populations (Burns, Flaherty, Ireland, & Frances, 1995), we proposed the need for current study to be tailored to Australian population and have excluded all international studies. In consideration of the eligible study designs, we have included all quasi-experimental study designs, as long as the study had taken a pre-intervention baseline measure in outcome for the purpose of difference-in-differences analysis on the intervention effect.

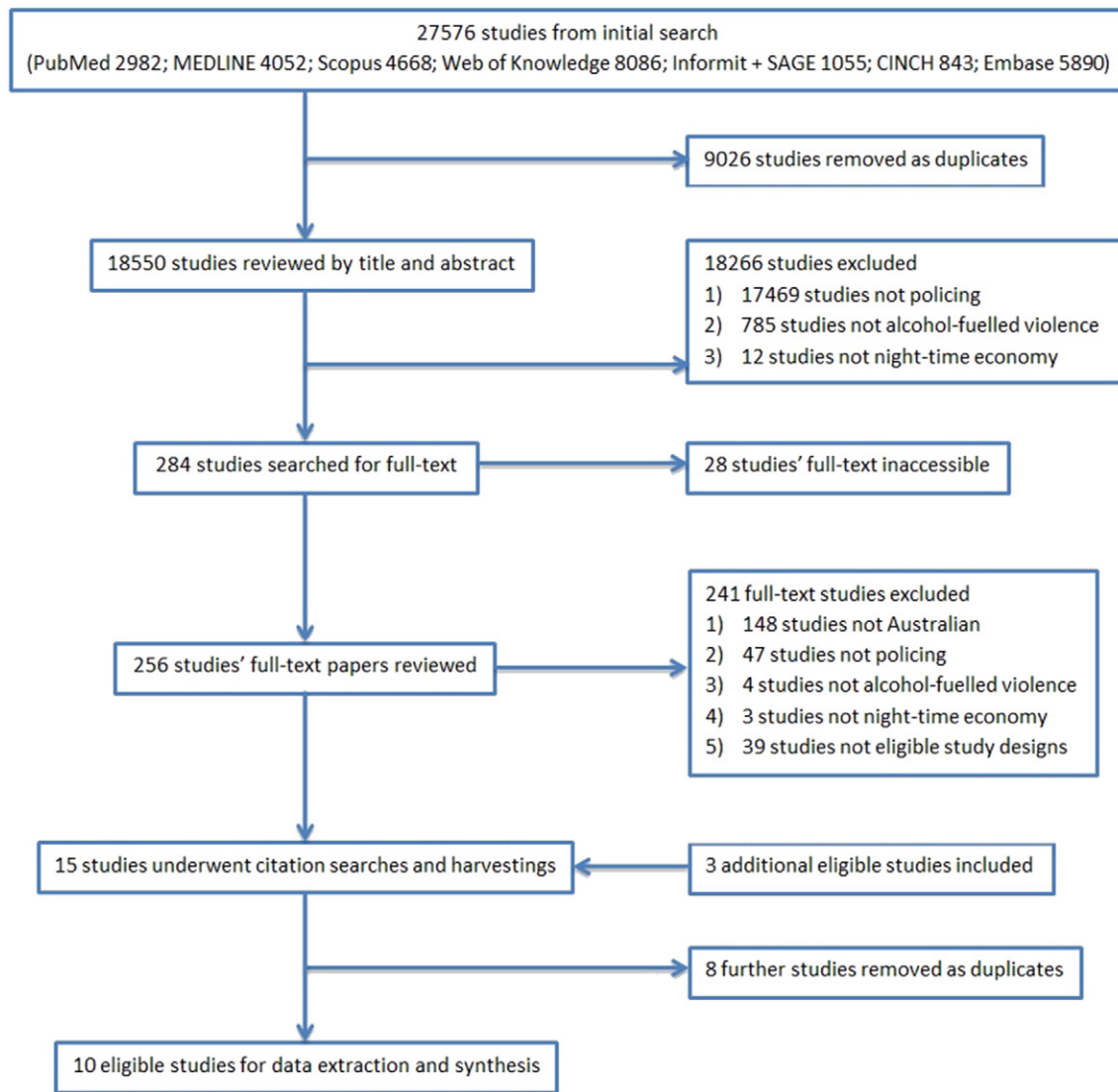


Fig. 1. Flow diagram of document searching and screening.

4.3. Quality assessment

Using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies, the quality of the eligible studies was assessed by the first and the second authors following the protocols set out by EPHPP (Effective Public Health Practice Project, 2010). This tool was considered the most suitable available, despite its

primary design to appraise interventions targeting individuals, where items such as selection bias and blinding are not appropriate for the assessment of studies on community interventions. Table 2 summarises the ratings of the quality assessment, and the findings of studies with overall weak ratings were interpreted with caution. Guidelines from National Health and Medical Research Council (NHMRC) were also utilised to define the level of evidence for the eligible studies and their overall

Table 1
Exclusion and inclusion criteria used.

Exclusion criteria for titles and abstracts	Inclusion criteria for full-text documents	Definition
Not policing interventions	The study evaluated policing intervention	Interventions that involved any form of police resources.
Not alcohol-related violence	The policing intervention targeted alcohol-related violence	Interpersonal conflicts occurring in the context of alcohol drinking.
Not night-time economy	The policing intervention was conducted in the night-time economy The study conducted in Australia The study used eligible study design	Night-time economy included any setting that was part of entertainment precinct, licensed events, or in and around licensed premises or venues including bars, hotels, and clubs where alcohol was served. Any studies, trials or projects conducted in Australian communities. Studies that used an impact evaluation methodology of experimental or quasi-experimental evaluation designs were considered eligible, including randomised control trials, regression discontinuity, multiple regressions, and matched control group, unmatched control groups, time series, and uncontrolled before and after tests.

