

**IMPROVING OUR UNDERSTANDING OF ALCOHOL DEPENDENCE
AMONG INDIGENOUS PEOPLES:
AN INTERNATIONAL SYSTEMATIC REVIEW AND QUANTITATIVE
STUDY OF TWO AUSTRALIAN ABORIGINAL COMMUNITIES**

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GradDipIndigHP

A thesis submitted to fulfil requirements for the degree of Doctor of Philosophy

Faculty of Medicine and Health

The University of Sydney

2022

Dedication

Dedicated to my two grandfathers, Poppy Alf and Poppy Kenny, who sadly passed away during my candidature. Poppy Alf kept the only two medals I ever earned in school, both for “Academic Excellence”. I love you both.

Declaration

This is to certify that to the best of my knowledge the content of this thesis is my own work.

This thesis has not been submitted for any other degree or other purpose.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

In addition to the statements above, permission to include the published material has been granted by the corresponding author.

Teagan Joan Weatherall

Authorship attribution statement

This thesis contains three published papers. For all of these, I was involved in all aspects, from conceptualisation to publication. I am lead and corresponding author on all three publications.

Chapter 2 of this thesis is published as: Weatherall TJ, Conigrave KM, Conigrave JH, Lee KSK. What is the prevalence of current alcohol dependence and how is it measured for Indigenous people in Australia, New Zealand, Canada and the United States of America? A systematic review. *Addiction Science and Clinical Practice* 15, 32 (2020).

<https://doi.org/10.1186/s13722-020-00205-7>.

- **My contributions to this paper were as follows:** designed the search terms with a university librarian, led the registration of the study with PROSPERO, conducted the systematic search of the literature, conducted screening and data extraction, led the writing of the manuscript, tables and figure, combined and refined co-authors' comments.
- **My co-authors contributions to this paper were as follows:** KC provided input into PROSPERO registration, adjudicated screening and data extraction, independently checked data extraction, reviewed drafts, oversaw scientific integrity of the study; JC provided input into PROSPERO registration, conducted a systematic literature search, title and abstract screen, full-text screen and data extraction, reviewed drafts; KL provided input into PROSPERO registration, conducted title and abstract screen, full-text screen and data extraction, reviewed drafts; all authors provided input into and approved the final manuscript.

Chapter 3 of this thesis is published as: Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Fitts MS, Hayman N, Lee KSK. Prevalence and correlates of alcohol dependence in an Australian Aboriginal and Torres Strait Islander representative sample: Using the Grog Survey App. *Drug and Alcohol Review*. 2022;41(1):125-134, <https://doi.org/10.1111/dar.13292>.

- **My contributions to this paper were as follows:** assisted to recruit participants, conducted data collection, conducted the data analyses with oversight from JC, led the writing of the manuscript, tables and figure, combined and refined co-authors' comments.
- **My co-authors contributions to this paper were as follows:** JC conceptualised the data analyses, conducted data cleaning and ensured data quality, reviewed drafts; KC designed the study, input into App design, reviewed drafts; JP input into App design, assisted to recruit participants to complete the survey App, reviewed drafts; SW co-conceived the idea of the App, designed the study, input into App design, reviewed drafts; RR designed the study, input into App design, reviewed drafts; MF helped to organise data collection, recruited participants to complete the App, reviewed drafts; NH designed the study, input into App design, reviewed drafts; KL co-conceived the idea of the App, designed the study, led App design, oversight for recruitment of participants, assisted with data collection, reviewed drafts; all authors provided input into and approved the final manuscript.

Chapter 4 of this thesis is published as: Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Chikritzhs T, Lee KSK. Alcohol dependence in a community sample of Aboriginal and Torres Strait Islander Australians: harms, getting help and

awareness of local treatments. *Addiction Science and Clinical Practice* 16, 65 (2021).

<https://doi.org/10.1186/s13722-021-00274-2>.

- **My contributions to this paper were as follows:** assisted to recruit participants to complete the survey App, conducted data collection, conducted the data analyses with oversight from JC, led the writing of the manuscript, tables and figure, combined and refined co-authors' comments.
- **My co-authors contributions to this paper were as follows:** JC conceptualised the data analyses, conducted data cleaning and quality, reviewed drafts; KC designed the study, input into App design, reviewed drafts; JP input into App design, assisted to recruit participants, reviewed drafts; SW co-conceived the idea of the App, designed the study, input into App design, reviewed drafts; RR designed the study, input into App design, reviewed drafts; TC designed the study, input into App design, reviewed drafts; KL co-conceived the idea of the App, designed the study, led App design, oversight for recruitment of participants, assisted with data collection, reviewed drafts all authors provided input into and approved the final manuscript.

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As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

K.S. Kylie Lee (Supervisor)

Abstract

Alcohol use is common globally and the health risks from drinking are recognised. However, Indigenous Peoples who have been impacted by colonisation, trauma and racism, could be at greater risk of developing alcohol-related harms. One of these harms could be alcohol dependence, the strong internal drive to use alcohol with an inability to control use, prioritising alcohol and also physiological characteristics. The way alcohol dependence is interpreted or identified can be different across cultures and for Indigenous Peoples. The overall aim of this thesis was to identify the prevalence of alcohol dependence among Indigenous Peoples globally, and the associations of dependence in an Indigenous Australian community sample.

Chapter 2 is a systematic review of the prevalence of alcohol dependence among Indigenous Peoples globally and examines how dependence is identified. Chapter 3 estimates the prevalence and describes the correlates of alcohol dependence in a representative community sample of Indigenous Australians. Chapter 4 identifies the associations between alcohol dependence with harms and getting help for drinking in a representative community sample of Indigenous Australians.

This research reports that the prevalence of current alcohol dependence among Indigenous Peoples globally from similarly colonised countries varies widely and shows few tools have been validated for Indigenous Peoples. The prevalence in the representative community sample of Indigenous Australians is similar to the general Australian population. Dependent drinkers were more likely to report harms and more likely to get help for their drinking. Researchers, health professionals and clinicians do well to use Indigenous-specific survey tools or operationalise existing tools when trying to identify alcohol dependence among

Indigenous Peoples. Accurate prevalence data can better inform treatment needs and unmet needs. Indigenous Australians need support and treatment options that are readily available, accessible and culturally appropriate. Identifying these needs could help with funding and resource allocation.

