

The impact of Indigenous-led programs on alcohol-related criminal incidents: a multiple baseline design evaluation

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A strong, positive relationship has been established between alcohol misuse and a range of health and social harms including alcohol-related criminal incidents (ARCI).^{1,2} In Australia, for example, the cost of ARCI comprises an estimated 21% of the societal cost of alcohol misuse, with an annual estimated cost of \$2.96 billion.³ Epidemiological evidence suggests disproportionately higher rates of ARCI are associated with both individual-level characteristics, such as age and gender, and community characteristics, such as socioeconomic disadvantage, income inequality and density of alcohol outlets.^{4,5} As a legacy of the inter-generational impacts of colonisation and the subsequent failure of social and health policies,^{6,7} Indigenous individuals and communities have been shown to be at disproportionately high risk of a range of alcohol-related harms.^{8,9} Rates of ARCI in Australia, for example, are 4.7 times higher for Indigenous males and 8.4 times higher for Indigenous females, compared to non-Indigenous Australians.¹⁰

Effectively responding to the disproportionately high rates of ARCI among Indigenous people requires a combination of both effective government policy and community-level action. International evidence clearly shows that national-level alcohol policies work: countries that have more alcohol policies and where those

Abstract

Objectives: To evaluate the impact of a multi-component, Aboriginal-led strategy to reduce alcohol-related criminal incidents for Aboriginal people in four rural/remote communities in New South Wales (NSW), Australia.

Methods: A retrospective multiple baseline design (MBD), using interrupted time series analysis of routinely collected crime data.

Results: A statistically significant reduction in alcohol-related criminal incidents was observed in one community for both victims of crime (parameter estimate -0.195; $p \leq 0.01$) and persons of interest (parameter estimate -0.282; $p \leq 0.001$). None of the analyses show level shifts, meaning there were no measurable changes immediately post the introduction of the Breaking the Cycle (BTC) programs.

Conclusions: It is not possible to conclude that the program was effective independently of any other community factors, because the statistically significant result was not observed across multiple communities. The statistically significant result in one community has clear practical benefits in that community: a sustained impact over two years would reduce Aboriginal victims of alcohol-related crime from an estimated 56 incidents per annum to 36, and reduce Aboriginal persons of interest in alcohol-related crime from an estimated 68 alcohol-related person of interest (POI) per annum to 40.

Implications for public health: The statistically and practically meaningful result in Community 1 highlights the potential of multi-component, Aboriginal-led strategies to reduce alcohol-related criminal incidents. Earlier engagement with researchers, to identify best-evidence strategies to reduce alcohol harms and to facilitate the use of prospective evaluation designs, would help translate the positive outcome in one community across multiple communities.

Key words: alcohol, harm, community-led programs, crime, Aboriginal-led strategies

policies are more strongly enforced have significantly lower per capita alcohol consumption.¹¹ Nevertheless, detailed epidemiological evidence also shows that the impact of alcohol policies within countries varies significantly between

communities, which highlights the importance of community-based, or place-based, action.^{4,10,12} Indeed, the World Health Organization's global strategy to reduce the harmful use of alcohol emphasises the importance of community action, defined as

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a process in which a community determines its own specific needs and the actions that might best meet those needs.¹³

Despite the global endorsement of community action, and evidence of its high acceptability to communities themselves,¹⁴ a systematic review of Australian Indigenous community-based projects reported four key findings: i) little evidence for effectiveness (only two of 31 studies reported statistically significant outcomes); ii) wide variability in levels of community participation at different stages of a project (typically high for during project implementation and low during evaluation); iii) low methodological quality; and iv) no economic analyses.¹⁵ Key explanations for the lack of effectiveness and variable community participation are likely to be the lack of genuine Indigenous ownership and leadership across all phases of community-based projects¹⁵ and a lack of knowledge about how to apply best evidence-practice.¹⁶ In addition, there has been an insufficient focus on undertaking evaluation research: a systematic review of the Indigenous-specific alcohol and drug literature published between 1993 and 2014 identified that evaluations comprised a minority of research (11%) and that this proportion is falling over time.¹⁷

To address these limitations, this study evaluates the impact of an Indigenous-led community action approach to reducing Indigenous ARCIs.

Methods

Ethics

Ethical approval was granted by the Aboriginal Health and Medical Research Council (1023/14) and the University of New South Wales Human Research ethics committees (HC14142).

Study design

A multiple baseline design (MBD) was used to evaluate the impact of the Indigenous-led community action initiatives, which are a rigorous alternative to RCTs and are endorsed as such by the Cochrane Collaboration's Effective Practice and Organisation of Care (EPOC) group for the evaluation of complex, real-world community-based programs.^{18,19} In a MBD, the introduction of a program is staggered over time across different communities, with repeated administration of outcome measures at multiple time

points. While the measures provide evidence of any impact, the commencement of the program at different time points in different communities increases confidence that any observed changes are a consequence of the program rather than other random or external factors. Commencement dates were defined as the first month of employment of the project workers, who facilitated the program design, approvals and implementation in each community. The project commenced in Community 1 on 1 October 2012, Community 2 on 1 February 2013, and Communities 3 and 4 on 1 May 2014. The program completion date for all communities was 30 June 2015, when federal funding ceased.