Table 2
Quality assessment for eligible studies.

Study	NHMRC evidence hierarchy	Study design	Intervention group	Control group	Overall rating	Selection bias	Design	Confounders	Blinding	Data collection	Withdrawals
Burns et al. (1995)	II	Randomised controlled trial	Licensed premises in 5 Sydney metropolitan patrols	Licensed premises in 5 Sydney metropolitan patrols	Moderate	Moderate	Strong	Strong	Moderate	Weak	Not applicable
Felson et al. (1997)	III-2	Cohort analytic	Licensed premises in Greater Geelong	Licensed premises in Warrnambool, Mildura, Ballarat, Wangaratta and Morwell	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Hauritz et al. (1998)	IV	Cohort	Licensed premises in Mackay, Cairns, Townsville, and Surfers Paradise	No control	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Miller et al. (2014)	III-3	Interrupted time series	Licensed premises (≈ 30) in Geelong during high-alcohol hours	No control	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Navarro et al. (2013)	II	Randomised controlled trial	Licensed premises in 10 New South Wales communities	Licensed premises in 10 New South Wales communities	Strong	Moderate	Strong	Strong	Moderate	Moderate	Not applicable
New South Wales Audit Office (2008)	IV	Cohort	Licensed premises of 8 communities in NSW: Coogee, Lake Macquarie, City Central, Canobolas, Newcastle, Coffs Harbour, Parramatta, and Tweed/Byron	No control	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Queensland Audit Office (2013)	III-2	Cohort analytic	Licensed premises in Surfers Paradise, Fortitude Valley, and Townsville	Licensed premises in Broadbeach CBD and Brisbane CBD	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Smith et al. (2011)	III-2	Cohort analytic	Licensed premises of civic entertainment precinct in Canberra	Licensed premises in Manuka and Kingston	Weak	Moderate	Moderate	Weak	Moderate	Weak	Not applicable
Van Beurden et al. (2000)	IV	Cohort	118 bars and taverns in the north coast region of rural New South Wales	No control	Weak	Moderate	Moderate	Weak	Weak	Strong	Weak
Wiggers et al. (2009)	III-2	Cohort analytic	Licensed premises in Western/Central New South Wales, North/South Coast New South Wales, and Metropolitan Sydney	Licensed premises in Metropolitan Sydney, and post-intervened licensed premises in Western/Central New South Wales	Moderate	Moderate	Moderate	Weak	Moderate	Moderate	Not applicable

Abbreviations: NHMRC = National Health and Medical Research Council.

grade for recommendation (National Health and Medical Research Council, 2009).

4.4. Data extraction

Details of the included studies were examined and information was gathered on the type of intervention, intervention component, study design, sample description, and outcome. This review focused on interventions aimed at reducing alcohol-related violence in the night-time economy of Australia, where the definition of violence is guided by the World Health Organisation (Krug, Mercy, Dahlberg, & Zwi, 2002) as:

“The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation.”

Whilst the link between alcohol and violence is clearly evident, the exact science behind alcohol consumption and aggression remains elusive and multi-factorial with significant individual differences (Beck &

Heinz, 2013). There lacks specificity to define the level/type of alcohol consumption that will lead to alcohol-related violence. Policing interventions to reduce alcohol-related violence may have a number of direct and indirect outcomes: direct outcomes may measure the change in police recorded incidences of assaults at licensed premises and their surroundings; indirect outcomes may measure the change in the related presentations to hospital emergency department (ED) or maxillofacial trauma. Thus this review broadly included police data and hospital admissions of assaults under the influence of alcohol as outcome measures, which are relatively obvious in defining patrons as victims of alcohol-related violence. However in order to compensate the issue of under-reporting in alcohol-related violence (Doherty & Roche, 2003), we also included data from self-reports, peer-reports and practitioner reports on alcohol intoxication and associated aggressive behaviour in the night-time economy of Australia.

4.5. Synthesis

Information gathered was presented descriptively with meta-analysis not performed due to insufficient data reported by the included

studies for calculation of effect sizes and the absence of standardisation in statistical analyses between these studies. Policing interventions were categorised into front-line strategy, monitoring, regulation and enforcement strategy, and collaborative partnership using the following definitions:

- *Front-line strategy*: general duties and physical patrolling of police to make visible presences in and around licensed premises.
- *Monitoring, regulation and enforcement strategy*: police intelligence to regulate operation of licensed premises and to enforce policies.
- *Collaborative partnership*: strategies developed from police working with a range of stakeholders.

Before narrative synthesis of the result, eight more studies were excluded from the included studies as duplicates, as they were reporting the same data set, but at different research stages of the same interventions. A notable example was the series of Dealing with Alcohol-related harm and the Night-Time Economy (DANTE) project by Miller and his colleagues (Miller et al., 2011, 2014; Miller, Sønderlund, et al., 2012; Miller, Tindall, et al., 2012), where the study in 2014 (Miller et al., 2014) was included for its most complete analysis, while the others were excluded.

5. Results

Ten studies met the criteria for data extraction, and the findings were presented in Table 3. A total of 15 policing interventions were examined by the eligible studies, which were categorised into two front-line strategies, four monitoring, regulation and enforcement strategies, and nine collaborative partnerships. The overall quality of the included studies was poor with seven studies rated poor, two moderate and one strong. Two studies were randomised controlled trials in pairs of communities or entertainment precincts with matched demographics. Four studies had non-randomised intervention allocations with unmatched controls, and one study utilised interrupted time series. The remaining three studies were observational studies of uncontrolled before-and-after trials. Reported outcomes for alcohol-related violence included police-recorded assaults and hospital injury data, while two studies reported both hospital and police data. Miller et al. (2014) used hospital data on injury-related presentations to evaluate five policing interventions, and six studies only collected police data on assaults. Interestingly, Van Beurden, Reilly, Dight, Mitchell, and Beard (2000) used Alcohol Use Disorders Identification Test (AUDIT) scores in a police-assisted alcohol brief intervention program. No studies reported specific hospital presentations such as alcohol-related maxillofacial trauma to measure alcohol-related violence.

