

Effectiveness of community-based interventions for reducing alcohol-related harm in two metropolitan and two regional sites in Victoria, Australia

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Abstract

Introduction and Aims. The relationship between alcohol intoxication and harm is well known, and many community-based interventions have been introduced in an attempt to reduce the rates of alcohol-related harm. The current paper uses two metropolitan and two regional Australian cities as sites to investigate the impact of community-based interventions on the reduction of alcohol-related harms. **Design and Methods.** Data for injury-related emergency department (ED) presentations and police attended assaults during high-alcohol hours (i.e. 20:00–06:00 h, Friday and Saturday nights) were obtained for each site from 2000 to 2015 for ED presentations and from 2000 to 2016 for police assaults. Autoregressive integrated moving average time series analyses were conducted to determine the impact of the community-based interventions introduced at each site for reducing these rates of ED injury presentations and police attended assaults. **Results.** None of the community-level interventions that were introduced across the four sites resulted in a reduction in ED presentation rates or assault rates. **Discussion and Conclusions.** The majority of interventions introduced across the four sites were proposed and implemented by local liquor accords. Given none of the interventions demonstrated a reduction in ED injury presentation rates or police attended assault rates, it is argued that local liquor accords may not be best placed to propose alcohol-related harm reduction measures, and instead, there should be a focus on the implementation of evidence-based regulatory strategies, such as restricted trading hours. [Curtis A, Coomber K, Droste N, Hyder S, Palmer D, Miller PG. Effectiveness of community-based interventions for reducing alcohol-related harm in two metropolitan and two regional sites in Victoria, Australia. *Drug Alcohol Rev* 2017;36:359–368]

Key words: alcohol, alcohol-related harm, intervention.

Introduction

The combined social cost of alcohol and illicit drug use in Australia is approximately AUD55.2bn a year [1]. In 2007, almost two-thirds of Australian men who were physically assaulted said that the perpetrator had been drinking or taking drugs, and 28% of victims had been consuming alcohol or drugs themselves [2]. Almost half of women physically assaulted and 84% of women who were sexually assaulted said that the perpetrator had been drinking or taking drugs [2]. Of those reporting involvement in aggressive encounters in night-time entertainment precincts, 88% had consumed alcohol prior to the incident [3].

While there is some evidence for successful strategies for reducing alcohol-related harm, including trading

hour and sale restrictions [4–9], these require implementation at a state level, which requires agreement among all relevant parties, which is not often reached. In the absence of such political will, many community-based interventions have been introduced by local government and local liquor accords in an attempt to reduce alcohol-related harm. A ‘liquor accord’ combines persons from local businesses (particularly licensees), council, police, local government and government agencies and community agencies, in a voluntary partnership with the intention of developing solutions to alcohol-related problems [10]. Liquor accords are primarily an Australian intervention, although New Zealand has ‘alcohol accords’, but these have not received any formal evaluation.

There have been community-based interventions implemented to reduce alcohol-related harm internationally

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with some success reported. The Stockholm Prevents Alcohol and Drug Problems (STAD) project was a multi-component approach to reduce public drunkenness, alcohol-related violence and to create a safer night-time economy in Stockholm [11]. Key components of the program were the responsible service of alcohol (RSA) programs aimed towards educating the servers, security and owners. Results of the 5 year period included a 29% reduction in violent crimes [12] and an increased refusal of service rate for drunk patrons [13]. However, a subsequent six-city expansion of the STAD program has shown that while uptake was good in all cities with very high levels of fidelity in implementation, the serving practice or alcohol-related harm did not change [14]. This might be a result of extremely low baseline at the beginning of the trial, where police operated in a reactive mode, only attending licensed venues when called to intervene in violent altercations that were beyond the capacity of venue security. The concept of RSA before STAD was almost non-existent, with pseudo-patron studies showing that in the initial round of observations, 95% of bars would serve an actor portraying heavily intoxicated behaviour who had staggered to the bar, had problems sitting down or standing at the bar and had fallen asleep briefly before attempting to order the beer. The improvement to only 47% of bars still serving these intoxicated individuals still represents a basic failure of RSA [15]. Starting from such a baseline, virtually any intervention would be likely to see an improvement.

Another example from Stockholm is an intervention labelled 'Student08', which was developed by STAD and the police in an attempt to decrease violent crime associated with alcohol consumption at student parties at licensed premises in Stockholm [16]. It involved co-operation between STAD, the city police, the licensing board and the Swedish Tax agency: information and education about restaurant regulations, and increased enforcement by police and increased inspections by the tax agency. An evaluation conducted between 2008 and 2010, using violence-related emergency room attendances, found a 23% reduction in violence among young people between 18 and 20 years of age [16].