Community selection and setting

Four rural New South Wales (NSW) communities with substantial Aboriginal populations were selected by the Australian Government through an open tender process to participate in their 'Breaking the Cycle of Alcohol and other Drug Abuse in Indigenous Communities' initiative (note that the NSW Aboriginal Health and Medical Research Council prefers the term 'Aboriginal' to refer to the Indigenous people of NSW). The population of the four communities ranged from 1,100 to 3,500 people, their median ages ranged from 32 to 38 years and the proportion of each community that identified as Aboriginal ranged from 16% to 65% (the estimated proportion of the NSW population that is Aboriginal is approximately 3%).²⁰ In 2016, the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-economic Disadvantage of the four communities participating in this study ranged from 757 to 927 (lower scores indicate that an area is relatively disadvantaged), compared to a national range of 404–1123.²¹

The Breaking the Cycle (BTC) initiative

The Breaking the Cycle (BTC) initiative aimed to empower Aboriginal communities to address the harms caused by drugs and alcohol, thereby contributing to the broader Australian Government's Closing the Gap strategy (<https://www.niaa.gov.au/indigenous-affairs/closing-gap>). The funding was managed by a local non-government organisation via a Community Alcohol and Substance Abuse Management Plan (CASP) developed by an Aboriginal consultant in collaboration with each community. Although the CASP activities differed for

each individual community, they comprised nine priority areas (summarised in Table 1 and described in detail below). Authority to approve expenditure in each community project sat with the Federal Minister for Indigenous Affairs. For the duration of the project, four BTC project workers were selected and employed by the local CASPs to manage the projects: three for communities 1 and 2 (two Aboriginal and one non-Aboriginal); and one for communities 3 and 4 (non-Aboriginal). Their primary responsibility was to develop and implement specific activities in consultation with local working groups and relevant stakeholders.

BTC program activities

The community-specific activities were designed to be integrated into nine priority areas that were common to the CASPs for all four communities. The number of activities undertaken by each community in each priority area, along with the cost of those activities, is summarised in Table 1. Although each community developed their own activities, the intent of these nine priority areas, along with illustrative examples, is detailed as follows.

Education and community awareness: Providing education and community awareness about risks of harm from alcohol and other drugs, building the capacity of community members to identify and respond to risks associated with alcohol and other drugs, and supporting existing health promotion activities. Examples included: standard drink awareness resources; calendars; alcohol-free months; support for Men's Shed programs; community sporting programs; and an upgrade to the Police Citizens Youth Club (PCYC) van to deliver health promotional activities.

Youth engagement and resilience: Engaging with young people through diversionary activities to reduce substance-related harms and providing education and training for young people about the harms associated with substance misuse. Examples included: alcohol-free discos; girls' leadership and resilience programs; Responsible Service of Alcohol training for young people; sporting events; supporting youth week events; and a traffic offenders' program.

Engaging and supporting families: Supporting activities that promote family-based approaches to education, awareness and care. Examples included: an alcohol-free Christmas family carnival and a family health day.

Promoting Aboriginal culture: Programs to promote community cultural connection, providing access to programs to address harms resulting from trauma, grief and loss and facilitate healing, community resilience. Examples of programs included: National Aborigines and Islanders Day Observance Committee (NAIDOC) events; youth camps; men and women’s workshops; Elder’s bingo nights; tackling violence program; Healing Foundation to focus on healing intergenerational trauma through reconnection with culture; Literacy for Life program to improve adult literacy; Aboriginal music festival; and Aboriginal women’s culture trip.

Social media, arts and e-technology: Supporting community involvement in social marketing and media campaigns and resources to raise awareness of drug and alcohol risk and promoting alcohol-free community arts events. Examples included: safe partying and community developed drug and alcohol health promotion; sewing groups; mental health arts projects and concerts.

Licensee engagement and participation: Participation in liquor accords and strategies to promote responsible service of alcohol and reduce risk of harm in the community. Examples included: a courtesy bus service and a range of harm reduction resources for licensees.

Healthy environment through improved infrastructure: Improving healthier living environments through enhancing facilities and infrastructure for remote communities. Examples included: building a skate park; developing a garden; and building improvements for a youth centre.

Improving responsiveness, capacity and integration of treatment services: Supporting early intervention and prevention initiatives, supporting targeted programs for young people affected by drug and alcohol and longer-term treatment/relapse prevention. There were no recorded programs in this priority area for the duration of the BTC funding as the communities did not design projects relevant to this area.

Community capacity building: Community-identified education to improve capacity to deliver substance misuse prevention and treatment and develop community leadership capacity. Examples included: BTC program support workshops to assist community members to deliver their projects; future program implementation workshops; employment training for mothers; and a community data workshop.

