Increasing alcohol restrictions and rates of serious injury in four remote Australian Indigenous communities

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ABSTRACT

Objective: To document rates of serious injuries in relation to government alcohol restrictions in remote Australian Indigenous communities.

Design and setting: An ecological study using Royal Flying Doctor Service injury retrieval data, before and after changes in legal access to alcohol in four remote Australian Indigenous communities, Queensland, 1 January 1996 – 31 July 2010.

Main outcome measures: Changes in rates of aeromedical retrievals for serious injury, and proportion of retrievals for serious injury, before and after alcohol restrictions.

Results: After alcohol restrictions were introduced in 2002–2003, retrieval rates for serious injury dropped initially, and then increased in the 2 years before further restrictions in 2008 (average increase, 2.34 per 1000 per year). This trend reversed in the 2 years after the 2008 restrictions (average decrease, 7.97 per 1000 per year). There was a statistically significant decreasing time trend in serious-injury retrieval rates in each of the four communities for the period 2 years before the 2002–2003 restrictions, 2 years before the 2008 restrictions, and the final 2 years of observations (2009–2010) ($P < 0.001$ for all four communities combined). Overall, serious-injury retrieval rates dropped from 30 per 1000 in 2008 to 14 per 1000 in 2010, and the proportions of serious-injury retrievals decreased significantly for all four communities.

Conclusion: The absolute and the proportional rates of serious-injury retrievals fell significantly as government restrictions on legal access to alcohol increased; they are now at their lowest recorded level in 15 years.

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Over the past 30 years, Australian government[1] and international reports have repeatedly shown that alcohol consumption plays a major role in the poor health outcomes of indigenous peoples. Rates of alcohol-related harm among Indigenous Australians are up to seven times higher than in the Australian population as a whole, with all age groups affected.[2] Although Indigenous Australians are less likely than non-Indigenous Australians to consume alcohol,[3] those who do drink alcohol do so at a level that about doubles their risk of long-term harm and increases by 50% their risk of short-term harm.[4] This level of alcohol consumption almost doubles their disease burden compared with the general Australian population.[5]

Core strategies to combat excessive alcohol consumption are supply reduction, demand reduction and harm reduction. Although rigorous intervention trials to provide an evidence base for cost-effective harm-reduction strategies are lacking,[6] supply-reduction strategies have been widely advocated internationally[7-10] and specifically for North Queensland by the Cape York Justice Study.[11]

In response to the latter study, the Queensland Government established the Meeting Challenges, Making Choices program[12] in 2002–2003, with a supply-reduction strategy (SRS) as the primary intervention for remote Indigenous communities in Qld. Local community justice groups (statutory bodies consisting of Indigenous Elders and others), in partnership with government agencies, decided on the nature and timing of alcohol restrictions. The government regulated the legal availability of alcohol for sale and established individual possession limits in specific remote Indigenous communities. The police and judicial systems enforced these regulations, imposing substantial penalties.

The relationship between alcohol consumption and violence is well established,[13-15] and violence is linked with excessive alcohol consumption in Indigenous communities, often extending beyond drinkers to non-consumers (bystanders, women and children).[2,16] Our 2008 study using Royal Flying Doctor Service (RFDS) data reported a 52% decline in serious injury in the 2 years after the SRS was introduced in four remote communities in Cape York, Qld.[17] A government review of the SRS also found a decline in hospital admissions for assault and, to a lesser extent, for other injuries.[18]

With the success of the 2002–2003 SRS, the government introduced a second SRS in 2008 with even tighter alcohol restrictions (principally through regulatory changes to existing legislation). These ranged from limited access to total prohibition across all 19 discrete Indigenous communities in Qld.[19] Here, we assess the changes in rates of serious injuries after this second SRS in four of these Indigenous communities.

METHODS

Design and setting

We used an ecological design and obtained RFDS aeromedical retrieval data for four remote Aboriginal and Torres Strait Islander communities in Cape York, Qld, for the period 1 January 1996 – 31 July 2010. (RFDS operational details are described elsewhere.[20])

The four study communities had each been subject to a stepwise reduction in the legal availability of alcohol since 2002 (Box 1). In summary, in the first SRS (2002–2003), all communities moved to restricted access; in the second SRS (2008), three communities moved to prohibition, while a fourth allowed low-alcohol beer within licensed premises.