5.1. Front-line strategy

Operation Nightlife 1 was one of five policing interventions in Geelong that Miller et al. (2014) evaluated using interrupted time series and autoregressive integrated moving average (ARIMA) model analysis on the injury-related ED presentations at Barwon Health Geelong Hospital. Operation Nightlife 1 was launched in January 2007 for licensed premises in Geelong, aiming to reduce alcohol-related violence by introducing maximum police visibility during high-risk hours (Miller et al., 2014). Miller and his colleagues found a non-significant decrease of 0.10 ($P = 0.452$) in ED presentations per 10,000 population for Operation Nightlife 1 (Miller et al., 2014).

In 1992, Burns et al. (1995) examined the effectiveness of increased police visits by two to three times a week to licensed premises of known “trouble-spots” in five experimental geographically based units called patrols. They aimed to heighten the supervision of New South Wales (NSW) Liquor and Registered Clubs Acts with emphasis on policing irresponsible services to the underage and to the intoxicated patrons. This

study showed robust study design in randomised allocation of experimental patrols which were analysed in pairs with matched controls in population, ethnicity, socioeconomic status, and employment status. However the trial was limited by its short intervention period of 2 months in an overall study period of 6 months (Burns et al., 1995). Overall this intervention showed no significant impact in the assault rate, despite an increase was observed in police-recorded assaults during intervention period, while assault-related hospital admissions had a decrease (Burns et al., 1995). No post-intervention hospital data was available without any explanation provided, and no statistical significances were detected on chi-squared tests ($P > 0.05$).

5.2. Monitoring, regulation and enforcement strategy

ID Scanners and Risk-Based Licensing were enforcement interventions in Geelong and examined in the same fashion as Operation Nightlife 1 (Miller et al., 2014). ID Scanners has been operational since October 2007 which provided improved police intelligence to enforce regulation on underage drinking by detecting and banning patrons with fake IDs in Geelong entertainment precinct (Miller et al., 2014). Risk-Based Licensing was implemented more recently in January 2011 which aimed to differentiate between venue types, trading hours and sizes by enforcing new licensing regime, where police can increase on-the-spot fines for license breaches at their discretion (Miller et al., 2014). Miller et al. (2014) observed a significant increase of 0.77 ($P < 0.001$) in injury-related ED presentations per 10,000 population for ID Scanners and a non-significant increase of 0.12 ($P = 0.548$) for Risk-Based Licensing.

Smith et al. (2011) analysed the effectiveness of Responsible Liquor Licensing Project as part of Australian Capital Territory (ACT) police's response to alcohol-related crime in the entertainment precincts of central business district (CBD) in Canberra over the summer period of 2009–2010 with direct comparison to the entertainment precincts of Manuka and Kingston. The project aimed to educate problematic premises identified, facilitate and enforce responsible liquor licensing through four key stages with education, workshop for licensees, pre-arranged visits for feedbacks and concerns for building positive relationship with licensees, and police enforcement visits with officers of regulatory services during high-risk hours (Smith et al., 2011). However, no significant change in the assault rate was observed, and 12 of the 43 licensed premises trialled still breached the Liquor Act during the enforcement stage (Smith et al., 2011).

Alcohol Linking Program was evaluated in 3 sequential trials of Western/Central NSW, North/South Coast NSW, and Metropolitan Sydney (Wiggers, Radvan, Dalton, Valentine, & Nichols, 2009). The program was an intelligence-led policing intervention with Data Recording Intervention for risk stratification of licensed premises to deliver three levels of Premises Intervention (Wiggers et al., 2009). Data Recording Intervention involved structured information gathering by police 4–6 months prior to Premises Intervention on the number of attended incidents, where level 1 was given to licensed premises with no incidents, level 2 for ones with irregular incidents, and level 3 for consistent trends of incidents (Wiggers et al., 2009). Premises Intervention escalated from police sending warning letters to licensees explaining the initiative (level 1) to police reporting identified incidents to licensees (level 2), and finally to police visiting licensees for covert audits, feedbacks and recommendations (level 3) (Wiggers et al., 2009).

Data Recording Intervention was active for majority of the time throughout the trial period of 4 years, while Premises Intervention was implemented in three periods of 7–8 months from year 2002 to 2004 (Wiggers et al., 2009). While the outcome of first experimental area (Western/Central NSW) was analysed in comparison to not yet trialled Metropolitan Sydney, this first experimental area was then used as the study control for the subsequent two trials of North/South Coast NSW and Metropolitan Sydney (Wiggers et al., 2009).

Table 3
Summary of policing interventions identified.