Measures

Epidemiological methods have been applied to routinely collected crime data to establish that there is a strong, positive relationship between alcohol misuse and ARCs.¹⁰ Nevertheless, a 2015 systematic review¹⁵ identified only one evaluation of an Indigenous community action program that has used epidemiological methods applied to routinely collected data for evaluation: a time series analysis of community-specific injury data to estimate the impact of an injury prevention program.²² Consequently, a unique feature of this evaluation is the use of time series analysis of routinely collected, community-specific criminal incident data to estimate the impact of the BTC activities.

Criminal incident data were obtained from the NSW Bureau of Crime Statistics and Research

(BOCSAR) for each participating community (defined by their postcode) from 1 January 2002 to 31 December 2016. Three types of de-identified unit record crime data for people aged 13 years and older were obtained:

- Criminal incident:* Defined by BOCSAR as ‘an activity detected by or reported to police which involved the same offender(s) and the same victim(s), occurred at the one location, during one uninterrupted period of time, falls into one offence category (e.g. assault, offensive conduct, theft) and falls into one incident type (e.g. actual, attempted, conspiracy).²⁰ Unit-level criminal incident data comprised date and time, postcode, offence category and subcategory.
- Person of Interest (POI):* A POI is a suspected offender recorded by police in connection with a criminal incident, although not all criminal incidents have a POI recorded against them. The same POI can be linked to more than one criminal incident, and one criminal incident can involve multiple POIs. Unit-level POI data included age, gender, postcode, Aboriginal and Torres Strait Islander status and offence category and subcategory.
- Victim of Crime (VOC):* BOCSAR defines a victim of crime as ‘anyone who has come to the attention of the NSW Police either because they reported a crime against them or the crime was otherwise detected’. VOC information is only provided for the offences of murder, manslaughter, attempted murder, domestic assault, non-domestic assault, robbery, sexual offences and abduction/kidnapping. Unit-level VOC data included age, gender, postcode, Aboriginal and Torres Strait Islander status and relation to the offender.

Table 1: Number and cost of Breaking the Cycle (BTC) program activities implemented in four rural/remote communities in NSW from 1 October 2012 to 30 June 2015.

BTC Key Priority Areas	Community 1		Community 2		Community 3		Community 4		Total	
	Number of activities	Cost to deliver activities \$	Number of activities	Cost to deliver activities \$	Number of activities	Cost to deliver activities \$	Number of activities	Cost to deliver activities \$	Number of activities	Cost to deliver activities \$
1. Education and community awareness	12	51,418	3	53,559	4	22,243	6	5,508	25	132,728
2. Youth engagement and resilience	8	73,610	3	61,360	2	2,600	2	950	15	138,520
3. Engaging and supporting families	-	-	-	-	-	-	2	3,149	2	3,149
4. Promoting Aboriginal culture	5	410,606	2	355,000	2	1,345	6	14,507	15	781,458
5. Social media, arts and e-technology	1	21,500	1	21,500	-	-	-	-	2	43,000
6. Licensee engagement and participation	2	57,750	-	-	-	-	-	-	2	57,750
7. Healthy environment through improved infrastructure	2	158,400	1	60,000	-	-	-	-	3	218,400
8. Improving responsiveness, capacity and integration of treatment services	-	-	-	-	-	-	-	-	-	-
9. Community capacity building	1	26,334	1	26,334	2	15,368	4	14,386	8	82,422
Total activities and costs	31	799,618	11	577,753	10	41,556	20	38,500	72	1,457,427

Identifying alcohol-related criminal incidents (ARCI)

Although NSW Police flags incidents as alcohol-related, the accuracy and consistency with which police officers identify criminal incidents as alcohol-related, both within and between communities, is unknown. Given this uncertainty, a proxy measure was applied, using readily identifiable criminal incidents that are strongly correlated with alcohol misuse. This proxy has been developed,

validated and used in Australia to compare rates of ARCI across Australian jurisdictions and between communities.^{5,12,23} Specifically, the proxy measure comprised offence categories (assault, disorderly conduct and malicious damage to property) that occur at times when excessive alcohol consumption is highly likely to be a contributing factor (Sunday 10pm – Monday 6am, Monday 10pm – Tuesday 2am, Wednesday 10pm – Thursday 2am, Friday 10pm – Saturday 6am, and Saturday 6pm – Sunday 6am).

The proxy measure was applied to both the POI and VOC datasets by merging each of them separately with the criminal incident dataset. As the BTC initiative aimed to reduce alcohol-related harms for Aboriginal people in the selected communities, only incidents specifically involving Aboriginal Australians were examined.