While many interventions have been introduced, these have not usually been supported by independent, rigorous research and have not demonstrated any effectiveness for reducing alcohol-related harm in Australia [17], particularly in both metropolitan and regional sites within Australia [18,19].

Three evaluations have been conducted on liquor accords or aspects of accords in Australia. These were conducted in Geelong, Ballarat and Fremantle. The first evaluation of the Geelong liquor accord found a 52% reduction in assaults 12 months after the accord was implemented [20] although the assault data included in the evaluation covered Geelong and outer suburbs within a

90 km radius. Further, there were no alcohol indicators for the assault, other than time committed [20,21], resulting in difficulties attributing the noted decline only to the effect of the liquor accord [17]. Recent regulations and additions to the Geelong liquor accord, such as ID scanners, have been subjected to evaluation and have been found to have little impact on reducing the number of emergency department (ED) presentations for alcohol-related injury from 2005 to 2011 [22]. Further, a larger study using police assault data and ED presentation data for alcohol-related assault found that these rates have actually been increasing over time [23].

The Ballarat liquor accord first implemented a 03:00 h lockdown in 2003 making it the city with the longest running licensed venue lockdown requirement [24]. In 2010, the lockdown time was changed to 02:30 h as a trial run from March until September [25], and after the trial period the licensees in the accord continued the 02:30 h lockdown voluntarily. Other key regulations included in the Ballarat accord include a shot curfew preventing shots from being ordered after 01:00 h, a blanket patron banning process, which involves ensuring an individual banned from one venue is banned from all venues who are members of the accord unless they undergo an appeal process, and a focus on adhering to Victorian RSA standards [26]. One evaluation of the original 03:00 h lockdown found that it had an impact on reducing offences, including a 39% decrease in assaults and a 17% reduction in property damage [27], although this finding was not evident in the rate of alcohol-related ED presentations from 1999 to 2009. The ED data from 1999 to 2009 revealed a reduction in alcohol related assaults and intoxication rates in the 6 months prior and 6 months after the 03:00 h lockdown [24], indicating that the lockdowns alone could not account for the change. After the initial decline in the rate of ED presentations, the rates began to increase and eventually grew higher than the rates in Geelong [24].

The Fremantle liquor accord regulations include cover charges, guidelines for RSA and the prohibition of discounts on drinks and drink promotions [17]. The Fremantle accord also includes a Better Practices Committee, who set the RSA training standards and training programs for licensed venues [28]. The evaluation of the Fremantle liquor accord is considered to be a more rigorous evaluation than other accord evaluations because of the inclusion of a control site and the substantial amount of data collected before and after the intervention [29]. The outcome measures in the evaluation were as follows: surveys from patrons, residents, businesses and taxi drivers regarding perceived changes during this time; risk assessments; and the use of pseudo patrons for measuring service of alcohol to those who are under age or visibly intoxicated [17]. Other data included pre-intervention and post-intervention included drink-

driving charges, road crashes, assaults associated with individual premises and server practices [29]. There were no significant changes in opinions, risk assessments, pseudo patrons and other measures after the implementation of the accord, and there were no significant changes between the control site and the implementation site, which was suggested to be a result of the control area's implementation of its own accord [29].

Generally, past research has shown little support for the effectiveness of community-based interventions, and in particular, there is a lack of peer-reviewed research investigating the effectiveness of community-based interventions on ED injury presentations and assault data for particular sites. The current article seeks to correct this gap in the literature using two metropolitan and two regional cities in Australia as sites to investigate the impact of community-based interventions on the reduction of alcohol-related harms. In particular, ED injury presentation data and police attended assault data are utilised to determine the impact of community-based interventions for reducing alcohol-related harm.

Methods

Setting

Four Victorian sites were utilised for the current paper: two metropolitan (Melbourne CBD and Frankston) and two regional (Geelong and Shepparton). On the basis of the 2011 Census of Population and Housing [30], the population of the Melbourne CBD is 93 625. Frankston is located in the outer southern suburbs of Melbourne, about 40 km south of the Melbourne CBD, with 126 458 people. Geelong is located in South Western Victoria, about 75 km south west of the Melbourne CBD, and has a population of 210 875. Shepparton is located in North Central Victoria, about 180 km north of Melbourne, and has a population of 60 499. The reason for choosing these sites was twofold: First, they provide a sample of both metropolitan and regional sites; and second, they all have long-standing liquor accords that have been implementing various interventions to reduce alcohol-related harm, alongside local government (or municipal) councils, some since the early 1990s.