Acknowledgements

A huge thank you to the Aboriginal and Torres Strait Islander people who participated in this study and made this research possible. Without them and their willing support I could not have completed this. I am very thankful that they shared their stories and experiences with me.

I cannot thank Professor Kate Conigrave and Associate Professor Kylie Lee enough. They supported me and believed in me from the start. They hired me in my first administrative role at the University of Sydney and supported me to become a research assistant, to complete a post-grad degree and this thesis. Their support included face-to-face meetings, virtual meetings during a global pandemic, phone calls, emails and text messages. Thank you to Doctor James Conigrave for his supervision and unique ways of teaching. His invaluable skills in statistics and analyses were very much appreciated. To help me grasp things more easily he would explain things using illustrations and YouTube videos. A special mention to my fellow Aboriginal researchers from the team. They would spend time chatting with me, guiding me through the research process and share their experiences with me. I would also like to acknowledge our entire research team, who supported me at all the events, workshops and writing sessions that have been a huge help.

I would like to thank my husband Tim for his support, encouragement and lovely company. A special thank you to my two grandfathers, Poppy Alf and Poppy Kenny. Sadly, they both passed away during my candidature. They have always been big supporters of me in everything I do and always encouraged me to do my best academically. I hope I have made them both proud. Thank you to my mum and dad, Peggy and Pepe. Thank you to my sisters Koorine, Jasmine and Taleah, and my brother Josh. Thank you to my nan, Joan, for her love

and support over the years, and to all my family. Also thank you to my father-in-law and mother-in-law, Bob and Dixie. I would like to acknowledge my beautiful nephew and nieces, Jeremiah, Eliana and Summer, who are a source of joy in my life. I love you all too much to describe. Finally, I would like to thank my dear friends. Their kind words, joy and love for me and Tim is why they are cherished.

Preface

My path to this thesis commenced when I was employed as a research assistant at The University of Sydney. Early on in this role, I assisted in the validation study of the Grog Survey App (2016-2017), on which I am a co-author (Appendix F). The survey data presented in this thesis (Chapters 3 & 4) are part of the larger Grog Survey App project. The validation process included two teams of Indigenous research assistants (in South Australia and Queensland) recruiting 200 participants to complete the App twice and also complete a clinical interview about each participant's drinking (including quantity consumed, frequency, dry patches in the last 2-4 weeks). The clinical interviews were conducted by Aboriginal health professionals and my role was to code the handwritten clinical interview notes ready for analysis. I manually calculated participants' standard drinks in the diary filled in by each Aboriginal health professional. This task required knowledge of common terminologies and slang used in Australia, and by Indigenous health professionals and Indigenous participants. For example, when a health professional might record responses such as "long-neck", "slab", "tinnie", "stubbie" or "four X". I knew what they were talking about and could code the standard drinks accordingly.

I enjoyed my work on the validation study and it sparked my interest in the Grog Survey App and my desire to complete further education. Following this, at the encouragement of Professor Kate Conigrave and A/Professor Kylie Lee, I enrolled in a Graduate Diploma in Indigenous Health Promotion at The University of Sydney. My experience completing the Graduate Diploma helped me to develop valuable skills that I would need in research. In 2019, I was recognised as a High Performing Graduate of 2018 in the School of Public Health and this gave me the confidence to enrol in a post-graduate research degree.

Early in my PhD candidature (2019), I travelled to one of the study communities a number of times to assist with data collection. I attended meetings with local service providers in the urban site in South Australia, and worked alongside and learned from the local Aboriginal clinicians who led that data collection. Data collection venues included health services, housing offices, shopping centres, local community events and parks. I saw firsthand the planning and effort that went into recruiting a representative community sample of Indigenous Australians to participate in the study.

During my time collecting data in the urban site in South Australia, I often reflected on the conversations I had with our study participants. Some participants, after they completed the survey, wanted to tell me about their past alcohol use or that they had “given up alcohol”. One participant told me she was glad that someone was getting the “real story” on what was happening in the community to change the narrative that all Aboriginal people are “alcoholics”. Also, some people shared their stories with me about alcohol-related harms they had witnessed or knew about and their past attempts to seek help for their drinking. During one data collection event I remember setting up an iPad for an older Aboriginal man to complete. He started to tell me about his past experiences with alcohol. He told me that alcohol had previously been a big part of his life. He had also witnessed domestic violence against his mother when he was young and attributed this to alcohol. Reflecting on these stories, I am grateful that the participants felt comfortable and safe to share them with me.

On a different occasion I was talking with a local Aboriginal research assistant about their local experiences of alcohol-related harms. We discussed how we had each observed that a lower socio-economic background can impact greatly on an individual’s drinking. For example, sometimes local Indigenous people who drink alcohol appeared to have more run-

ins with police and security guards than non-Indigenous people. Sometimes run-ins with security guards happen because local Indigenous people do not meet dress standards required to enter ‘pubs’ or clubs. Conversations such as these helped me to reflect on the fact that for some Indigenous people, alcohol-related harms may not just be linked to alcohol. They could also be linked to other social factors. Reflecting on these inspired me to find out what factors are associated with dependence. I am grateful that I spent time in this community to see firsthand the diversity of stories among Indigenous Australians and alcohol in this urban community.

My personal hope for this thesis is that it might go some way to address the stigma associated with Indigenous Australians and alcohol, that is so often portrayed in the Australian media. After spending time in community with participants, community members and local Aboriginal clinicians, I hope I have represented their stories correctly and honestly.

Funding sources

This work is supported by the Australian National Health and Medical Research Council via the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198) and a Project Grant (#1087192).

Dissemination of study findings

The following publications, presentations and interviews have arisen from the research presented in this thesis.

Peer-reviewed publications

1. Weatherall TJ, Conigrave KM, Conigrave JH, Lee KSK. What is the prevalence of current alcohol dependence and how is it measured for Indigenous people in Australia, New Zealand, Canada and the United States of America? A systematic review. *Addiction Science and Clinical Practice* 15, 32 (2020). <https://doi.org/10.1186/s13722-020-00205-7>.

2. Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Fitts MS, Hayman N, Lee KSK. Prevalence and correlates of alcohol dependence in an Australian Aboriginal and Torres Strait Islander representative sample: Using the Grog Survey App. *Drug and Alcohol Review*. 2022;41(1):125-134, <https://doi.org/10.1111/dar.13292>.

3. Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Chikritzhs T, Lee KSK. Alcohol dependence in a community sample of Aboriginal and Torres Strait Islander Australians: harms, getting help and awareness of local treatments. *Addiction Science and Clinical Practice* 16, 65 (2021). <https://doi.org/10.1186/s13722-021-00274-2>.

Presentations

June 2019	The Lowitja Institute International Indigenous Health and Wellbeing Conference 2019. “Supporting Indigenous health services to reduce harms from alcohol” (Darwin, Northern Territory)
September 2019	Centre of Research Excellence: Indigenous Health and Alcohol 2019 Public Symposium. “Prevalence of alcohol dependence and how it is measured in Indigenous communities: a systematic review” (Sydney, New South Wales)
September 2020	Centre of Research Excellence: Indigenous Health and Alcohol 2020 Symposium Series. “Prevalence and correlates of alcohol dependence in a representative sample: The Grog Survey App” (online webinar)
March 2021	National Indigenous Drug and Alcohol Conference 2021 (symposium in a plenary session). Creating Pathways for Indigenous Australians to Lead the Way in Alcohol Research. “Prevalence and correlates of alcohol dependence in a representative sample: The Grog Survey App” (Glenelg, South Australia)
October 2021	Centre of Research Excellence: Indigenous Health and Alcohol 2021 Symposium Series. “Alcohol dependence in a community sample: harms, getting help, local supports” (online webinar)

Media interviews (radio)

April 2021	4ZZZ 102.1 FM (Queensland)
April 2021	ABC Eyre Peninsula (South Australia)

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Glossary

AA	Alcoholics Anonymous (mutual support programme)
Aboriginal	In an Australian context, not referring to Torres Strait Islander people
ACHSA	Aboriginal Health Council of South Australia
AOD	Alcohol and other drugs
APA	American Psychological Association
App	Grog Survey Application, Grog Survey App
ASSIST-Lite	Alcohol, Smoking and Substance Involvement Screening Test (short form)
AUD	Alcohol Use Disorder
AUDADIS	Alcohol Use Disorder and Associated Disabilities Interview Schedule
AUDIT	Alcohol Use Disorders Identification Test
AXIS	Appraisal Tool for Cross-Sectional Studies
CAGE	CAGE (a screening tool) is derived from the four questions of the tool: Cut down, Annoyed, Guilty, and Eye-opener
CAGE-T	CAGE-T (a modified screening tool) is derived from five questions of the tool: Cut down, Annoyed, Guilty, Eye-opener and Treatment
CDP	Community Development Program (Australian Government remote employment and development service)
CI	Confidence interval
CIDI	Composite International Diagnostic Interview

CRAFFT	Derived from six questions on alcohol or drugs use: Car, Relax, Alone, Forgotten, Friends or family, Trouble
Detox	Detoxification (withdrawal management)
DF	Degrees of freedom
DIS	Diagnostic Interview Schedule
DSM	American Psychiatric Association's Diagnostic and Statistical Manual
ICD	World Health Organization's International Classification of Diseases
Indigenous Australian	Aboriginal and Torres Strait Islander Australian
IRIS	Indigenous Risk Impact Screen
JC	James H. Conigrave
JP	Jimmy Perry
KC	Katherine M. Conigrave
KL	K.S. Kylie Lee
Koori	An Aboriginal person from New South Wales or Victoria
MAST	Michigan Alcoholism Screening Test
MF	Michelle S. Fitts
NH	Noel Hayman
NSW	New South Wales
NZ	New Zealand
OR	Odds ratio
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	The International Prospective Register of Systematic Reviews

QLD	Queensland
ROC	Receiver Operating Characteristic
RR	Robin Room
SADQ	Severity of Alcohol Dependence Questionnaire
SADS	The Schedule for Affective Disorders and Schizophrenia
SD	Standard drinks
SMART Recovery	Self-Management and Recovery Training
SMAST	Short Michigan Alcoholism Screening Test
SW	Scott Wilson
TAFE	Technical and Further Education
TC	Tanya Chikritzhs
TW	Teagan J. Weatherall
UM-CIDI	University of Michigan-Composite International Diagnostic Interview
USA	United States of America
WHO	World Health Organization
WMH-CIDI	World Mental Health-Composite International Diagnostic Interview

Chapter One

1. Introduction

1.1. Overview

This thesis explores the prevalence and associations of alcohol dependence among urban and remote Aboriginal and Torres Strait Islander (hereafter, Indigenous) Australians. In this chapter I provide a brief history of the impacts of colonisation on Indigenous Peoples. I then define alcohol dependence, describe how alcohol dependence is identified, and present global estimates of the prevalence of dependence and associated factors. Knowing the prevalence of, and factors associated with dependence can help inform treatment needs, including unmet needs. It is also helpful to identify community subgroups (e.g. age groups or genders) that could benefit from tailored support. I explore how dependence might be different in Indigenous contexts and conclude that more work is needed to understand and detect dependence in Indigenous Australian communities.

1.2. Indigenous Peoples post colonisation: strengths and disadvantages

Indigenous Peoples in similarly colonised countries (Australia, New Zealand, Canada and the United States of America [USA]) are strong and resilient [1] and come from diverse language and cultural groups. They love and value family, culture and ‘Country’ (homelands where they are from or reside) [2]. They have survived—as have their traditions, stories and culture.

Despite these strengths, Indigenous Peoples in colonised countries have experienced a long history of trauma and disadvantage compared to general populations [3, 4]. It was between the 1400s and 1800s that Indigenous Peoples’ homelands were colonised to become countries now known as Australia, New Zealand, Canada and the United States of America. Indigenous

Peoples have endured a painful process of colonisation from the British empire [2, 5, 6], massacres during and after colonisation [7], efforts by colonisers and governments to remove Indigenous Peoples language and culture [2], ongoing racism, discrimination [8] and stigma [9]. Homelands were forcibly and systematically removed from Indigenous Peoples and their families [2, 10]. Indigenous Peoples worked their land, they gathered food and medicines and they cared for it [2]. They did not ruin the land, exploit its resources, or bring it into a state of ruin—and yet it was stolen from them and their future generations.

Some Indigenous Peoples had their children forcibly removed from their families and institutionalised in camps and missions [11, 12]. These children were not taken away from their parents because they were unloved or poorly treated. Instead, governments removed children from their parents, causing much pain, because of their race. In Australia, nearly every Indigenous family has been impacted on by the Stolen Generations [12]. The term the ‘Stolen Generations’ refers to the time when Aboriginal children in Australia were removed from their families through government policies [13].