Data analysis

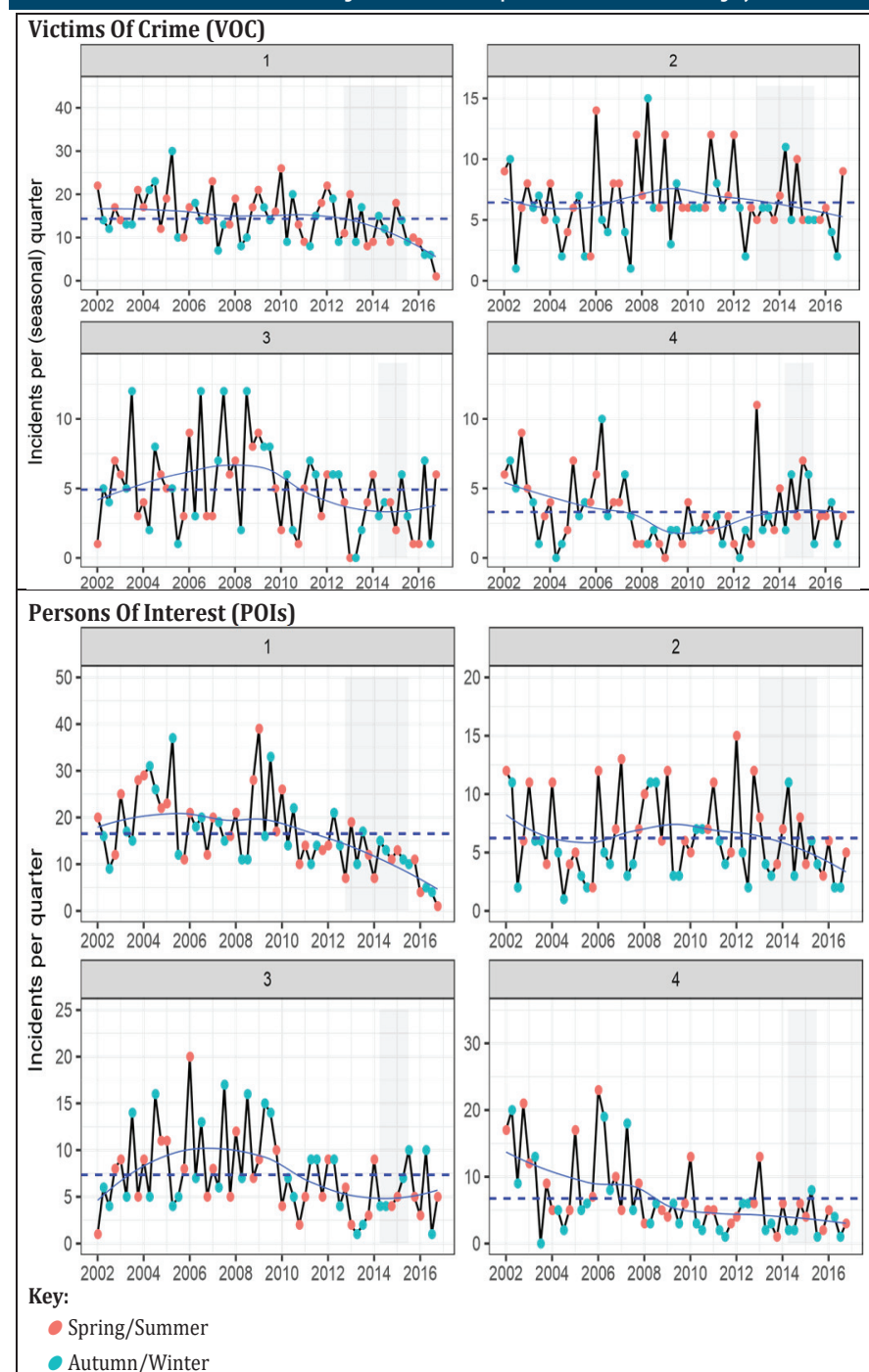
All analyses were performed in R.²⁴ Interrupted time series analyses were conducted separately for each community, as is recommended for MBDs.²⁵ Monthly ARCI data involving Aboriginal VOC and POIs were aggregated to the quarterly data due to the low monthly number of ARCI per community. Segmented regression models were fit for Aboriginal VOC and POI to determine if the BTC programs were associated with a change in trend of the quarterly time series for each of the communities. A generalized linear autoregressive moving average (GLARMA) modelling framework was used,²⁶ which can account for autocorrelation and is appropriate for count data. The models were parameterised to include terms for the pre-BTC program temporal trend, an immediate level shift (coinciding with the project commencement date in each community) and a change in temporal trend from the BTC program period through to the end of the BTC program period. Indicator variables were also included to represent seasonality, since previous research has found that more ARCI occur in summer.²⁷ Model assumptions were assessed by inspecting the residuals for serial correlation, outlying points, normality and the validity of the assumed distribution via the probability integral transformation.²⁸ Akaike information criterion (AIC) was used to compare goodness of fit.²⁹

Results

Summary statistics for ARCI over the study period (2002 to 2011)