	Study	Study rating	Intervention integrity			Outcomes				
			Description	Consistency	Contamination	Hospital admission	Police recorded assault	P-value	Comments	
Front-line strategy	Miller et al. (2014)	Weak	Operation Nightlife 1: maximum police visibility during high-risk hours.		Can't tell	Yes	↓ 0.10 per 10,000		0.452	95% CI (− 0.37, 0.17)
	Burns et al. (1995)	Moderate	Scheduled visits to experimental licensed premises by two uniformed police two to three times per week.		Yes	No	↓	–	>0.05	Significant increase in assaults during intervention phase with no overall significant difference.
Monitoring, regulation and enforcement strategy	Miller et al. (2014)	Weak	ID Scanners: detection of fake IDs with record to ban identified people from the nightlife precinct.		Can't tell	Yes	↑ 0.77 per 10,000		<0.001	95% CI (0.56, 0.98)
			Risk-Based Licensing: new licensing regime with increased fees for breaches that differentiates between venue operations.		Can't tell	Yes	↑ 0.12 per 10,000		0.548	95% CI (− 0.27, 0.51)
	Smith et al. (2011)	Weak	Responsible Liquor Licensing Project: intelligence gathering, education, licensee training, enforcement with visible police presence during high alcohol periods.		Yes	Can't tell		–		Short-term decrease in assaults with no overall change. No statistical analysis performed.
	Wiggers et al. (2009)	Moderate	Alcohol Linking Program: police education of letters, reports, covert audits and follow-up feedback visits to licensees based on the alcohol intelligence information collected from improved police recording.	Western/Central NSW	Yes	No		↓ 9.2%	0.0006	Control = ↑ 6.8%
	North/South Coast NSW	Yes		Yes		↓ 13.3%	0.0007	Control = ↑ 0.3%		
	Metropolitan Sydney	Yes		Yes		↑ 4.4%	0.5192	Control = ↑ 6.9%		
Collaborative partnership	Miller et al. (2014)	Weak	Night Watch Radio Program: improved communication between security staff, street cleaners and CCTV operator via radio with police		Can't tell	Yes	↓ 0.07 per 10,000		0.593	95% CI (− 0.30, 0.17)
			Operation Nightlife 2: renewed focusing of police resources and enforcement of liquor licensing laws with improved radio contact between police and licensees and fines for drunkenness and rowdy behaviour.		Can't tell	Yes	↓ 0.04 per 10,000		0.779	95% CI (− 0.34, 0.26)
	Navarro et al. (2013)	Strong	Co-ordinated effort between local councils, local media, alcohol licensees, liquor accords and the police (increase visibility) targeting problematic weekends in communities of NSW.	Problematic weekends	Yes	Yes		↑ 1%	0.96	IRR = 1.00; 95% CI (0.66, 1.53)
		Non-problematic weekends		Yes	Yes		↓ 19%	0.01	IRR = 0.81; 95% CI (0.71, 0.93)	
	Queensland Audit Office (2013)	Weak	Drink Safe Precincts: coordination of multiple government agencies and police to provide safer drinking environment, law enforcement, increased and high-visibility policing in entertainment precincts.	Surfers Paradise	Can't tell	Can't tell	–	↓ 23.3%		No statistical analysis performed
		Fortitude Valley		Can't tell	Can't tell	↓ 2.2%	↑ 6.7%			
		Townsville		Can't tell	Can't tell	↑ 11.1%	↓ 28.9%			
	New South Wales Audit Office (2008)	Weak	Alcohol-Response Taskforce: OLGR collaboratively work with police and licensees to provide education and enforcement to target areas in 8 communities of New South Wales.		Can't tell	Can't tell		↑ in 3/8 – in 1/8 ↓ in 4/8		Overall no change in assaults rates in New South Wales. No statistical analysis performed.
Van Beurden et al. (2000)	Weak	Operation Drinksafe: information stands in bars and taverns using uniformed police officer and health educator to provide alcohol brief intervention to patrons.		Yes	No			<0.005	↓ 15% in AUDIT scores. ↓ 19% in binge drinking rates.	
Hauritz et al. (1998)	Weak	Community Forum, Code of Practice, and Task Groups from partnership of research team, council, Queensland Health, police, community and business groups.	Community Safety Action Projects	Can't tell	No		↓ 81.2%	0.000	No control	
	Surfers Paradise Safety Action Project		Can't tell	No		↑ 79.4%	0.440	No control		
Felson et al. (1997)	Weak	Geelong Accord: cooperation between police, Liquor Licensing Commission and republicans with twelve policies to contain alcohol consumption within safer settings.		Can't tell	No		↓ 37%		No statistical analysis performed	

Abbreviations: – = no change relative to control/baseline; ↑ = increase relative to control/baseline; ↓ = decrease relative to control/baseline; NHMRC = National Health and Medical Research Council; NSW = New South Wales; OLGR = Office of Liquor, Gaming and Racing; AUDIT = Alcohol Use Disorders Identification Test; IRR = Incidence Rate Ratio; CI = confidence interval.

For trials in Western/Central NSW and North/South Coast NSW, 9.2% ($P = 0.0006$) and 13.3% ($P = 0.0007$) reductions in the number of alcohol-related assaults were reported respectively (Wiggers et al., 2009). On the other hand, alcohol-related assaults increased in both experimental and control areas during the third trial, but no statistical significance ($P = 0.5192$) was found and a greater increase of alcohol-related assaults was observed in the study control (Western/Central NSW 6.9% vs. 4.4% in experimental Metropolitan Sydney) (Wiggers et al., 2009).

5.3. Collaborative partnership

Night Watch Radio Program (NWRP) and Operation Nightlife 2 are the two remaining policing interventions in Geelong that were evaluated with the interrupted time series study by Miller et al. (2014). NWRP utilised radio network to provide coordinated action between security staff, street cleaners, closed-circuit television operators and police (Miller et al., 2014). While NWRP was implemented in March 2007, Operation Nightlife 2 was then launched in June 2009 which evolved from NWRP to include radio network between police and licensees for better communications and early notifications of problematic patrons (Miller et al., 2014). Operation Nightlife 2 also introduced new fines for patrons with rowdy behaviour and drunkenness (Miller et al., 2014). NWRP and Operation Nightlife 2 showed reductions of 0.07 ($P = 0.593$) and 0.04 ($P = 0.779$) in injury-related ED presentations per 10,000 population respectively (Miller et al., 2014).