During the Stolen Generations, children would try to hide from government officials, and if they were taken from their parents they would often try to run away [14], sometimes travelling thousands of kilometres to get back home [15]. Some children thought their parents had sent them away, thinking they were not loved—how wrong they were [12]. These traumas still affect Indigenous Peoples to this day and will continue to negatively impact their children and future generations [16]. These traumas increase an Indigenous individual’s risk of mental health issues and substance use disorders, including dependence on alcohol [17].

As an Aboriginal person, these experiences have also affected my own family. In May 2019 I was sitting in a food court at a local shopping centre with my grandfather and brother. An old aunty came in and sat with us and she and my grandfather started yarning (commonly used word meaning to have a chat or discussion) about the past. They spoke about their days working when they were kids, picking potatoes, hunting rabbits, not being able to go out some days because they only had one horse. I jokingly said: “My work is tapping a keyboard”. Aunty said to me: “Yes, that’s because you received an education—when we were kids the government stopped us from getting an education. We had to take what we got.” Then they started reminiscing about the Stolen Generations and the effect it had on the family and the community. Aunty told a story about how one day one of the kids had to go into town to the hospital. While the adults were at the hospital with the young fella the other kids went to the movie theatre. During the movie, the government officials came in and took all the kids away, forcibly removing them from their parents. The parents were devastated. Aunty says the pain caused them to turn to alcohol and they all became ‘alcoholics’. Indigenous Peoples who have experienced similar traumatic events are at an increased risk of experiencing alcohol-related harms.

1.3. Alcohol use and its impact

Alcohol use globally

Globally, alcohol consumption is common [18]. It is estimated that approximately 2.3 billion people drink alcohol [19]. Individuals who drink alcohol are at an increased risk of developing health (physical, mental or emotional) and social (education, employment, financial, relationships or harms to others) alcohol-related issues [19]. Also, individuals who drink alcohol and have a mental health disorder, or have experienced disadvantage or disempowerment, can be at a greater risk of developing these health and social alcohol-

related issues or an alcohol use disorder [20, 21]. As described above Indigenous Peoples have experienced a long history of trauma and disadvantage and this can put them at greater risk of developing alcohol-related issues.

Alcohol use in Australia

In Australia, alcohol consumption is common [22]. It is estimated that three out of four Australians drink alcohol (76.6%, 2019 data, aged 14+) [23]. Of those who do drink, one in six (16.8%, 2019 data, aged 14+) Australians consume alcohol at a level that puts them at a lifetime risk of harm. Also, approximately a quarter of Australians consume alcohol that puts them at an increased risk of injury on a single occasion (24.8%, 2019 data, aged 14+) [23]. In general, individuals living with social disadvantage are more at risk of alcohol-related harm [20]. Social disadvantage is associated with increased health problems, limited housing, lower education, lower income and higher unemployment. Indigenous Australians are more likely to experience social disadvantage and associated stress than others [24]. That and the pain they have experienced through the effects of colonisation, Stolen Generations, and the forced removal of land, language and culture may cause them to turn to alcohol and increase their risk of harm [20, 25-27].

Health risks from alcohol

People who drink alcohol can be at greater risk of experiencing short-term or long-term harms [22]. Short-term harms include physical injury, violence, falls or vehicle accidents [22, 28, 29]. Long-term harms include poorer physical health (e.g. cancers [30], liver diseases, increased risk of stroke), mental or emotional disorders, grief or trauma [31-33]. Alcohol can also impact people socially, affecting their relationships with family and friends [32]. Lastly,

alcohol can impact on people financially, affecting their ability to function in day-to-day life, to secure or keep housing, impacting educational opportunities or employment [32].

Many governments provide guidelines aimed to reduce health risks for people who drink alcohol, both globally [18] and in Australia [22]. Due to the risks associated with alcohol consumption, the Australian government states that an individual who chooses to drink should drink no more than ten standard drinks a week and no more than four standard drinks in one day [22]. Government recommendations like these are important as consuming alcohol more frequently and drinking a greater quantity of alcohol can put an individual at greater risk of developing an alcohol use disorder (AUD) and, in particular, alcohol dependence.

1.4. What is alcohol dependence?

While clinicians agree that alcohol dependence is real and serious—definitions of dependence vary and are set out in two main different sets of guidelines. One is the World Health Organization's (WHO) International Classification of Diseases (11th revision, ICD-11) that lists three characteristics of dependence [34]. According to the WHO, alcohol dependence (ICD-11) is identified as a strong internal drive to use alcohol that leads to three specific characteristics: 1) the inability to control use of alcohol; 2) priority given to alcohol over other activities; and 3) physiological characteristics (including tolerance, withdrawal, such as 'shakes' or tremors when stopping use or first thing in the morning when waking up) [34].

The other main guidelines are set out by the American Psychiatric Association (APA): The Diagnostic and Statistical Manual of Mental Disorders (5th revision, DSM-5) [35]. The APA has moved away from a diagnosis of 'alcohol dependence' or 'alcohol abuse' as previously

used (DSM-IV) [36]. The APA now lists 11 diagnostic criteria for the broader term ‘alcohol use disorder’ [35] to describe a continuum of severity, ranging from mild, moderate to severe [37].

A diagnosis of alcohol dependence or alcohol use disorder can either be ‘current’ (in the last 12-months) or ‘lifetime’ (ever diagnosed in a lifetime). In this thesis, I use ICD-11 terminology for ‘current alcohol dependence’. I do so for the following reasons: 1) identifying the prevalence of current alcohol dependence can more clearly inform current treatment needs, including relapse prevention medication needs, and having a clear cut-off makes it easier to communicate results to communities or policy makers; 2) it is in keeping with terminology used in most available literature among Indigenous Peoples; 3) hospitals in Australia use the ICD system for coding diagnoses; and 4) data reported in this thesis is part of a larger project that describes the full spectrum of drinking, including hazardous drinking, which is a term for alcohol as a health risk factor, and is only available in ICD and not in DSM-V. Whilst I use the terminology ‘dependent’ versus ‘non-dependent’, dependence may not be binary but a flowing continuum, as used in DSM-V. However, binary classifications are useful to determine whether symptoms are frequent or severe enough to impact an individual’s life, impact a community, or to warrant access to more intensive treatment.