The four study communities were chosen from the 19 Qld Indigenous communities. Only these four had: (i) formal government restrictions on the legal supply of alcohol throughout the study period; (ii) logistical and management systems ensuring that all people with serious injuries were transported to definitive care by the RFDS; (iii) sufficient isolation to ensure that aeromedical retrievals occurred from the community where the injury was sustained; and (iv) limited changes in the logistics or management of serious injury throughout the study period. These factors ensured that the RFDS database accounted for all the injury cases, with no leakage to other centres.

The health care service for each community was a government-funded clinic staffed by Queensland Health nurses, with visiting medical and ancillary staff provided by both Qld Health and the RFDS. Each location had the same health care providers and shared a common experience in minor day-to-day changes in policy, management, logistics and

1 Legal access to alcohol by community: first (2002–2003) and second (2008) supply-reduction strategies

Community	Intervention began	Alcohol content of beer		Wine	Alcohol content of spirits		Open carriage*	Canteen	Take away	Home brew
		⩽ 4%	> 4%		⩽ 5.5%	> 5.5%				
A	30 Dec 2002	Yes	No	No	Yes	No	No	Yes	No	Yes†
B	05 Dec 2003	Yes	No	No	No	No	No	Yes	No	Yes
C	03 Oct 2003	Yes	Yes	No	No	No	No	Yes	No	Yes
D	05 Dec 2003	Yes	Yes	No‡	No‡	No	Limited	Yes	Limited	Yes
A	27 Nov 2008	No	No	No	No	No	No	No	No	No
B	20 Mar 2008	No	No	No	No	No	No	No	No	No
C	07 Jul 2008	No	No	No	No	No	No	No	No	No
D	01 Dec 2008	Yes	No	No	No	No	No	Yes§	No	No

* Possession outside of licensed premises. † Ceased on 01/03/2005. ‡ Except church use. § Public bar. ◆

delivery of health care. Each location had limited x-ray services for limbs and chest only, and no inpatient facilities. In the study period, there were no significant changes in procedures or protocols for retrieval of patients with serious injury.

Serious injury and alcohol consumption

Serious injury was defined as injury that required hospital treatment and, as such, could not be managed within the study communities. We used serious injury requiring aeromedical retrieval as a surrogate marker for evidence of excessive alcohol consumption, while acknowledging that not all serious injuries occurred as a result of excessive alcohol consumption. There is substantial evidence that a significant proportion of such injuries are due to alcohol, but this proportion cannot be precisely quantified.[21,22]

Data collection

RFDS clinicians directly involved in aeromedical retrievals completed data sheets contemporaneously; these were later entered into the RFDS electronic de-identified database. Included were:

- demographic data (patient's date of birth, sex and Indigenous status);
- clinical severity of the patient's condition (4-point Likert scale: critical, high, low, and nil); and
- up to three clinical diagnostic categories; and one external cause of injury (where applicable).

Statistical methods

Population data for each of the study communities were obtained from 2001 and 2006 census data (Box 2).[23] All retrieval-rate calculations were based on the most recent census data at the time of observation and expressed as rates per year per 1000 community members. Using census data, rather than current estimated population data, may underestimate population sizes and thus overestimate reported rates. Any potential bias introduced would be towards the "null value" thereby underestimating true decreases.

2 Proportion of Indigenous Australians in the four study communities

Community	2001 Census data		2006 Census data	
	Total population	Indigenous population	Total population	Indigenous population
A	1047	919 (88%)	1129	1059 (94%)
B	891	753 (85%)	1101	1028 (93%)
C	453	276 (61%)	599	541 (90%)
D	649	559 (86%)	644	580 (90%)

Calculations of linear trends before and after the introduction of the 2008 SRS were based on retrieval data for 2008, and for the 2 years before and after the introduction. Yearly rates for 2010 were estimated based on information available for the first 7 months. This approach is reasonable as no quarterly or seasonal fluctuations of absolute or proportional rates were observed in all other years (smallest P value = 0.58).