The total number of ARCI in each community was 4,983 (Community 1), 3,647 (Community 2), 2,817 (Community 3) and 1,824 (Community 4). The proportion of all POIs that were for alcohol-related incidents ranged from 10.0% (Community 4) to 4.9% (Community 2). The proportion of all VOC that were for alcohol-related incidents ranged from 7.5% (Community 3) to 9.1% (Community 2). The majority of POIs were

Figure 1: Time series plots of VOC and POIs in each community, showing quarterly aggregated incidents (jagged line), mean incidents (dashed line), a smoothed regression line and the period of active intervention (grey shaded bars).



male in each community (range 72% to 79%), while most VOCs were male in two communities (46% and 47%) and female in two communities (53% and 55%). The most common age range for POI was 13–19 years (range 27% to 39%), while the most common age range for VOC was 20–29 years in two communities (21% and 23%) and 30–39 years in two communities (23% and 24%).

Impacts of the BTC programs: segmented regression

Visual inspection of Figure 1 shows that Community 1 had the longest period of intervention (the widest grey shaded bars). The time series shows that, for all four communities, rates of ARClS were variable during the pre-intervention period for both Aboriginal VOCs and POIs. All four communities showed a trend of declining or flat rates of ARClS (both VOC and POI) after the commencement of the intervention.

Table 2 shows that the declining or flat rates of ARClS associated with the introduction of the BTC intervention activities were only statistically significant in Community 1. Specifically, the rows in bold type labelled ‘Trend change (BTC)’ show a statistically significant downward trend in ARClS post-intervention relative to pre-intervention, for both VOC (parameter estimate -0.195; $p \leq 0.01$) and POI (parameter estimate -0.282; $p \leq 0.001$). None of the analyses show level shifts, meaning there was no measurable change immediately post the introduction of the BTC programs.

For victims of crime, the statistically significant change is equivalent to a 17.8% decrease in ARClS per year (computed as 1 minus the exponent of the parameter estimate: 95%CI: 6.2% to 27.9%; p -value = 0.003). For Community 1, with a mean pre-BTC program incident rate of 14 incidents for Aboriginal VOC per quarter (approximately 60 per year), this is a decrease to 11.5 VOC per quarter in the first year post-BTC program commencement and to 9.4 VOC per quarter in the second year. This trend would be expected to continue if the effects of BTC remain. There was evidence of seasonality effects for VOC in Community 1, with summer rates being relatively high.

For persons of interest, this translates to a 24.6% reduction in the number of people associated with alcohol-related crime per year (95%CI of 10.8 to 36%, p -value = 0.001) For Community 1, with a mean pre-BTC program

Table 2: Parameter estimates from the interrupted time series analysis of the impact of the BTC activities on VOC (model 1) and POI (model 2).

	Parameter Estimate (standard errors)			
	Community 1	Community 2	Community 3	Community 4
Model 1: Victims of crime (VOC) - parameter estimates for negative binomial ARClS				
Intercept	3.050*** (0.081)	2.026*** (0.139)	1.670*** (0.245)	1.560*** (0.230)
Trend (pre)	-0.015 (0.010)	0.022 (0.019)	-0.028 (0.029)	-0.031 (0.027)
Season:				
Autumn	-0.247** (0.093)	-0.216 (0.137)	0.126 (0.253)	-0.228 (0.201)
Winter	-0.396*** (0.105)	-0.691*** (0.157)	0.336 (0.218)	-0.372 (0.259)
Spring	-0.310** (0.101)	-0.261# (0.139)	-0.060 (0.284)	-0.225 (0.258)
Level (BTC)	0.113 (0.162)	-0.175 (0.229)	-0.954 (0.657)	0.466 (0.426)
Trend Change (BTC)	-0.195** (0.067)	-0.045 (0.092)	0.412 (0.332)	0.129 (0.365)
% Point Change:				
Trend Change (BTC)	-17.75	-4.44	51.03	13.81
Autumn %	-21.86	-19.39	13.42	-20.42
Winter %	-32.67	-49.87	39.95	-31.06
Spring %	-26.63	-23.01	-5.84	-20.17
AIC[^]	360.27	293.00	302.12	261.31
Model 2: Persons of Interest (POI) - parameter estimates for negative binomial ARClS				
Intercept	3.297*** (0.114)	2.208*** (0.137)	2.272*** (0.187)	2.756*** (0.100)
Trend (pre)	-0.030# (0.017)	0.020 (0.019)	-0.032 (0.022)	-0.109*** (0.012)
Season:				
Autumn	-0.174** (0.065)	-0.475*** (0.141)	-0.088 (0.193)	-0.167 (0.138)
Winter	-0.261** (0.087)	-0.892*** (0.161)	0.159 (0.186)	-0.769*** (0.122)
Spring	-0.350*** (0.073)	-0.497*** (0.143)	-0.237 (0.197)	-0.177 (0.142)
Level (BTC)	0.054 (0.232)	-0.232 (0.240)	-0.254 (0.373)	0.600 (0.554)
Trend Change (BTC)	-0.282*** (0.085)	-0.114 (0.102)	0.100 (0.230)	-0.161 (0.380)
% Point Change:				
Trend Change (BTC)	-24.56	-10.76	10.47	-14.86
Autumn %	-16.01	-37.83	-8.41	-15.39
Winter %	-22.95	-59.03	17.29	-53.66
Spring %	-29.54	-39.17	-21.10	-16.19
AIC[^]	386.64	290.89	336.37	307.47