1.5. Identifying alcohol dependence

To identify alcohol dependence, different tools have been developed to screen (identify likely dependence), assess (identify severity of likely dependence), and diagnose (by a clinician or a questionnaire for example, using ICD or DSM criteria).

A range of tools are used to screen for alcohol dependence; for example, the Alcohol Use Disorders Identification Test (AUDIT) [38], the CAGE questionnaire (CAGE is derived from the four questions of the tool: Cut down, Annoyed, Guilty, and Eye-opener) [39], the CRAFFT tool (CRAFFT is derived from six questions on alcohol or drugs use: Car, Relax, Alone, Forgotten, Friends or family, Trouble) [40], and the Michigan Alcohol Screening Test (MAST) [41]. It is not clear how often these tools have been used with Indigenous Peoples.

Frequently used diagnostic assessment tools include: the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) [42], Composite International Diagnostic Interview (CIDI) [43], Diagnostic Interview Schedule (DIS) [44], the Schedule for Affective Disorders and Schizophrenia (SADS) [45], and the Severity of Alcohol Dependence Questionnaire (SADQ) [46].

Different items are also used to identify impacts from alcohol or characteristics of dependence, including harms to self and others. For example, questions include: “Have you or someone else been injured as a result of your drinking?” or “Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?” (AUDIT, Q9-10) [38]; and “Was there ever a time in your life when your drinking or being hung over frequently interfered with your work at school, on a job, or at home?” (CIDI, J6) [43].

1.6. Prevalence of current alcohol dependence

It is important to identify the prevalence of alcohol dependence to better inform treatment needs—particularly unmet needs. For example, prevalence data can be used to inform

communities of where health promotion efforts should be targeted, and where more funding is needed particularly in regions or populations with higher reported prevalence.

Globally

Globally, the World Health Organization estimates that approximately one in 40 individuals are dependent on alcohol (2.6%, aged 15+, ICD-10, in the last 12-months) [18].

Indigenous Peoples globally

Globally among Indigenous Peoples, there are limited estimates available on the prevalence of current alcohol dependence and these vary widely. For example, two studies show very different estimates—a nearly tenfold difference—in the prevalence of current alcohol dependence in two different Native American community samples (3.8% versus 33.3%, both DSM-III-R, USA) [47, 48].

In Australia

In Australia, one in 70 individuals in the general population are dependent on alcohol, using a diagnostic tool (1.4%, aged 16+, DSM-IV, in the last 12-months, 2007 data) [49]. However, a more recent Australian national survey, using a screening tool, estimated that approximately one in ten individuals likely meet the criteria for current alcohol dependence (9.9%, aged 14+, ASSIST-Lite, 2019 data) [23]. It is difficult to compare these findings, as the first study used a diagnostic tool and the second used a screening tool. Until further evidence is available, we will assume the 2007 data is the more reliable estimate. As mentioned earlier, screening tools are used to identify likely dependence and diagnostic tools are used by a clinician to make or disprove a definite diagnosis. Screening can help detect unhealthy alcohol use early on using brief questionnaires, including self-administered screening tools,

and can be completed in health service waiting rooms or during pre-consult examinations. In contrast, a comprehensive assessment by a clinician or trained researcher is used to confirm a diagnosis [50]. The same assessment can be used to identify an appropriate treatment pathway.

Indigenous Australians

It is not currently possible to assess the prevalence of alcohol dependence among Indigenous Australians as the few studies which have been conducted have used samples unlikely to be representative of Indigenous Australian communities. For example, in one Western Australian community with known high rates of psychological trauma, one in three individuals met the criteria for lifetime alcohol dependence (33.5%, aged 18+, CIDI, AUDIT) [4]. Similarly, a higher prevalence of alcohol dependence was reported in studies of Indigenous Australians who were incarcerated (22.5%, aged 18+, NSW; 45.3%, QLD; both using AUDIT) [31, 51]. However, prevalence estimates of alcohol dependence from communities with known high rates of trauma, or from prison populations, do not represent Indigenous communities overall. In fact, it could be said that a higher prevalence would be expected in these populations as individuals may use alcohol to cope with past psychological traumas, and alcohol could also contribute to interactions with the law.

Among Indigenous Australians, there is considerable variation in how much people drink, within and between communities [52]. Accordingly, the prevalence of alcohol dependence might also differ greatly from one Indigenous community to another. So, what is the reality in Indigenous communities? Are existing estimates of alcohol dependence accurate or do varying research methods and recruitment processes contribute to higher prevalence estimates in these settings? Indigenous Australian communities are diverse and so the prevalence of

dependence is also likely to vary. Estimates of alcohol dependence using non-Indigenous samples, or even general population questionnaires, may not be accurate as cultural differences may affect the way people respond to dependence questions that are based on the diagnostic criteria [53, 54]. New estimates using representative samples of communities, and using culturally appropriate methods and tools might yield more accurate estimates on the prevalence of alcohol dependence among Indigenous Australians.

1.7. Factors associated with alcohol dependence

It is important to better understand the factors that can put an individual at risk of developing alcohol dependence. Doing so can help to identify what subpopulations or communities need attention, support, or funding. For example, if alcohol dependence is highly correlated with drinking greater quantities of alcohol, or with men, or individuals with a lower income, then health promotion efforts or investment can be arranged accordingly.

Globally

Globally, it has been reported that men, young people (aged 18-29) and people with lower income are associated with current alcohol dependence [55]. Elsewhere, alcohol dependence is associated with people with higher consumption levels and alcohol-related harms [19, 56]. For example, harms to self (poorer health, injuries or accidents) or to others (family, friends or community members).

Indigenous Peoples globally

Among Indigenous Peoples globally, little research has reported on the environmental, psychological and socio-demographic factors associated with alcohol dependence. In one study of two Native American populations, male gender and a low income (falling below the

USA poverty line) were associated with current alcohol dependence (n = 3084, aged 15-54) [57].

In Australia

In Australia, men, young people (aged 16-24) and individuals who have never been married are at increased risk of current alcohol dependence (2007 data) [49]. This same study reported that co-occurrence of alcohol dependence and anxiety is common. Individuals with alcohol dependence were three times more likely to meet criteria for an anxiety disorder and four times more likely to have a comorbid disorder compared to individuals with alcohol abuse [49]. A more recent Australian study reported that more than one in four individuals who were likely alcohol dependent had been diagnosed or treated for a mental disorder (27%, 2019 data, aged 14+) [23].