Data and analyses

Emergency department data. Emergency department presentation data were obtained from the Victorian Emergency Minimum Dataset, and patient statistical local area was utilised to determine the location. In classifying patients into Geelong, Frankston and Shepparton, Victorian Statistical Local Area Maps were consulted

[31]. The statistical local areas used for analysis for Shepparton were Greater Shepparton City Parts A and B; for Frankston were Frankston City, East and West; and for Geelong were Greater Geelong City Parts A and B, Corio Inner, Newtown, Queenscliff, South Barwon Inner and Surf Coast East and West. ED presentation data for Melbourne were not utilised given the numerous hospitals that patients are able to attend in the area and the difficulty associated with determining which attendances presented as a result of intoxication or an injury that occurred in the central business district of Melbourne. The data were obtained for midnight to 06:00 h Friday and Saturday nights (HAH) for the period of January 2000 to December 2015, given that the use of HAH identifies 56% of all ED injury cases with prior alcohol involvement [32]. Further, only data for those presentations where the patient was over 15 years of age were used, given the existing age category of 15–19 years in the Victorian Emergency Minimum Dataset database, as well as the low likelihood that those aged below this were attending an ED for an alcohol-related incident. ED presentations were differentiated into a diagnosis of injury using International Classification of Disease S and T codes. For the ED data, the identifier HAH1 will be utilised.

A quarterly rate of ED presentations per 10 000 local government area (LGA) population was used as the denominator (obtained from Australian Bureau of Statistics, 2016), as this allowed a more accurate comparison between sites to be made.

Assault data. Police recorded assaults were obtained for the four sites, including Melbourne, over the period from January 2005 to June 2016 from Crime Statistics Victoria. For assault data, the high alcohol hours of 20:00–06:00 h on Friday and Saturday nights are utilised (HAH2), given findings that assault offences involving alcohol tend to occur between these hours [33,34].

A quarterly rate of assaults per 10 000 LGA population was used as the denominator (obtained from Australian Bureau of Statistics, 2016). As LGA population was not available for 2015 and 2016, these figures were created on the basis of the previous 10 years of LGA population. However, for Melbourne, assault data raw numbers are used, rather than a rate per LGA population. Melbourne data have been analysed in this way given that calculating the rate based on the population in the LGA would be misleading as many people travel into the city of Melbourne during HAH2 who do not actually live within the area. This decision is primarily based on findings from a previous study [35], whereby only 10.9% of people interviewed attending the Melbourne CBD came from within the City of Melbourne LGA (unpublished

data [3]). While there are also visitors to the regional centres, the numbers are likely to be relatively small compared with the metropolitan centres because of significant travel distance and times, minimal public transport access and considerably less late night entertainment options.

Analyses. All analyses were conducted using STATA 14.0 [36]. Autoregressive integrated moving average (ARIMA) time series analyses were used to determine the effect of community-based interventions introduced at the four sites for reducing alcohol-related harm [37,38]. While seasonal ARIMA models were

Table 1. Interventions implemented in Melbourne, Geelong, Frankston and Shepparton from 2005 to 2015 to reduce alcohol-related harm