Notes:
Significance codes: *** 0.001; ** 0.01; * 0.05; # 0.1
[^]Akaike information criterion

incident rate of 17 incidents for Aboriginal POI per quarter (approximately 60 per year), this is a decrease to 12.8 POI per quarter in the first year post-BTC program commencement and to 9.8 POI per quarter in the second year. This trend would be expected to continue if the effects of BTC remain. There was evidence of seasonality effects for POI in communities 1 and 2, with summer rates being relatively high.

Discussion

This study used a high-quality evaluation (multiple baseline design) and the application of time series analysis to routinely collected criminal incident data to demonstrate that a multi-component, Aboriginal-led strategy statistically significantly reduced rates of ARClS (both for VOC and POI) in one of four communities. The significant

result in Community 1 is independent of the underlying downward trend in ARClS across NSW over the same time period,³⁰ while the use of the proxy measure of ARClS controlled for variation in police reporting in different communities. Despite this finding, no definitive statements can be made about the effectiveness of the program in reducing ARClS generally because the statistically significant result in Community 1 was not replicated in the other three communities and the 95% confidence interval associated with the change was wide, most likely due to the relatively small number of data points available for analysis. Nevertheless, these results highlight the clear potential of Aboriginal-led strategies and the feasibility of evaluating them using rigorous methods in partnership with researchers. Although the key intent of this analysis is the pre- to post-program evaluation of

BTC within each community, rather than cross-community comparisons, a number of factors may have contributed to the statistically significant reductions being only observed in Community 1. First, Community 1 had a greater proportion of BTC programs implemented across a wider range of BTC key priority areas (Table 1), meaning it received relatively more funding (55% of total program funding) than Community 2 (40%) Community 3 (3%) and Community 4 (3%). Second, Community 1 also had the longest duration of the BTC programs (2.7 years) compared to Community 2 (2.4 years) and communities 3 and 4 (1.3 years each). This greater exposure to the program activities in Community 1 may have improved its impact. Third, Community 1 had the highest numbers of ARCIs, meaning the result may reflect a regression to the mean effect. Fourth, anecdotal observations by the research team may suggest that there may have been more community support for, and engagement in, the program in Community 1. Fifth, the results may have been more uniform across communities if the program activities were more precisely tailored to each of the communities' unique needs, local dynamics and ARCI characteristics.²⁷ Finally, communities 1 and 2 had more project workers to implement the programs, and the only Aboriginal project workers. This may have contributed to the observed outcomes, although it may be a marginal, rather than a key, factor given only community 1 achieved statistically significant reductions.

There are a number of opportunities for improving the design and evaluation of future Aboriginal-led initiatives to reduce crime. First, the BTC approach did attempt to respond to increased recognition of the need for Indigenous autonomy in the design of the community-based programs: the CASPs with their nine priority areas and community-defined activities were developed by an Aboriginal consultant in collaboration with each community. Nevertheless, the Australian Government's Minister for Indigenous Affairs retained the final authority to approve expenditure in each community in this project, which limited the true extent of Aboriginal autonomy. While transparent oversight of public expenditure is obviously necessary, this requirement does not exclude true autonomy in deciding how funds might best be used to improve Indigenous-specific health and well-being. Second, although the multiple baseline evaluation

design used in this study is adequately rigorous, a randomised design would have improved the methodological quality of the evidence. A randomised controlled trial would require earlier engagement between the communities and researchers, rather than a retrospective evaluation. Even where an MBD is the optimal design, earlier engagement would allow randomising the order in which the communities commence a program, rather than that being determined by logistical factors related to community readiness. Earlier engagement would also allow the development and use of surveys and qualitative interviews to measure more nuanced processes and outcomes than is possible using only routinely collected ARCIs. Third, the development of an Aboriginal-specific proxy measure of ARCIs may improve the accuracy of that measure by more effectively addressing between-community variation in police reporting of both alcohol-related incidents and the Aboriginal status of those involved. The principle of using routinely collected data could be extended to generate additional outcomes, such as alcohol-related hospital emergency department presentations. Finally, the time series analysis was based on data aggregated quarterly, rather than monthly or less, which represents information loss in temporal analyses.³¹ A consequence of quarterly aggregation may have been the relatively wide 95% confidence intervals reported, even for the statistically significant outcome for Community 1. There is no obvious resolution to this analysis choice, however, given it was determined by the small monthly counts of ARCIs.