Navarro et al. (2013) examined a multi-component intervention in a prospective, matched-paired randomised controlled trial of 20 rural communities in NSW. The communities were matched on risk factors for alcohol-related violence which were the proportion of males, ages between 15 and 24 and Aboriginal and Torres Strait Islanders (Navarro et al., 2013). Random allocation was applied to assign one of the paired communities as experimental groups (Navarro et al., 2013). The intervention aimed to target problematic weekends identified in each experimental community by the definition of weekends in top 30% above the average number of alcohol-related assaults from 2001 to 2007 (Navarro et al., 2013). With a coordinated effort between local councils, local media, alcohol licensees, liquor accords and the police, Navarro and his colleagues evaluated the effectiveness of warning letters to licensees from the Mayor's office, raising awareness on alcohol-related violent crime by local media, and increased police visibility (Navarro et al., 2013). The intervention was trialled over a period of 19 months from May 2008 to December 2009, and no change was observed in the incidents of alcohol-related assaults during problematic weekends when comparing experiment communities to the controls with Incidence Rate Ratio (IRR) of 1.00 (Navarro et al., 2013). However a significant reduction of 19% (IRR = 0.81; $P = 0.01$) in alcohol-related assaults was found in non-problematic weekends between the experimental and the control communities (Navarro et al., 2013).

Drink Safe Precincts trial sought to reduce alcohol-related violence through partnerships of Department of Justice, Attorney-General, Queensland Police Service, Department of the Premier, Department of Communities, Child Safety and Disability Services (Queensland Audit Office, 2013). The key components of the trial included: increased high-visibility of police; enforcement of liquor licensing laws; provision of support, rest and recovery services; and coordinated services between venues, police, ambulance, community support services and transport providers (Queensland Audit Office, 2013). Drink Safe Precincts was active in Surfers Paradise, Fortitude Valley and Townsville for 33 months from December 2010 to September 2013 (Queensland Audit Office, 2013). Broadbeach CBD and Brisbane CBD were used as unmatched controls for comparison with Surfers Paradise and Fortitude Valley, respectively (Queensland Audit Office, 2013). While the trial reported mixed responses in the rate of alcohol-related hospital presentations, there was an overall decrease in the police recorded assault rate (Queensland Audit Office, 2013). However no analysis was performed to determine their statistical significance (Queensland Audit Office, 2013).

In 2007, Alcohol-Response Taskforce was introduced by Office of Liquor, Gaming and Racing (OLGR) in NSW, using data on alcohol-related crime to target high-risk areas for intervention (New South Wales Audit Office, 2008). OLGR worked closely with licensees to provide education on the responsible service of alcohol and the licensing laws through workshops, liquor accord meetings, bulletins, newsletters, and the local media for the public (New South Wales Audit Office, 2008). In partnership with the local police, OLGR also conducted audits on licensees to identify problems and to recommend changes (New South Wales Audit Office, 2008). Alcohol-Response Taskforce was implemented in a total of eight communities over periods of 4–12 months (New South Wales Audit Office, 2008). The per cent change in assaults on licensed premises was measured before and after the intervention in these eight communities (New South Wales Audit Office, 2008). Three communities of Coogee, Lake Macquarie, and City Central trialled for 12 months showed increased assault rates of 21%, 26% and 1% respectively, while Canobolas showed no change in the assault rate after 12 months of intervention (New South Wales Audit Office, 2008). The remaining four communities of Newcastle, Coffs Harbour, Parramatta, and Tweed/Byron with intervention periods of 4–7 months showed reductions of 16%, 33%, 14% and 4% in assault rates respectively, but statistical analysis was not performed for these findings (New South Wales Audit Office, 2008).

From November 1994 to May 1995, Operation Drinksafe, an alcohol brief intervention program for drinkers in bars and taverns, was trialled by van Beurden et al. (2000). The program provided opportunistic alcohol brief intervention in the community by a health educator with the assistance of a police officer in 118 bars and taverns of rural NSW (van Beurden et al., 2000). The participating patrons completed the 10-item AUDIT and also underwent blood alcohol concentration (BAC) testing on breath analysis instrument (van Beurden et al., 2000). AUDIT scores and BAC readings were then utilised to provide a personalised risk assessment for the participants with education and information given on alcohol harm prevention (van Beurden et al., 2000). Referrals to the drug and alcohol services were also provided to people who had alcohol problems (van Beurden et al., 2000). In a 12 months' follow-up of 53% of the surveyed samples, there were 15% decrease in AUDIT scores ($P < 0.005$) and 19% decrease in monthly binge drinking frequency ($P < 0.005$) (van Beurden et al., 2000).

Surfers Paradise Safety Action Project was implemented in 1993, involving a collaboration of the council, the department of Queensland Health, the university research team, the police force, the community, and the business groups (Hauritz et al., 1998). The project encouraged Surfers Paradise to take ownership of its alcohol-related problems with representative steering committees in the community forum (Hauritz et al., 1998). The forum and the nightclub managers introduced Code of Practice, regulating the operation of licensed venues and ensuring the safety of the night-time economy through risk assessments and community-based monitoring via police enforcements (Hauritz et al., 1998). On the other hand, Community Safety Action Projects are replicas of Surfers Paradise Safety Action Project for Mackay, Cairns and Townsville (Hauritz et al., 1998). Hauritz et al. (1998) reported significant decrease of 81.2% ($P = 0.000$) in physical assaults for Community Safety Action Projects, while there was a non-significant increase of 79.4% ($P = 0.440$) for Surfers Paradise Safety Action Project. This increase of physical assaults in Surfers Paradise is a reflection of the fact that although Surfers Paradise Safety Action Project was effective during the experimental period (Homel et al., 1997), data collected two years post experiment by Hauritz et al. (1998) showed that compliance with the code has virtually ceased, and violence has returned to its pre-intervention level. Indeed, licensees failed to comply with the code because it was not commercially viable for them when their competitors did not comply either, and enforcement of the code by the liquor licensing authority also did not occur (Mazerolle, White, Ransley, & Ferguson, 2012).