Name of intervention	Site implemented (year)	Description
Designated area CBD ban	M (2007–) F (March 2009–) S (March 2010–)	An area in an entertainment precinct where alcohol-related violence and antisocial behaviour has occurred. Police can issue a designated area CBD ban for a person for up to 72 h.
Responsible practice guidelines	M ^a (June 2007–)	A resource aimed at enhancing safety and reducing the level and impact of crime and violence in and around licenced venues. It focuses on reducing the harms associated with excessive alcohol consumption.
02:00 h lockdown	M ^a (June–September 2008) F ^a (January 2009–) S (August–November 2008)	No person is allowed to enter a licenced premise after 02:00 h.
03:00 h lockdown	S (November 2008–)	No person is allowed to enter a licenced premise after 03:00 h.
Patron banning	M (2011–) F ^a , S (August 2011–)	Licensees and police can ban a patron from a venue for troublesome behaviour.
Shatterproof glass	M (July 2009–) F ^a (November 2011–)	All alcohol served in shatterproof glasses at high-risk nightclubs in Melbourne's CBD.
'No excuses' campaign	M ^a (December 2009–)	An awareness campaign that aims to make patrons aware that licensees can refuse them entry or ask them to leave.
Party bus legislation	M (August 2010–)	Party buses required to hold BYO permit if passengers bring own alcohol; or a liquor licence if they sell alcohol.
Liquor licence freeze	M ^a (2011–)	No new licences for bars, pubs and nightclubs operating after 01:00 h unless the applicant can show exceptional circumstances.
Safe taxi rank	M (December 2011–) G ^a (January 2005–) F ^a (November 2005–)	M: Taxi ranks, which are staffed by a security officer in a distinct uniform, are monitored by security cameras and have additional lighting and clear signage. G: Designated taxi rank staffed by security guards between 01:00 h and 06:00 h on Saturday and Sunday mornings. F: Taxi ranks staffed by security personnel, 01:00–05:00 h. The rank also has four CCTV cameras.
'Don't miss the party' campaign	M ^a (June 2014–)	An awareness campaign that aims to reduce the number of alcohol related interpersonal assaults in and around night-time venues.
Operation nightlife 1	G (January–July 2007)	Maximum police visibility during high-risk hours.
Night watch radio program	G ^a (March 2007–)	Connection of security staff via radio with relevant personnel.
ID scanners	G ^a (October 2007–)	Matches ID images to photographs to detect fake IDs.
Operation Razon	G (April 2008–)	Undercover police at licenced venues.
'Just think' campaign	G ^a (June 2008–)	Local celebrities endorsing 'safe' drinking patterns and reduced violence.
Operation nightlife 2	G (June 2009–)	Improved radio contact between police and licensees.
Fine strategy	G (July 2010–)	Primary focus on using fines, rather than arrests, to deal with antisocial behaviour.
'So you know' campaign	G ^a (August 2010–) S ^a (August 2012–)	Awareness posters focusing on fines.
Risk-based licensing	M, G, S (January 2010–)	Venues are charged an annual fee, plus a 'risk loading', which is based on factors such as trading hours, capacity and licence type.
Frankston drink safe project	F (June 2005–May 2007)	Education outside of venues on Friday and Saturday nights.
Night life radio project	S ^a (August 2011–)	This involves venues and police communicating through radio.

^aIntervention was introduced by the local liquor accord. BYO, bring your own; CBD, central business district; F, Frankston; G, Geelong; M, Melbourne; S, Shepparton.

explored during preliminary data analysis, it was decided that ARIMA models were more appropriate because of the following: (i) the lack of a clear, repetitive seasonal pattern in any of the data (e.g. consistent peaks each summer); and (ii) the lack of a good model fit for the seasonal ARIMA models that were examined.

The standard modelling strategy for time series analyses was used [37]. ED presentation data were aggregated by quarter as time series models were unable to be adequately fitted to monthly data, and assault data were aggregated by month. Separate analyses were conducted for each site. Parameter *P*-values and the Akaike information criterion were used to determine the final model [39]. All independent variables (i.e. interventions) were designated as dichotomous ‘event’ variables (0 = pre-intervention, 1 = intervention, 0 = post-intervention (if applicable)), and univariable ARIMA models were used to identify the best-fitting lag for each intervention included in the model. The specified lag indicates when an intervention has the largest impact; however, this lag may not necessarily be statistically significant. For example, a lag of two in a monthly time series indicates an intervention has the largest impact 2 months after implementation. Multivariable ARIMA modelling was then used to examine the influence of all intervention variables on harms within each site.

Interventions. All of the alcohol-related harm reduction interventions implemented in the four sites of interest are shown in Table 1. Those interventions that were introduced by liquor accords have been identified.

Results

Emergency department data

There were 15 856 ED presentations during HAH1 for injury from January 2000 to December 2015. Of these, 6491 were in Geelong, 3423 were in Shepparton and 5941 were in Frankston.

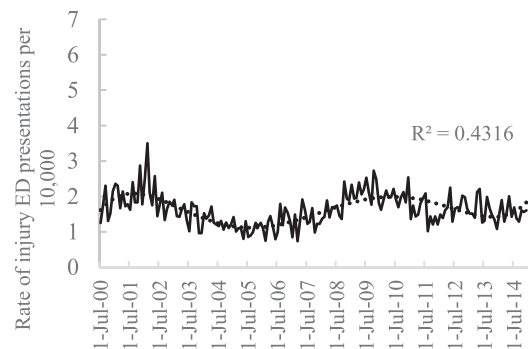
Injury presentations

Figure 1 shows the rate of injury related ED presentations during HAH1 in Geelong, Shepparton and Frankston.