Indigenous Australians

Among Indigenous Australians, little research has reported on the factors associated with alcohol dependence in community samples. In one sample of Indigenous Australians who were incarcerated, it was reported that alcohol dependence was associated with a lower income and daily cannabis use [51].

1.8. Alcohol dependence in cross-cultural contexts

Identifying characteristics of alcohol dependence

The way that alcohol dependence is identified is not necessarily the same across all cultures, as alcohol dependence characteristics can be interpreted differently [53, 58]. For example, the inability to control one's drinking is a characteristic that is used to identify alcohol dependence. Loss of control when drinking might manifest differently in Indigenous

communities due to episodic drinking patterns. For example, some individuals drink regularly because they want to, while others might take regular breaks from drinking (e.g. episodic drinkers). Some people choose not to drink (abstainers). Indigenous Australians may not necessarily feel like they have lost control over their drinking alcohol (even while dependent) because they know they have gone without it previously—they can have extended breaks from drinking, sometimes lasting months. One study reported that approximately three in five Indigenous Australians who are current drinkers reported a time when they did not consume any alcohol in the previous 12-months (median period without drinking alcohol = 60 days) [59].

Alternatively, Indigenous Australians might report loss of control when drinking due to external factors. For example, in a remote setting it is sometimes difficult to identify loss of control over use because access to alcohol is often controlled by external factors. This can occur because supply of alcohol can be cut off by the local police (e.g. during times of in-fighting supply can be ceased temporarily until things settle down), limited funds available to the drinker to purchase alcohol (i.e. running out of money), or government-imposed restrictions on the types, quantity and strength of alcoholic beverages available [60]. In some communities only a limited number of mid-strength beer cans can be purchased per day. The episodic nature of drinking and the external factors that impact on use might make it difficult to identify if an individual has actually lost control over their drinking.

Prioritising alcohol over other things is another characteristic used to identify alcohol dependence. How this manifests could vary in different Indigenous Australian contexts. For example, in a remote Indigenous community there may not be enough employment opportunities in the community for everyone [61]. Thus, individuals who drink alcohol may

not identify that alcohol is being prioritised over work, as work may not be an option for them. However, alcohol could be prioritised over things such as getting children ready for school, attending or celebrating children's schooling achievements, attending sporting events, engaging in cultural events and going back on Country. Thus, in an Australian Indigenous setting, being 'hooked on alcohol', or having alcohol as 'number one' in an individual's life, is not necessarily prioritising alcohol over work. Rather, alcohol could be prioritised over family commitments and cultural responsibilities, when there is a strong internal drive to use alcohol, or when a drinker just cannot go without it [62].

Physiological characteristics are another characteristic used to identify alcohol dependence (i.e. tolerance or withdrawal, e.g. 'shakes' or tremors) [63]. Tolerance is a feature of dependence, but episodic drinkers without other features of dependence can also have a high tolerance to large quantities of alcohol. For example, in one stratified sample of Indigenous Australians, high quantities of standard drinks (SD) of alcohol were consumed per drinking occasion by both men and women (19.4 SD for men; 14.8 SD for women) [64]. Whereas the same study reported that only 15% of current drinkers reported symptoms of dependence monthly [64]. This illustrates that some Indigenous Australians who drink alcohol may have a high tolerance, but are not necessarily dependent on alcohol. On the other hand, there may be some Indigenous Australians who have a level of dependence, but this could be influenced by the context in which they drink. For example, if they are staying in a community where there is no access to alcohol there will be no evidence of dependence versus a community where alcohol is readily available they may show a level of dependence. Withdrawal is another physiological feature used to identify alcohol dependence. However, withdrawal may not be noticed by people who drink alcohol. Due to the episodic nature of drinking amongst Indigenous Australians, withdrawal symptoms may not even present at all. For example, one

study in Queensland previously reported that when access to alcohol was cut-off, no one presented to the local primary health care centre with alcohol withdrawal symptoms [65]. This illustrates that while withdrawal is a key characteristic of dependence, sometimes it is not present due to the episodic nature of drinking that can be common among Indigenous Australians.

Tools used to identify alcohol dependence

Existing tools used to screen, assess or diagnose current alcohol dependence might not be compatible with local Indigenous communities' worldviews and values [53, 66]. This could present challenges when trying to identify alcohol dependence in Indigenous communities. Indigenous Australians' values of culture, tradition, Country and family are different from mainstream or western values of education, academia, wealth and prestige. In keeping with this, it may be beneficial for tools to be operationalised for Indigenous Australian contexts [66].

For example, CIDI asks: 'Was there ever a time in your life when your drinking or being hung over frequently interfered with your work at school, on a job, or at home?' (Section J, J6) [43]. In some Indigenous communities, school is not available or limited (in some communities school stops at Year 10), higher education is not available (there are no higher education centres or universities), there are limited employment opportunities [61] and work around the home is impacted by social issues associated with overcrowded housing [2]. Accordingly, these frames of references may not be useful for establishing alcohol dependence for many Indigenous Australians. It might be better to ask Indigenous Australians about whether alcohol could interfere with cultural and ceremonial obligations.

Because if alcohol is interfering with cultural obligations, this may not be identified using existing tools.

Indigenous Australians face racism [6], discrimination [8] and stigma in relation to drinking alcohol [8]. Indigenous Australians' use of alcohol is often portrayed negatively in the media. Accordingly, tools used to identify alcohol dependence need to allow for factors that could be linked to an individual's experience of alcohol dependence [67]. For example, ASSIST-Lite asks: 'Has anyone expressed concern about your drinking?' (Q2c) [68]. An Indigenous Australian might respond yes, but the 'concern' could be related to stigma or being labelled an 'alcoholic' by strangers who do not know them or their drinking patterns. Similar experiences have been reported in Native American populations, where individuals would take on community-held perceptions of guilt and shame when it comes to their alcohol consumption, but it probably was not warranted [69]. Irrespective of the tools used, clinicians, researchers and interviewers need to be aware of cultural differences and impacts from stigma related to alcohol dependence [58].