Poisson regression analyses (within each community and for all four communities combined) were used to assess time trends of rates of serious-injury retrievals for the 2 years before the first restrictions were introduced (2001–2002 in Community A; 2002–2003 in the other three communities), the 2 years before the second round of restrictions (2007–2008 in all communities), and the last 2 years of observations (2009–2010). Time trends of proportions of serious-injury retrievals (out of all retrievals) were similarly assessed by means of exact χ^2 type tests for linear trends.

Ethics approval

The James Cook University Human Research Ethics Committee approved this study of de-identified data (H3465).

RESULTS

During the study period, 1 January 1996 – 31 July 2010, there were 5375 aeromedical retrievals from the four study communities. In 1996–1998, over 30% of retrievals were injury-related; this proportion dropped to 17.8% in 2009 and 15.2% in 2010. The proportion of aeromedical retrievals for all causes in which the patient was Indigenous fell from a high of 94.5% in 1996 to a low of 84.5% in 2010.

The proportions of patients in the four clinical severity categories who required all-cause aeromedical retrieval remained very similar in the study period with, on average, 1.8% critical, 21.8% high, 69.1% low and 7.5% nil. Age and sex distributions of those retrieved for any cause were also basically unchanged — average age of 31.8 (SD, 21.1) years, 49% males. The proportion of retrievals from each of the study communities remained stable over time (36.8% Community A, 28.3% Community B, 17.7% Community C, and 17.2% Community D) and closely reflected the population distribution in 2006 (32.5% Commu-

3 Observed injury retrieval rates (rounded to the nearest integer) per 1000 Indigenous community members per year, and average rates, 1996–2010

Community	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A	28	16	20	18	23	36	31	20	16	29	26	33	23	20	20
B	42	30	28	28	37	35	29	26	10	16	18	12	26	17	8
C	24	22	38	29	15	31	57	46	20	20	55	26	46	24	11
D	20	12	34	22	17	25	48	35	26	23	12	17	23	25	16
Average	*29*	*20*	*30*	*24*	*23*	*32*	*41*	*32*	*18*	*22*	*28*	*22*	*30*	*21*	*14*

Shaded cells indicate when the first and second alcohol supply-reduction strategies were introduced. ◆

nity A, 31.7% Community B, 17.2% Community C, and 18.5% Community D).

Introduction of the first SRS in 2002–2003 (Box 1) was associated with a 52% decline in serious-injury retrievals in the following 2 years compared with the 2 years before the introduction. Detailed results were published in 2008.[17]

Severe injuries in the study communities reached a relative minimum in the year after the first SRS and started to climb again to around 30 per 1000 per year (Box 3). Serious-injury rates were on average increasing (+2.34 per 1000 per year) in the 2 years before the second SRS (Box 4), yet without reaching the levels observed before the first SRS (41 per 1000 per year).

After the introduction of the second SRS in 2008, a reverse average trend (–7.97 per 1000 per year) was observed in the four communities. Overall, serious-injury retrieval rates dropped from 30 per 1000 in 2008 to 14 per 1000 in 2010, an average reduction of 54%, constituting the lowest serious-injury retrieval rates in these communities since records commenced in 1996. Over the same period (2008–2010), the average retrieval rate in all study communities for all causes other than serious injury increased by 13.14% (from rounded values of 75 per 1000 in 2008 to 85 per 1000 in 2010).

Statistical tests of time trends of rates of serious-injury retrievals for the 2 years before the 2002–2003 SRS, the 2 years before the 2008 SRS and the last 2 years of observations (2009–2010) showed statistically significant decreases in each community and for all four communities combined ($P = 0.01$ for Community A, and $P < 0.001$ for communities B, C and D and for all four combined). At the same time the proportions of serious-injury retrievals (out of all retrievals) decreased significantly for all four communities and overall (from 29.5% before any restrictions to 17.0% in 2009–2010) (Box 5).