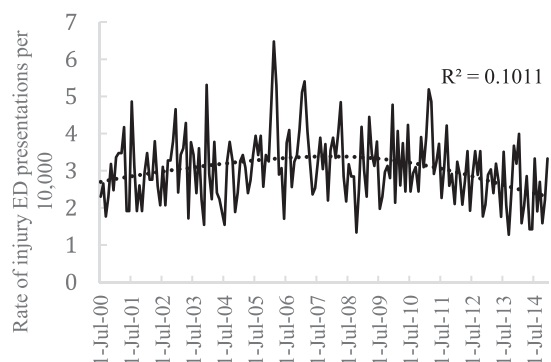
The effect of community interventions on the rate of ED injury presentations for Geelong, Shepparton and Frankston during HAH1 was examined using an ARIMA model.

For Geelong, data were differenced to produce a stationary series, with the final specified model: arima

Geelong



Shepparton



Frankston

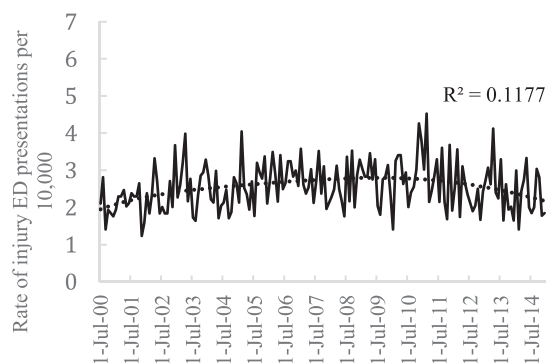


Figure 1. Rate of injury emergency department (ED) presentations per 10 000 for Geelong, Shepparton and Frankston.

(0,1,1; Portmanteau test for white noise $Q = 21.01$, $P = 0.86$). The STATA default number of lags was used for all Portmanteau tests for white noise. All interventions were then entered into the model to determine if they had any impact on the rate of ED presentations. The multivariable ARIMA model indicated that none of the interventions introduced in Geelong had a significant effect on the rate of HAH1 ED injury presentations (Table 2).

Table 2. The effect of interventions implemented in Geelong, Shepparton and Frankston on emergency department injury presentations

Intervention	Coefficient (95% CI)	P-value
<i>Geelong</i>		
Nightlife 1 (lag 1)/Night Watch Radio Program (lag 1)	0.14 (−2.78, 3.06)	0.925
ID scanner (lag 1)	1.16 (−24.99, 27.31)	0.931
Just think (lag 1)/Razon (lag 1)	1.27 (−8.09, 10.64)	0.790
Nightlife 2 (lag 1)	−0.07 (−1.11, 0.96)	0.888
So you know (lag 1)/Fines (lag 1)	−0.73 (−13416.09, 13414.64)	1.000
Risk-based licensing (lag 2)	0.03 (−22608.92, 22609)	1.000
Moving average (lag 1)	−0.59 (−0.83, −0.35)	<0.001
<i>Shepparton</i>		
Patron banning (lag 1)/Night life radio project (lag 1)	−2.49 (−6.14, 1.15)	0.180
Designated area ban (lag 0)	0.88 (−7.88, 9.65)	0.843
So you know (lag 1)	−1.26 (−4.74, 2.22)	0.477
02:00 h lockout (lag 0)	−2.64 (−12.72, 7.43)	0.607
03:00 h lockout (lag 1)	−0.63 (−8.34, 7.08)	0.873
Safe taxi rank/CCTV (lag 1)	−0.72 (−2.30, 0.85)	0.368
Risk-based licensing (lag 1)	−0.13 (−12.88, 12.62)	0.984
Auto-regression (lag 1)	−0.80 (−1.05, −0.54)	<0.001
Auto-regression (lag 2)	−0.71 (−0.99, −0.43)	<0.001
Auto-regression (lag 3)	−0.40 (−0.67, −0.13)	<0.01
<i>Frankston</i>		
Patron ban (lag 1)/Shatterproof glass (lag 1)	−1.09 (−2.88, 0.70)	0.234
Designated area ban (lag 1)/Lockouts (lag 1)	0.03 (−1.92, 1.99)	0.974
Drink safe project (lag 1)	0.86 (−1.04, 2.75)	0.377
Risk-based licensing (lag 1)	−0.37 (−1.22, 1.96)	0.648
Moving average (lag 1)	−0.82 (−0.98, −0.66)	<0.001

Note: Where two interventions were introduced within the same time period, they are tested as a combined effect. CCTV, closed-circuit television; CI, confidence interval.

