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

Stephen A Margolis, Valmae A Ypinazar, Reinhold Muller and Alan Clough

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, 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 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.
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.\(^\text{21,22}\)

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).\(^\text{23}\) 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.

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 \(\chi^2\) type tests for linear trends.

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

<table>
<thead>
<tr>
<th>Community</th>
<th>Intervention began</th>
<th>Alcohol content of beer</th>
<th>Alcohol content of spirits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(\leq 4%)</td>
<td>(&gt; 4%)</td>
</tr>
<tr>
<td>A</td>
<td>30 Dec 2002</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>B</td>
<td>05 Dec 2003</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>C</td>
<td>03 Oct 2003</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>05 Dec 2003</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A</td>
<td>27 Nov 2008</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B</td>
<td>20 Mar 2008</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>C</td>
<td>07 Jul 2008</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>D</td>
<td>01 Dec 2008</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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

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### 2 Proportion of Indigenous Australians in the four study communities

<table>
<thead>
<tr>
<th>Community</th>
<th>2001 Census data</th>
<th>2006 Census data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total population</td>
<td>Indigenous population</td>
</tr>
<tr>
<td>A</td>
<td>1047</td>
<td>919 (88%)</td>
</tr>
<tr>
<td>B</td>
<td>891</td>
<td>753 (85%)</td>
</tr>
<tr>
<td>C</td>
<td>453</td>
<td>276 (61%)</td>
</tr>
<tr>
<td>D</td>
<td>649</td>
<td>559 (86%)</td>
</tr>
</tbody>
</table>

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### 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

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>A</td>
<td>28</td>
<td>16</td>
<td>20</td>
<td>18</td>
<td>23</td>
<td>36</td>
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<td>33</td>
<td>23</td>
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<tr>
<td>B</td>
<td>42</td>
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<td>28</td>
<td>37</td>
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<td>16</td>
<td>18</td>
<td>12</td>
<td>26</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>22</td>
<td>38</td>
<td>29</td>
<td>15</td>
<td>31</td>
<td>57</td>
<td>46</td>
<td>20</td>
<td>20</td>
<td>55</td>
<td>26</td>
<td>46</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>12</td>
<td>34</td>
<td>22</td>
<td>17</td>
<td>25</td>
<td>48</td>
<td>35</td>
<td>26</td>
<td>23</td>
<td>12</td>
<td>17</td>
<td>23</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>Average</td>
<td>29</td>
<td>20</td>
<td>30</td>
<td>24</td>
<td>23</td>
<td>32</td>
<td>41</td>
<td>32</td>
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<td>22</td>
<td>28</td>
<td>22</td>
<td>30</td>
<td>21</td>
<td>14</td>
</tr>
</tbody>
</table>

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


<table>
<thead>
<tr>
<th>Community</th>
<th>Linear trends in retrieval rates*</th>
<th>Reductions in retrieval rates, 2008 v 2010†</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+1.81 –1.66 −14.5%</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>+2.81 −9.06 −70.2%</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>+5.96 −17.55 −75.7%</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>−1.23 −3.62 −31.3%</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>+2.34 −7.97 −54.0%</td>
<td></td>
</tr>
</tbody>
</table>

* 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 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 of...
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.

ACKNOWLEDGEMENTS
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COMPETING INTERESTS
None identified.

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REFERENCES

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See also pages 507 and 508

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25.6%</td>
<td>19.0%</td>
<td>17.5%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>B</td>
<td>32.3%</td>
<td>19.7%</td>
<td>14.7%</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>C</td>
<td>30.7%</td>
<td>23.5%</td>
<td>14.4%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>D</td>
<td>31.0%</td>
<td>25.4%</td>
<td>21.4%</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td>Average</td>
<td>29.5%</td>
<td>21.1%</td>
<td>17.0%</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>