4 Linear trends in injury retrieval rates before (2006–2008) and after (2008–2010) the second supply-reduction strategy, and reductions in retrieval rates, 2008 v 2010

	Linear trends in retrieval rates*		Reductions in retrieval rates, 2008 v 2010†
Community	2006–2008	2008–2010	
A	+1.81	–1.66	–14.5%
B	+2.81	–9.06	–70.2%
C	+5.96	–17.55	–75.7%
D	–1.23	–3.62	–31.3%
Average	*+2.34*	*–7.97*	*–54.0%*

* Average annual changes in retrieval rates per 1000 community members. † Changes in retrieval rates between 2008 and 2010, expressed as a percentage. ◆

DISCUSSION

We have shown a further substantial and significant drop — in excess of 50% — in serious-injury retrieval rates in four Indigenous communities in Cape York after the introduction of the second SRS. The rate of serious injury is now at the lowest recorded in 15 years. These results are consistent with a government report showing reductions in some communities in hospital admissions for assault-related trauma (2002–03 to 2009–10).[24]

Sudden rather than phased alcohol prohibition entails the possibility of inducing serious health consequences from acute alcohol withdrawal. However, the drinking patterns of Indigenous Australians are different from those of non-Indigenous Australians. Typically, some people are involved in heavy episodic drinking while a large proportion abstain.[25] An earlier study showed no instances of acute alcohol withdrawal syndrome (and no retrievals for alcohol withdrawal) after the sudden introduction of a total prohibition of legal alcohol in a remote Australian Indigenous community.[26]

The degree and effectiveness of enforcement of the strict laws on illegal importation of alcohol into these communities ("sly grogging") is uncertain. There have been anecdotal reports, supported by unpublished consultation data, of rising rates of sly grogging in some communities after the introduction of the SRS.[27,28] However, there was a higher rate of charges resulting in conviction for breach of alcohol restrictions in 2009–10.[24]

Focusing on supply reduction in the absence of demand-reduction strategies may lead to increasing use of other substances (eg, petrol sniffing or marijuana), as the fundamental issue of substance misuse has not been addressed.[29] Consultations with key community members and service providers in the major communities in Cape York during 2008–2009, including the four study communities, as well as pilot surveys of cannabis use among community members conducted in 2010 in two of the communities, indicate that some people who consumed alcohol had taken up cannabis use after the first SRS, some for the first time (unpublished data). Hence, strategies that complement supply reduction should also be considered, for example, behaviour modification programs through Indigenous men's support groups,[30] brief interventions in primary health care[6] and/or residential rehabilitation.[31]

Our study has several limitations. First, with no clearly applicable control groups within our data, it is not possible to ensure that our results are not part of a more widespread trend. There is some evidence that injury rates in general in Qld and across Australia are slowly rising over time.[23,32]

Second, in the absence of data on blood alcohol levels, a potential limitation of our study is the use of aeromedical retrieval for serious injury as a surrogate for injury caused directly by alcohol. However, measuring blood alcohol levels would still exclude instances of alcohol-related violence committed against non-drinking bystanders.

A third limitation is the possible variation over time in logistical factors (eg, staffing or capacity) that may have influenced whether an injured person was retrieved.

Future studies at the community level would be helpful. The apparent upward trend in serious injury after the 2002–2003 interventions may have been due to a number of local factors, such as population shifts to non-regulated locations in response to the SRS; studies could determine the impact of the SRS on population shifts. A potential confounding factor is the absence

5 Time trends in the proportion of retrievals for injury (among all retrievals) — first and second alcohol supply-reduction strategies (SRSs)

Community	Before first SRS (to 2003)	After first SRS (2004–2008)	After second SRS (2009 and beyond)	*P* (linear trend)
A	25.6%	19.0%	17.5%	< 0.001
B	32.3%	19.7%	14.7%	< 0.0001
C	30.7%	23.5%	14.4%	< 0.001
D	31.0%	25.4%	21.4%	< 0.02
Average	*29.5%*	*21.1%*	*17.0%*	*< 0.0001*

of data on the perceptions of community residents, and studies could explore local factors that may help maintain low injury rates, and the positive and negative community impacts, to determine the overall effectiveness of a government-legislated SRS.

In summary, after the second SRS in these four Indigenous communities, there were substantial, significant and consistent decreases in serious-injury rates to historically low levels, and coincidental decreases in the proportions of serious injuries in all retrievals (ie, increases in retrievals for other causes). The next step will be to enhance demand- and harm-reduction strategies, so that the three pillars of intervention can work in concert.

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COMPETING INTERESTS

None identified.

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