The same analysis was conducted for Shepparton during HAH1. Again, data were differenced to produce a stationary series. The best-fitting model was specified as $\text{arima}(3,1,0)$. The model fitted the data well: $Q = 28.08$, $P = 0.51$. The multivariable ARIMA model, with all interventions entered as predictors, indicated that none of the interventions introduced in Shepparton had a significant effect on the rate of ED presentations during HAH1 for injury.

The effect of interventions for Frankston was then examined. A stationary series was obtained through first-order differencing with the best-fitting model identified as $\text{arima}(0,1,1)$. A constant was not included in this model, therefore representing a simple exponential smoothing model. The model fitted the data well: $Q = 24.74$, $P = 0.69$. The multivariable ARIMA model indicated that none of the interventions had a significant effect on the rate of HAH1 ED presentations in Frankston.

Assault data

Overall, there were 11 674 assaults recorded for HAH2 over the period from January 2005 to June 2016 in Melbourne, Frankston, Geelong and Shepparton. Of

these, 7152 were in Melbourne, 1261 in Geelong, 1408 were in Shepparton and 1853 were in Frankston. Figure 2 shows the number of assaults in Melbourne and the rate of assaults in Geelong, Shepparton and Frankston.

The effect of interventions on the count of assaults in the Melbourne area during HAH2 was examined using an ARIMA model. The data were differenced, and the final model specified as an $\text{arima}(3,1,0)$; $Q = 52.97$, $P = 0.08$. All interventions were then entered into the model to determine their impact on the number of assaults. This multivariable ARIMA model indicated that none of the interventions had a significant effect on the count of assaults in Melbourne during HAH2.

For Geelong, as the model was already stationary no differencing was applied. The best-fitting model identified was $\text{arima}(1,0,1)$; $Q = 33.43$, $P = 0.76$. The multivariable ARIMA model, with all interventions entered as predictors, indicated that none had a significant effect on assault rate during HAH2 in Geelong.

An ARIMA was then conducted for Shepparton during HAH2. The data were already stationary, and the final model specified as $\text{arima}(0,0,0)$, indicating the data were simply white noise. The model fitted the data well: $Q = 41.79$, $P = 0.39$. All interventions were examined in a multivariate ARIMA model. As patron banning

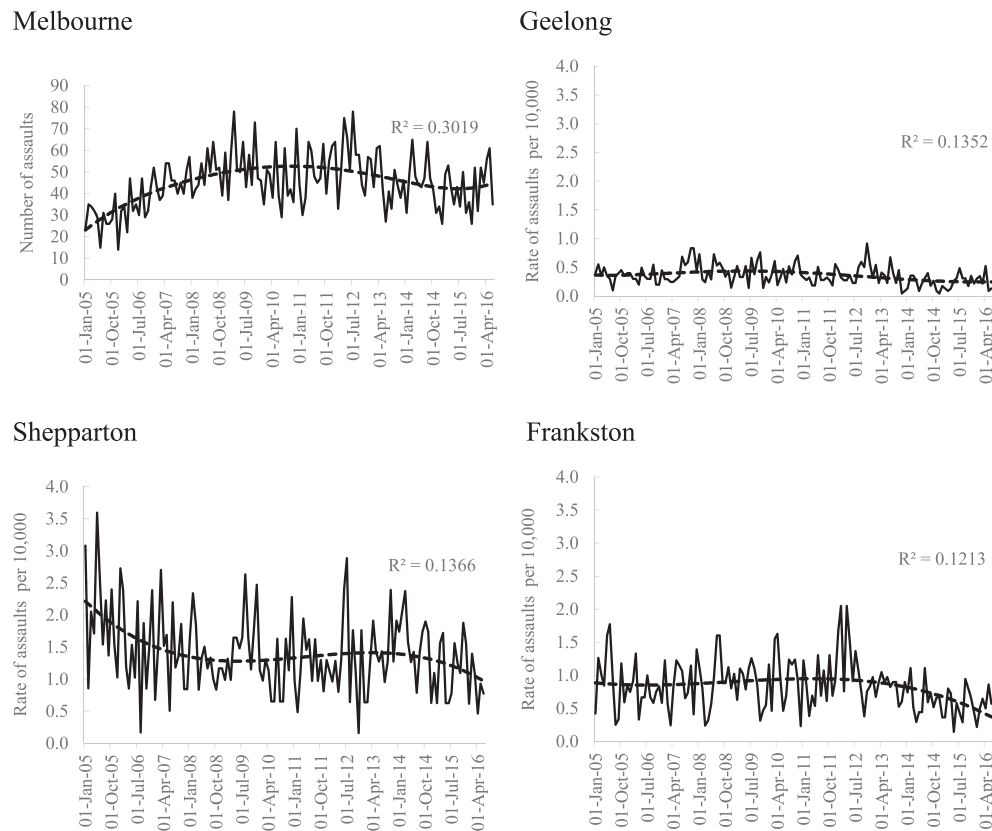


Figure 2. Number of assaults in Melbourne and rate of assault per 10 000 in Geelong, Shepparton and Frankston.