Geelong Accord was a cooperative effort involving the police, Liquor Control Commission and the hotel licensees to stop "pub hopping" by

means of entry and exit controls to reduce alcohol-related violence on the streets of licensed premises in Geelong (Felson et al., 1997). In 1989–1990, the police took on the main leadership role of Geelong Accord for the development of policies to restrict bar entries, reduce alcohol availability at licensed venues, enforce bylaws against drinking on the streets, and provide safer drinking environment (Felson et al., 1997). Felson et al. (1997) evaluated this Accord by comparing police data on serious assaults from Greater Geelong against Warrnambool, Mildura, Ballarat, Bendigo, Wangaratta and Morwell. Four years after the implementation of Geelong Accord, Geelong, a city known for its high level of crime, had 37% less assault rate than the other six Victorian cities, but the statistical significance of this finding was undetermined (Felson et al., 1997).

6. Discussion

At the outset, what is most striking is the limited number of robust published studies on the evaluation of police-based policies for the reduction of alcohol-related violence in the night-time economy. Majority (72%) of Australian studies evaluating policing interventions on alcohol-related violence in and around licensed premises was excluded due to their study designs focussing on the aspects of why, how and for whom, rather than what works. Despite the extensive literature describing police policies, we found the studies on policing interventions were more commonly composed of qualitative materials with a relative paucity of quantitative studies evaluating their effectiveness. The fact that there were only two studies with randomised controlled trials demonstrated the complexity of practical and theoretical aspects in policing interventions. There were also disproportionately higher numbers of studies (70%) reporting the outcomes of the collaborative partnership approach, which is consistent with Fleming's finding in recent trend of an increasing emphasis on the multi-component interventions with the police in the partnerships of many important stakeholders (Fleming, 2008).

The evidence for front-line policing strategy was initially demonstrated by Jeff and Saunders' (Jeffs & Saunders, 1983) landmark study in 1978, where a significant decrease in police arrests was observed with enhanced police visits to an English seaside resort of Torquay. Following this success, Burns et al. (1995) sought to repeat the same experiment to support the effectiveness of front-line policing in Australia. However conflicting results of increased police-recorded assaults were found during the intervention period. This discrepancy observed between the Torquay and the Sydney studies could be due to the fact that the residential communities of Sydney were inherently different to the resort town tourism of Torquay, resulting in different responses to increased police activities (Burns et al., 1995).

Secondly, the increased general duties of police would have allowed police to have increased opportunity to record offences comparing to their normal practice (Burns et al., 1995). This was reflected in the report by Burns and her colleagues on decreased assault-related hospital admissions during the intervention despite the observation of increased police-recorded assaults (Burns et al., 1995). This implies that hospital data could potentially be more reliable in detecting interventions' impact on alcohol-related violence than police-recorded data when the intervention itself is the increased police duty. This notion also seems to be supported by the observation made by Miller et al. (2014), where decreased injury-related ED presentations were found with front-line policing strategies. However neither of the reduced hospital admissions in these two studies was statistically significant to conclude that front-line policing effectively works.

Traditionally, front-line policing primarily revolves around reactive policing where police responds to incidents already occurred. Unfortunately the incident-driven nature of front-line policing limits the opportunity for individual and organisational identification of risk factors that contribute to violent crime, intoxication disorder, and associated harm. Front-line policing can often result in repeated attendances at same

licensed venues, leading to frustration at not solving the problem (Doherty & Roche, 2003). Consequently, responding police officers can undervalue their roles as educators by enforcement and de-emphasise any positive responses (Doherty & Roche, 2003). In contrast, interventions that utilised monitoring, regulation and enforcement strategies have the potential to facilitate prevention of alcohol-related incidents by involving police resources in a problem-orientated or proactive approach.

Braga et al. (1999) described problem-orientated policing to places, where police officers take proactive roles in identifying, understanding and responding pre-emptively to violent places in the communities, instead of the traditional reactive policing where the police officers patrol and make arrests. The same principle can be applied in policing interventions for licensed venues with high incidents of alcohol-related violence, where proactive policing can occur in various forms, such as educations, warning letters, or audits to high-risk drinkers and non-compliant licensees. Indeed, the success exhibited in the Torquay trial of Jeff and Saunders (Jeffs & Saunders, 1983) could also be the proactive measures police has taken, where licensees were given sufficient warnings of the upcoming interventions and reminded them of their responsibilities under the licensing legislation. This may explain why they observed a significant reduction in the police arrests, while Burns et al. (1995) observed increased police arrests when the licensees in Sydney did not receive pre-warnings for the increased police duties and their presence.

Proactive policing relies heavily on intelligence to guide problem-solving activities, where analysis of crime trends associated with alcohol-related violence would help police officers to identify licensed 'hot spots', rogue licensees, crowd controllers and problem drinkers (Doherty & Roche, 2003). The Intelligence-led policing can therefore be an effective tool for problem-solving, allowing operational police responses to be proactively developed to reduce the incidence and/or seriousness of alcohol-related violence by limiting the opportunity to offend and disrupting the progress of criminal behaviours. Both Alcohol Linking Program and Responsible Liquor Project are examples of proactive strategies identified in this study. Through enhanced police intelligence of recording and targeting high-risk premises, Alcohol Linking Program allowed police officers to prevent further escalation of violence via intensified Premises Intervention to the high-risk licensees. While Wiggers et al. (2009) reported significant reductions of the alcohol-related assaults in the first two experimented areas, their overall findings were inconsistent and were limited by their methodological shortcoming in using the already intervened licensees of Western/Central NSW as the study control. Conversely, Responsible Liquor Licensing Project showed no benefit in the ACT police's effort to educate and train licensees, and to provide enforcement visits to the licensed premises of Canberra CBD.