Despite these study limitations all having the practical effect of limiting the capacity of the evaluation to detect any changes as statistically significant, this study shows the great potential of multi-component, Aboriginal-led strategies to reduce ARCIs, given Community 1 did achieve statistically significant reductions in ARCIs for both VOC and POI. This result for Community 1 is also of substantial practical significance: a sustained impact of BTC over two years would reduce Aboriginal VOC rates from 14 incidents per quarter to nine (or 56 alcohol-related VOC per annum to 36) and Aboriginal POI rates from 17 incidents per quarter to 10 (or 68 alcohol-related POI per annum to 40). Addressing the limitations of this study, including more nuanced, real-time collection of process and qualitative data to understand the key

change enablers in communities, may help replicate the results of Community 1 across other communities.

Implications

This study demonstrates the potential of activating more routine partnerships between Indigenous-led, community-based initiatives and researchers. That concept is not new and various formulations for how those partnerships might be constructed have been described for a range of crime and health outcomes in both the international and Australian academic literature.³²⁻³⁶ Consequently, rather than simply reiterate another version of partnerships, it may be time to advocate for the development of frameworks and evaluation tools to operationalise the pragmatic functions of partnerships between Indigenous-led community-based programs and researchers. These tools could include pragmatic program logics, options for methodologically robust measures and access to existing best-evidence practice. The intent of these resources is to simultaneously facilitate current best evidence practice and the more rapid generation of new knowledge on program effectiveness.³⁷⁻⁴¹

References

1. Global Burden of Disease 2016 Alcohol Collaborators. Alcohol use and burden for 195 countries and territories, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018;392(10152):1015-35.
2. Burton R, Kane G, Mason J, Sheron N, Henn C, Beynon C. *The Range and Magnitude of Alcohol's Harm to Others. A Report Delivered to the Five Nations Health Improvement Network. A Rapid Review of Cross-sectional Surveys*. London (UK): Public Health England; 2019.
3. Manning M, Smith C, Mazerolle P. The Societal Costs of Alcohol Misuse in Australia. In: 454 - *Trends and Issues in Crime and Criminal Justice*. Canberra (AUST): Australian Institute of Criminology; 2013.
4. Breen C, Shakeshaft A, Slade T, Love S, D'Este C, Mattick RP. Do community characteristics predict alcohol-related crime? *Alcohol Alcohol*. 2011;46(4):464-70.
5. Collins SE. Associations between socioeconomic factors and alcohol outcomes. *Alcohol Res*. 2016;38(1):83-94.
6. Dudgeon P, Calma T, Brideson T, Holland C. The Gayaa Dhuwi (Proud Spirit) Declaration – a call to action for Aboriginal and Torres Strait Islander leadership in the Australian mental health system. *Adv Ment Health*. 2016;14(2):126-39.
7. Wynne-Jones M, Hillin A, Byers D, Stanley D, Edwige V, Brideson T. Aboriginal grief and loss: A review of the literature. *Aust Indig Health Bull*. 2016;16(3).
8. Australian Institute of Health and Welfare. *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples: 2015*. Canberra (AUST): AIHW; 2015.
9. Calabria B, Doran CM, Vos T, Shakeshaft AP, Hall W. Epidemiology of alcohol-related burden of disease among Indigenous Australians. *Aust NZ J Public Health*. 2010;34(S1):47-51.