and the nightlife radio project came into effect at the same time, we were unable to delineate their separate effects, and as such, they are reported as a combined variable in Table 3. The multivariable ARIMA model indicated that none of the interventions had a significant effect on the assault rate during HAH2.

Lastly, the effect of interventions on the assault rate in Frankston was examined. The data did not require differencing, and the best-fitting model was an arima (1,0,1; $Q = 37.46$, $P = 0.58$). The multivariable ARIMA model examining the impact of the interventions indicated that none had a significant effect on the assault rate during HAH2.

Discussion

The current paper investigated the impact of a variety of community-based interventions, including those proposed by liquor accords, which were introduced to address alcohol-related harm in four sites in Victoria, Australia. Overall, there were no significant effects of any interventions on ED presentations for injury during high alcohol hours over the period of 2000–2015 for Geelong, Shepparton or Frankston. In both Geelong and Shepparton, injury presentations have remained relatively stable over the 15 year period, and ARIMA

models revealed that none of the interventions included in this paper had a significant impact in terms of reduction of harms. In Geelong, this has been in the context of varying police interventions [40,41] and a substantially declining density of late night venues.

The ARIMA models revealed no associations with the interventions implemented on assault counts/rates across any of the four sites.

Given there was no impact by the interventions on both ED presentations and assault numbers/rates, it can be concluded that these likely had no effect in reducing these particular harms. This finding might be explained by the lack of mandatory interventions that have been implemented across these four sites. All of the interventions investigated in the current paper were voluntary, were introduced by local liquor accords and tend to focus on controlling patron behaviour once the person is intoxicated, or were more broadly educational in nature [17]. While one international community-based voluntary intervention has achieved large reductions in violent assaults (Student08) in Stockholm, no other relevant interventions were able to be located that have been able to achieve such impact. Instead, previous research has demonstrated that mandatory measures, which focus on reducing both the price and availability of alcohol, along with how late a person can consume alcohol, are overwhelmingly more effective at reducing harm [4,42–45].

Table 3. The effect of interventions implemented in Melbourne, Geelong, Shepparton and Frankston on assaults

Intervention	Coefficient (95% CI)	P-value
<i>Melbourne</i>		
Patron ban (lag 4)	9.26 (−27.83, 46.34)	0.625
CBD ban (lag 1)	−3.32 (−25.08, 18.44)	0.765
Lockouts (lag 1)	2.07 (−16.22, 20.37)	0.824
Licence freeze (lag 1)	−10.63 (−40.26, 19.00)	0.482
Safe taxi rank (lag 1)	−6.03 (−35.22, 23.17)	0.686
Responsible practice guidelines (lag 1)	−4.45 (−56.23, 47.33)	0.866
No excuses (lag 1)	−14.85 (−68.03, 38.32)	0.584
Don't miss the party (lag 1)	−0.20 (−18.01, 17.60)	0.982
Party bus laws (lag 1)	−0.82 (−20.21, 18.56)	0.934
Shatterproof glass (lag 1)	4.59 (−10.11, 19.31)	0.540
Risk-based licensing (lag 1)	6.31 (−34.98, 47.60)	0.765
Auto-regression (lag 1)	−0.77 (−0.94, −0.60)	<0.001
Auto-regression (lag 2)	−0.63 (−0.82, −0.43)	<0.001
Auto-regression (lag 3)	−0.39 (−0.53, −0.25)	<0.001
<i>Geelong</i>		
Nightlife 1 (lag 1)	−0.13 (−0.31, 0.05)	0.149
Night watch radio program (lag 1)	0.15 (−0.05, 0.35)	0.148
ID scanner (lag 1)	−0.06 (−0.26, 0.145)	0.591
Just think (lag 1)	−0.14 (−0.38, 0.09)	0.236
Nightlife 2 (lag 1)	0.08 (−0.10, 0.26)	0.393
So you know (lag 1)	−0.15 (−1.24, 0.94)	0.788
Fines (lag 1)	0.07 (−1.08, 1.23)	0.901
Risk-based licensing (lag 0)	−0.12 (−0.33, 0.09)	0.279
Razon (lag 1)	0.06 (−0.20, 0.31)	0.664
Auto-regression (lag 1)	0.90 (0.67, 1.13)	<0.001
Moving average (lag 1)	−0.80 (−1.10, −0.48)	<0.001
<i>Shepparton</i>		
Patron banning (lag 1)/Nightlife radio project (lag 1)	0.05 (−0.42, 0.51)	0.842
So you know (lag 1)	0.11 (−0.56, 0.78)	0.749
02:00 h lockout (lag 1)	−0.39 (−2.72, 1.94)	0.742
03:00 h lockout (lag 1)	0.14 (−0.29, 0.58)	0.511
Safe taxi rank/CCTV (lag 1)	−0.20 (−0.81, 0.41)	0.517
Risk-based licensing/Designated area ban (lag 1)	−0.38 (−0.89, 0.13)	0.145
<i>Frankston^a</i>		
Patron ban (lag 4)	−0.13 (−0.44, 0.17)	0.376
Designated area ban (lag 4)	0.16 (−0.55, 0.87)	0.659
Lockouts (lag 1)	−0.22 (−0.83, 0.39)	0.484
Drink safe project (lag 1)	−0.31 (−0.69, 0.07)	0.110
Risk-based licensing (lag 1)	−0.10 (−0.59, 0.38)	0.681
Auto-regression (lag 1)	0.51 (0.15, 0.86)	<0.01
Moving average (lag 1)	−0.18 (−0.56, 0.19)	0.338