In a NSW police survey by Smith, Wiggers, Considine, Daly, and Collins (2001), majority of officers believed that alcohol servers are responsible for preventing intoxication (93%) and that education rather than enforcement of licensees is the most effective way to ensure compliance with the Liquor Act (67%), but more than half of police officers (59%) thought such role would be better undertaken by other agencies. This is explained by the fact that almost half of police officers (45%) felt themselves lack the necessary skills to monitor the responsible service practices of licensed premises, while 83% of officers considered insufficient resources and time were allocated to monitoring, educating and enforcing the responsible service of alcohol (Smith et al., 2001). This is reflected in our results where other stakeholders such as OLGR, local councils, and community members would take on such roles when the police are involved in collaborative partnerships with them. For example, OLGR in Alcohol-Response Taskforce conducted proactive strategies to disseminate the information on responsible alcohol service to the licensees and the public, where police would only use enforcement as the primary means to educate licensees in comparison (New South Wales Audit Office, 2008).

Another barrier for police to initiate proactive interventions is the problematic reliance on police data as a single source of intelligence, which can be incomplete due to structural and behavioural reasons (Doherty & Roche, 2003). Studies that employ police data can be at risk of measurement bias due to a number of factors known to interfere with police's willingness and ability to collect intelligence (Doherty & Roche, 2003). Under-reporting by victims of alcohol-related violence can occur due to fear of reprisals, social costs in reporting violence, social stigma, habituation to violence and perceptions of unidentifiable assailants (Clarkson, Cretney, Davis, & Shepherd, 1994). Staffs at licensed premises can also avoid reporting incidents onsite for fear of trade restriction, while police officers may manipulate own data since recorded crime data are the primary performance indicator for themselves (Jones, Kypri, Moffatt, Borzycki, & Price, 2009). Additional intelligence sources such as National Drug Strategy Household Survey and hospital injury data have been suggested to supplement police data to guide policies, projects and operational responses to reduce alcohol-related problems in the licensed drinking environments (Doherty & Roche, 2003; Miller et al., 2014; Sutherland, Sivarajasingam, & Shepherd, 2002).

Data on hospital admissions have the advantage of providing a reliable continuous source of information on victimisation of alcohol-related violence. However, it is dependent on hospital policies and treating physicians, as the location of injury and involvement of alcohol may not always be automatically recorded for each injury-related hospital presentation (Queensland Audit Office, 2013; Sutherland et al., 2002). With oral and maxillofacial surgeons already at the frontline managing victims of violent crime, Warburton and Shepherd (2002) have outlined the importance of the surgeons' role in interagency violence prevention by working with researchers to ensure high-quality evaluations and raising public awareness by drawing attention to the problem – disfigurement of victims, cost to health services, psychological problems, and violence presented to ED. A subsequent study by Warburton and Shepherd (2006) also demonstrated the potential benefits of a policing intervention that is prompted by structured ED assault data collection on precise assault locations and enhanced by educational visits to high-risk licensees from ED and maxillofacial consultants. Intervention in the two clubs involving both educational visits and policing was associated with significantly greater assault reduction, when compared with that achieved through policing intervention alone in nine other high-risk clubs (Warburton & Shepherd, 2006).

With regards to collaborative partnerships, despite the increasing support of this multi-component approach, our result showed significant inconsistency in the evidence presented. Direct comparison of the nine identified interventions in collaborative partnerships had not been possible, due to the heterogeneity of these strategies with different stakeholders and types of partnerships, which employed resources at various levels. While NWRP, Operation Nightlife 2, Community Safety Action Projects, and Geelong Accord showed trends for potential benefits in preventing alcohol-related violence, interpretation of these results is limited due to their study designs with lack of appropriate controls and/or lack of statistical significance. The only high-quality study was the multi-component intervention trialled by Navarro et al. (2013), which showed possible displacement of the intervention's benefits from problematic to non-problematic weekends. However this observation could also be the consequence of the broader Alcohol Action in Rural Communities project (Shakeshaft et al., 2012), a community action project of 13 interventions in a prospective randomised controlled trial which Navarro and his colleagues' study was nested in (Navarro et al., 2013).

Since the recognition of the association between alcohol-related violence and excessive binge-alcohol consumption (McLeod, Stockwell, Stevens, & Phillips, 1999; Shepherd, Robinson, & Levers, 1990), alcohol brief interventions have been widely incorporated into primary healthcare settings with evidence supporting their effectiveness in bringing about positive behavioural changes (McQueen, Howe, Ballinger, & Godwin, 2015; Smith, Hodgson, Bridgeman, & Shepherd,

2003). Operation Drinksafe was an innovative intervention that adapted brief interventions for use in 'the real world'. With convenient sampling of patrons from licensed premises, the ten AUDIT questions and blood alcohol concentration readings were able to readily identify high-risk individuals, where over half of patrons were consuming alcohol in the hazardous range and 5% had either sustained or caused alcohol-related injury during the past year (Reilly et al., 1998). From a police perspective, the Drinksafe initiative was an example of community policing that complemented law enforcement for breaches of licensing laws. Thus, this collaborative partnership approach demonstrated significant potential in dealing with alcohol-related violence, that was also well-accepted by licensees and their patrons (Reilly et al., 1998).