Some Indigenous Australians may also not easily identify withdrawal symptoms. Instead they may deny having them due to 'shame' [70]. While others may think these symptoms are associated with other health conditions (e.g. epilepsy or tremors due to Ventolin for treatment of asthma), or because of caffeine withdrawal, instead of alcohol withdrawal (personal communication with Scott Wilson, Aboriginal Drug and Alcohol Council of South Australia). They may do this to avoid being judged by health professionals [71], or because of racism or stigma [9, 58, 72], or fear of being labelled an 'alcoholic'.

Screening tools that have been operationalised for Indigenous Australians or are Indigenous-specific may be better able to identify individuals who report symptoms of alcohol dependence [54]. This could then help to identify those who experience greater harm or who may require care from specialised treatment services [73, 74]. Such tools would also need to ensure anonymity of participants [75].

To address these challenges in screening for alcohol use, a culturally-appropriate tablet computer-based application has been developed to help Indigenous Australians to report their drinking or abstinence [76]. The Grog Survey Application (App) is a reliable, visually interactive iPad application that has been found to be acceptable [27] and accurate [77] to help Indigenous Australians describe if they drink, what they drink and how much they drink. The App collects demographic information and consumption data and takes into account that individuals might be drinking in non-standard drinking containers (e.g. mug or soft drink bottle). It also takes into account that some Indigenous Australians drink in groups and may share alcohol. Also, the App allows participants to report the frequency of dependence symptoms. The App features three dependence questions based on ICD-11. The dependence questions were operationalised for use with Indigenous Australians.

The App is self-administered, as asking questions about alcohol consumption and dependence is sensitive [66]. Individuals can complete the App by themselves anonymously and honestly without feeling judged, stigmatised, or fear any consequences from their survey responses. Fears could include being worried that children will be removed, being forced into treatment, or being labelled an ‘alcoholic’. The App has been found to be “OK” or easy to use by participants, and has visual and interactive elements that were identified as key strengths to help accurately capture an individual’s drinking story [27]. The App identifies consumption

using visual elements, for example a slider that the participant can slide up or down to show how full of alcohol a drinking container is, and then calculates standard drinks in the back-end [27, 77]. Consumption is assessed using a modified Finnish method [78, 79] and appeared well suited and correlated with interviewer assessment of drinking as well as with alcohol withdrawal tremors. This suggests internal consistency and validity [77]. The information collected on the App can be used to improve our understanding of the prevalence and correlates of dependence in Indigenous Australian communities.

Treatment options

Globally, a range of treatment options exist to treat alcohol dependence. These can include pharmacotherapies (e.g. acamprosate, naltrexone or disulfiram) [80-82], and specialist treatment services, that either have been culturally-adapted, community-controlled, or are Indigenous-specific (e.g. substance use treatment centres or alcohol and other drug residential rehabilitation services) [83-86]. Other options that are sometimes culturally-adapted include community education and brief interventions [87], counselling [81, 88], mutual support groups (e.g. Self-Management and Recovery Training [SMART Recovery] groups [89, 90], 12-step programs [91]) and home detoxification (home ‘detox’) [92, 93]. There are also Indigenous practices and models for treatment or care [94], such as Aboriginal women’s groups [95] and traditional healing [91].

More is needed to make treatment options for alcohol dependence culturally appropriate for Indigenous Peoples [96]. This could include: greater understanding of local communities and of the specific cultural and family obligations of the individual, and what local supports are available and can be offered back home on Country. Treatment services need to ensure that cultural protocols, beliefs and values of Indigenous Australians are respected. This will help

clients feel culturally secure [97]. In addition to alcohol treatment services, support could also be provided to families and the wider community. For example, ensuring availability of alternatives to drinking, to challenge the social norms around drinking in community, to build on individuals' connection to Country and culture, and create economic opportunities [25, 32]. Also, it is important to identify potential barriers that might prevent Indigenous Peoples from getting help. For example, Indigenous Australians might be less likely to access mainstream services [98] and this might happen because of racism or judgemental attitudes [99]. Indigenous Australians sometimes prioritise 'sorry business' (a period of time to mourn a death in the family or community) over treatment [99] and some communities might have a lack of traditional healing treatment options [96]. Also, in some communities stigma is associated with the use of relapse prevention medications [100] or individuals being forced into treatment because of social, legal or justice issues. Identifying these potential barriers in communities and then overcoming them can support Indigenous Australians to get help for their drinking.

1.9. Knowledge gaps

Previous research has not systematically reviewed the literature to identify the global prevalence of current alcohol dependence among Indigenous Peoples from similarly colonised countries. Nor has it considered what tools are typically used to screen, assess or diagnose alcohol dependence among Indigenous Peoples globally, or if such tools have been validated. Accurate estimates of current alcohol dependence in Indigenous Australian communities are currently lacking. There have been few studies of alcohol dependence and the studies that are available are unlikely representative of Indigenous Australian communities. Thus it is not clear what the prevalence of alcohol dependence is among Indigenous Australians. Also, little work has been done looking at the prevalence and

correlates of current alcohol dependence in representative community samples of Indigenous Australians. Nor on the associations of current alcohol dependence with harms and getting help for drinking among Indigenous Australians. Thus, it is important to know more about alcohol dependence and who within Indigenous communities may be more likely to need or want support. Also, it is important to identify what types of support Indigenous Australians are aware of or would suggest as this could help with funding and resource allocation.

Prevalence and correlation studies may help with this.

1.10. Thesis aims

To address these gaps, the aims of this thesis are:

1. To conduct a systematic review of the evidence on the prevalence of current alcohol dependence and how dependence is measured in Indigenous Peoples globally (in Australia, New Zealand, Canada and the United States of America).
2. To identify prevalence and correlates of current alcohol dependence in an Indigenous Australian community sample.
3. To identify the association between current alcohol dependence and specific harms and getting help for drinking in an Indigenous Australian community sample.

1.11. Positioning the researcher

I am a Kamilaroi and Anaiwan woman from Northern New South Wales. My grandparents moved their families to Sydney, New South Wales when their children were young. I was born in Western Sydney and grew up there with my extended family. As an adult I have lived for a number of years in a very remote Aboriginal community in the Northern Territory, where my husband is from, and in an Aboriginal community in remote Queensland. Living in

an urban city and then living in very remote Aboriginal communities has influenced my understanding of what alcohol dependence might look like in our communities.