^aShatterproof glass was dropped for Frankston due to collinearity. Note: Where two interventions were introduced within the same time period, they are tested as a combined effect. CCTV, closed-circuit television; CI, confidence interval.

This is distinct from ‘lockouts’, which still allow people to drink later into the night [24]. An important consideration is whether local liquor accords are best placed to be developing and implementing interventions to address alcohol-related harm, given none of the interventions they had introduced across the four sites over a 15 year period have demonstrated any effect on ED presentations or assault rates. Further, their voluntary nature and the lack of consequences for venue operators not doing what they promise mean that ‘accords’ or ‘forums’ are unlikely to be successful when financial bottom-lines are threatened [46,47].

Limitations

There are some limitations with the current study. Firstly, there were interventions that were introduced within the same quarter across all sites, which was the timeframe that had to be used for ARIMA analyses to ensure adequate model fit. This is problematic as we are unable to discern the individual effects on injury or assault rate for each intervention that is introduced. However, given there was no significant impact overall, it is safe to assume the measures implemented across the four sites were not successful. This

is an important finding when compared with multifaceted interventions such as those implemented in Newcastle [7,48] and Sydney [49], which did show a major impact on police assaults and ED attendances [42,50]. Secondly, ED injury presentations and recorded assaults are likely to be an underrepresentation of actual occurrences of alcohol-related harm in the night-time economy, given many people would likely sustain injuries or be involved in fights and not attend an ED or report it to police. A third limitation is the lack of a control series or site for the data. This occurred because of a lack of available data for non-HAH hours and an inability to locate comparable control sites for each of the sites utilised, given those which may be considered suitable have often implemented a series of their own interventions to address alcohol-related harm. Fourthly, the authors did not have access to any information regarding the fidelity of implementation of, or adherence to, the interventions discussed in the current paper, and as such, it is difficult to determine whether this influenced the outcomes. Lastly, because of the large number of interventions tested within the models, simplified modelling techniques were used, resulting in an inability to detect potential gradual effects of the interventions.

Conclusion

The current paper investigated the impact of community-based interventions introduced at two metropolitan and two regional sites in Victoria, Australia. While each site implemented a variety of interventions in an attempt to reduce alcohol-related harm over a lengthy period of time, none of these had a significant impact on the ED injury presentations or assault rate. This highlights the importance of ensuring that any interventions are properly documented, including plans for evaluation, prior to the intervention. Finally, it is of vital importance that those considering reforms to address alcohol-related harm implement consistent, evidence-based regulatory interventions.

Conflict of interest

Peter Miller receives funding from Australian Research Council and Australian National Health and Medical Research Council, grants from NSW Government, National Drug Law Enforcement Research Fund, Foundation for Alcohol Research and Education, Cancer Council Victoria, Queensland government and Australian Drug Foundation, travel and related costs from Australasian Drug Strategy Conference. He has

acted as a paid expert witness on behalf of a licensed venue and a security firm.

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