Geelong Accord consisted one of the first initiatives that have attempted to reduce harm and alcohol supply by controlling bar entries with cover charges for entry after 11 p.m. and denial of free re-entry (Felson et al., 1997). Geelong Accord aimed to discourage 'pub hopping', which subsequently reduces the chances for interpersonal violence to occur. However, this initiative only deters patrons at best, in comparison to the lockout policies, which restrict alcohol availability and remove patrons by requiring licensees to close earlier and disallowing any entries to venues after the set time (Kypri, Mcelduff, & Miller, 2014; Mazerolle et al., 2012; Miller, Coomber, Sonderlund, & Mckenzie, 2012; Palk et al., 2010). The lockout policies have been developed from the observed evidence that escalated alcohol-related violence were closely correlated to increased liquor trading hours (Chikritzhs & Stockwell, 2002; D'abbs, Forner, & Thomsen, 1993; Stockwell & Gruenewald, 2004). The lockout strategy has gained considerable support over the last decade and seemed to have only been utilised as a crime prevention measure within Australia with few studies that have evaluated its individual impact on alcohol-related harm (Palk et al., 2010).

While Kypri et al. (2014) found a sustained lower assault rate by restricting closing time for licensed premises of the New Castle CBD in NSW, they failed to find any benefits with another lockout policy in Hamilton, a nearby suburb to the New Castle CBD. Inconsistent results were also present in other Australian states, where Miller, Coomber, et al. (2012) showed no discernible long-term impact with the lockout intervention in Ballarat, Victoria, and Palk et al. (2010) observed a potential trend of reduced assault rate with the introduction of a lockout policy in Gold Coast, Queensland. Interestingly, Mazerolle et al. (2012) found the lockout had no impact on violence around the licensed premises, despite the impressive result of lockouts cutting the level of violent crime inside the licensed premises by half. Similar to our findings with policing interventions, majority of lockout policies were evaluated using uncontrolled study designs, and there remains a need for further research on these commonly used interventions (Kypri et al., 2014).

In comparison to previous reviews, current study was consistent in finding the methodological shortcomings of studies evaluating policing strategies, and the evidence base to recommend these interventions on is weak (Brennan et al., 2011; Jones et al., 2011). We also failed to validate the key finding by Doherty and Roche's research on intelligence-led, proactive policing being the most effective form of policing (Doherty & Roche, 2003). While studies in the United States of America showed significant benefits with police enforcement on underage drinking and sale refusals, these impacts appeared to be short-lived (Mcknight & Streff, 1994; Wagenaar, Toomey, & Erickson, 2005). On the other hand, studies that evaluated the Tackling Alcohol-related Street Crime (TASC) project in the United Kingdom supported Alcohol Linking Program with evidence that high-level policing in high-risk premises identified from ED assault data was more effective than low-level policing (Maguire & Nettleton, 2003; Warburton & Shepherd, 2006). However, like Alcohol Linking Program, the evidence base of these studies on the TASC project is limited by their low-quality study designs.

Following the NHMRC guideline for recommendations on policies (National Health and Medical Research Council, 2009), we found that while the policing interventions included in the result would be

generalisable and applicable to the night-time economy in Australian context, but their body of evidence only provided some support for recommendation and care should be taken in their application (Grade C). This is primarily because of the inconsistency and the moderate impact found in the results of the included studies. When assessed in the individual category of policing interventions, we found the evidence remains supportive for the collaborative partnership approach (Grade C), while the body of evidence is weak for front-line policing, and monitoring, regulation and enforcement strategies (Grade D). For the latter two categories, recommendations must be applied with caution, due to limited studies evaluating their effectiveness with significant inconsistency in their findings and the restricted impact of their interventions on alcohol-related violence.

Overall, current study found no evidence that policing interventions were effective in reducing alcohol-related violence in and around licensed premises, especially when the only two randomised controlled trials in our result also failed to demonstrate significant reductions in alcohol-related assaults from their interventions. The inherent weakness of poor-quality study designs in the seven included studies limits any inferences that could be made from them, because of their limitations to attribute any intervention effects in the absence of appropriate control groups and their inability to reject observed findings by chance without appropriate statistical analyses. There is also a lack of long-term evaluation for policing interventions, which can be a concern, knowing the poor sustainability of Surfers Paradise Safety Action Project.

As part of the ethical obligations in implementing public health interventions, authorities should ensure structured evaluative designs are in place for any ongoing policing policies. For example, randomised controlled trials, standardised data collections and appropriate analyses are highly recommended. Research collaboration with oral and maxillofacial surgeons may also offer better surveillance of these policies, since they are the lead specialty dealing with the traumatic outcomes of alcohol-related violence. However this review is limited by its restricted scope within Australia, and is subject to selection bias by not searching for grey literatures in our methodology. Thus the findings of this review may be partial and would have limited application outside Australia.

7. Conclusion

Current study did not find convincing evidence in the application of policing interventions to prevent alcohol-related violence in the night-time economy. Future evaluations of policing interventions in addressing alcohol-related violence should focus on using more appropriate and robust methodologies. While appropriate to capture both the quality and quantity of events, police alone are not a reliable single source of intelligence, particularly when the intervention involves increased general duty of police officers. Potentials from police working in collaborative partnerships with other agencies showed that finely grained contextual responses are needed to alcohol-related violence rather than a one-size-fits-all approach.

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Contributors

Timothy Liu and Angela Higginson designed the study and wrote the protocol. Timothy Liu and Jason Ferris conducted literature searches and screening for eligible studies. Timothy Liu performed qualitative analysis of the results, while Jason Ferris and Anthony Lynham supervised the

analysis. Timothy Liu wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Competing interests

All authors declare that they have no competing interests.

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