10. Snijder M, Calabria B, Dobbins T, Knight A, Shakeshaft A. A need for tailored programs and policies to reduce rates of alcohol-related crimes for vulnerable communities and young people: An analysis of routinely collected police data. *Alcohol Alcohol*. 2018;53(5):578-85.
11. Carragher N, Byrnes J, Doran CM, Shakeshaft A. Developing an alcohol policy assessment toolkit: Application in the western Pacific. *Bull World Health Organ*. 2014;92(10):726-33.
12. Breen C, Shakeshaft A, Slade T, D'Este C, Mattick RP. Assessing reliability of measures using routinely collected data. *Alcohol Alcohol*. 2011;46(4):501-2.
13. World Health Organisation. *Global Strategy to Reduce Harmful Use of Alcohol*. Geneva (CHE): WHO; 2010.
14. Czech S, Shakeshaft A, Breen C, Sanson-Fisher R. Whole-of-community approaches to reducing alcohol-related harm: What do communities think? *J Public Health*. 2010;18:543-51.
15. Snijder M, Shakeshaft A, Wagemakers A, Stephens A, Calabria B. A systematic review of studies evaluating Australian indigenous community development projects: The extent of community participation, their methodological quality and their outcomes. *BMC Public Health*. 2015;15:1154.
16. McCalman J, Tsey K, Clifford A, Earles W, Shakeshaft A, Bainbridge R. Applying what works: A systematic search of the transfer and implementation of promising Indigenous Australian health services and programs. *BMC Public Health*. 2012;12(1):600.
17. Clifford A, Shakeshaft A. A bibliometric review of drug and alcohol research focused on Indigenous peoples of Australia, New Zealand, Canada and the United States. *Drug Alcohol Rev*. 2017;36(4):509-22.
18. Cochrane Effective Practice and Organisation of Care Review Group. *Data Collection Checklist*. Ontario (CAN): University of Ottawa Institute of Population Health; 2002.
19. Komro KA, Flay BR, Biglan A, Wagenaar AC. Research design issues for evaluating complex multicomponent interventions in neighborhoods and communities. *Transl Behav Med*. 2016;6(1):153-9.
20. Australian Bureau of Statistics. *Census Community Profiles 2011*. Canberra (AUST): ABS; 2016.
21. Australian Bureau of Statistics. *2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016*. Canberra (AUST): ABS; 2016.
22. Shannon C, Canuto C, Young E, Craig D, Schluter P, Kenny G, et al. Injury prevention in Indigenous communities: Results of a two-year community development project. *Health Promot J Austr*. 2001;12(3):233-7.
23. Matthews S, Chikritzhs T, Catalano P, Stockwell T, Donath S. *Trends in Alcohol-related Violence in Australia, 1991/92-1999/00*. Perth (AUST): National Drug Research Institute; 2002.
24. R: A language and environment for statistical computing. Vienna (AUT): R Foundation for Statistical Computing; 2017.
25. Biglan A, Ary D, Wagenaar AC. The value of interrupted time-series experiments for community intervention research. *Prev Sci*. 2000;1(1):31-49.
26. Dunsmuir WTM, Scott DJ. The glarma package for observation-driven time series regression of counts. *J Stat Softw*. 2015;67(1):1-36.
27. Shakeshaft A, Doran C, Petrie D, Breen C, Havard A, Abudeen A, et al. The effectiveness of community action in reducing risky alcohol consumption and harm: A cluster randomised controlled trial. *PLoS Med*. 2014;11(3):e1001617.
28. Czado C, Gneiting T, Held L. Predictive model assessment for count data. *Biometrics*. 2009;65(4):1254-61.
29. Akaike H. A new look at the statistical model identification. *IEEE Trans Automat Contr*. 1974;19(6):716-23.
30. Bureau of Crime Statistics and Research. *Incidents of Assault Police Recorded by NSW Police Force by Local Government Area and Alcohol Related Status: Number, Proportion, Rate and Trend, Reference 15-13281*. Sydney (AUST): New South Wales Department of Justice; 2015.
31. Rossana R, Seater J. Temporal aggregation and economic time series. *J Bus Econ Stat*. 1995;13:441-51.
32. Bainbridge R, McCalman J, Tsey K, Brown C. Inside-out approaches to promoting Australian Aboriginal wellbeing: evidence from a decade of community-based participatory research. *Int J Health Wellness Soc*. 2011;1:13-28.
33. Baydala L, Fletcher F, Worrell S, Kajner T, Letendre S, Letendre L, et al. Partnership, knowledge translation, and substance abuse prevention with a First Nations community. *Prog Community Health Partnersh*. 2014;8(2):145-55.
34. Cochran PAL, Marshall CA, Garcia-Downing C, Kendall E, Cook D, McCubbin L, et al. Indigenous ways of knowing: Implications for participatory research and community. *Am J Public Health*. 2008;98(1):22-7.
35. Mayo K, Tsey K, Team ER. The research dance: University and community research collaborations at Yarrabah, North Queensland, Australia. *Health Soc Care Community*. 2009;17(2):133-40.
36. Pyett P. Working together to reduce health inequalities reflections on a collaborative participatory approach to health research. *Aust NZ J Public Health*. 2002;26(4):332-6.
37. Munro A, Allan J, Shakeshaft A, Breen C. "I just feel comfortable out here, there's something about the place": Staff and client perceptions of a remote Australian Aboriginal drug and alcohol rehabilitation service. *Subst Abuse Treat Prev Policy*. 2017;12(1):49.
38. Munro A, Shakeshaft A, Clifford A. The development of a healing model of care for an Indigenous drug and alcohol residential rehabilitation service: A community-based participatory research approach. *Health Justice*. 2017;5(1):12.
39. Knight A, Havard A, Shakeshaft A, Maple M, Snijder M, Shakeshaft B. The feasibility of embedding data collection into the routine service delivery of a multi-component program for high-risk young people. *Int J Environ Res Public Health*. 2017;14(2):208.
40. Knight A, Maple M, Shakeshaft A, Shakeshaft B, Pearce T. Improving the evidence base for services working with youth at-risk of involvement in the criminal justice system: Developing a standardised program approach. *Health Justice*. 2018;6(1):8.
41. Snijder M, Wagemakers A, Calabria B, Byrne B, O'Neill J, Bamblett R, et al. 'We walked side by side through the whole thing': A mixed-methods study of key elements of community-based participatory research partnerships between rural Aboriginal communities and researchers. *Aust J Rural Health*. 2020;28(4):338-50.