Growing up as an Aboriginal woman, my family have always been major influences in my life. One such person is my grandfather, Alfred Hampton. Sadly, he passed away during the final year of my candidature. I always enjoyed ‘kicking back’ (as he put it) with him and having a yarn. One day we got to talking about my studies. Pop (born in the late 1930s) went on to tell a story about Uncle Dick, his mum’s brother. Uncle Dick worked hard in a physical job and he would go to the ‘pub’ at the end of the day to have a drink or two. One day, the bar manager’s son would not serve him because he wanted to see a ‘beer card’, because he was Aboriginal. Uncle Dick told the young barman to go get his father. Uncle Dick said he had been working hard all day and just wanted a cold beer—just like everyone else (referring to the non-Aboriginal people). The manager said that he could not serve him. Uncle Dick would not have it. Uncle Dick said he had to be served sitting there on the barstool and from the bar, and not from the back door where ‘sly grog’ was being sold to the Koori’s (a term commonly used to refer to Indigenous Australians from New South Wales or Victoria, Australia). Uncle got his beer. This is just one story. My family, and probably all Aboriginal people around Australia, have similar stories. These stories have influenced me in my studies over the years and illustrate the disparity in experiences in relation to alcohol consumption and Indigenous Australians.

1.12. Thesis outline

After this general introductory chapter, this thesis contains a series of three publications (making up three results chapters). These include a systematic review and two original research articles with results from a cross-sectional survey and then a general discussion

follows. Chapter One (this chapter) contextualised current alcohol dependence among Indigenous Peoples globally, Indigenous Australians and their history, current alcohol dependence and examined cross-cultural issues related to how alcohol dependence is measured among Indigenous Peoples. Chapter Two is a systematic review of the literature that identifies the prevalence of current alcohol dependence and how it is measured among Indigenous Peoples globally from similarly colonised countries (Aim One). Chapter Three identifies the prevalence and demographic correlates of current alcohol dependence in an urban and remote community sample of Indigenous Australians from South Australia (Aim Two). Chapter Four builds on Chapter Three and identifies associations between current alcohol dependence, harms and getting help for drinking in a representative community sample of Indigenous Australians (Aim Three). Both Chapter Three and Chapter Four use data collected from representative community samples (urban and remote) using the Grog Survey App. Chapter Five draws together the research undertaken with a general discussion putting my study findings in context of the international literature, and presents implications for policy, practice, community and further research.

Three publications form the results chapters (#2-4) of this thesis and they are included in journal format. The overall listing of tables and figures is divided by chapter and can be found in the overall thesis list of figures and tables. Each results chapter (#2-4) has its own reference list. The introduction and discussion chapters (#1&5) have a combined single reference list at the end of the thesis.

Chapter Two

2. Systematic review of the literature

The previous chapter identified the importance of understanding current alcohol dependence among Indigenous Peoples to better inform treatment needs and identify areas of support for Indigenous communities. To improve our understanding of alcohol dependence among Indigenous Australians, it is useful to review the prevalence among Indigenous Peoples who have a similar history of colonisation. It is also important to determine what tools are currently being used to measure alcohol dependence among Indigenous Peoples and whether they are culturally appropriate.

Until the current research, there had not been a systematic review of the prevalence of current alcohol dependence among Indigenous Peoples. Further, no systematic review had identified what tools are typically used to screen, assess or diagnose alcohol dependence, or if they have been validated for Indigenous Peoples.

Therefore, this chapter will: 1) describe the prevalence of current (12-month) alcohol dependence among Indigenous Peoples from similarly colonised countries (Australia, New Zealand, Canada and the United States of America); 2) describe what tools have been used to identify alcohol dependence; and 3) identify if the tools have been validated for general and Indigenous communities.

Publication #1: Weatherall TJ, Conigrave KM, Conigrave JH, Lee KSK. What is the prevalence of current alcohol dependence and how is it measured for Indigenous people in

Australia, New Zealand, Canada and the United States of America? A systematic review.
Addiction Science and Clinical Practice. 2020;15(1):32.

REVIEW

Open Access



What is the prevalence of current alcohol dependence and how is it measured for Indigenous people in Australia, New Zealand, Canada and the United States of America? A systematic review

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Abstract

Background: Alcohol affects Indigenous communities globally that have been colonised. These effects are physical, psychological, financial and cultural. This systematic review aims to describe the prevalence of current (12-month) alcohol dependence in Indigenous Peoples in Australia, New Zealand, Canada and the United States of America, to identify how it is measured, and if tools have been validated in Indigenous communities. Such information can help inform estimates of likely treatment need.

Methods: A systematic search of the literature was completed in six electronic databases for reports on current alcohol dependence (moderate to severe alcohol use disorder) published between 1 January 1989–9 July 2020. The following data were extracted: (1) the Indigenous population studied; country, (2) prevalence of dependence, (3) tools used to screen, assess or diagnose current dependence, (4) tools that have been validated in Indigenous populations to screen, assess or diagnose dependence, and (5) quality of the study, assessed using the Appraisal Tool for Cross-Sectional Studies.

Results: A total of 11 studies met eligibility criteria. Eight were cross-sectional surveys, one cohort study, and two were validation studies. Nine studies reported on the prevalence of current (12-month) alcohol dependence, and the range varied widely (3.8–33.3% [all participants], 3–32.8% [males only], 1.3–7.6% [females only]). Eight different tools were used and none were Indigenous-specific. Two tools have been validated in Indigenous (Native American) populations.

Conclusion: Few studies report on prevalence of current alcohol dependence in community or household samples of Indigenous populations in these four countries. Prevalence varies according to sampling method and site (for example, specific community versus national). Prior work has generally not used tools validated in Indigenous contexts. Collaborations with local Indigenous people may help in the development of culturally appropriate ways of measuring alcohol dependence, incorporating local customs and values. Tools used need to be validated in

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Indigenous communities, or Indigenous-specific tools developed, validated and used. Prevalence findings can inform health promotion and treatment needs, including funding for primary health care and specialist treatment services.

Keywords: Indigenous, Australia, New Zealand, Canada, United States of America, Alcohol, Dependence, Prevalence, Screening, Assessment

Background

Alcohol affects Indigenous communities globally that have been colonised. These effects are physical, psychological, financial and cultural in nature [1, 2]. Colonisation, economic marginalisation, and governments' systematic efforts to erode 'Country' (land, homelands) and culture causes trauma that continues to affect Indigenous Peoples. As a result, Indigenous Peoples are at increased risk of alcohol use disorders (AUDs), including alcohol dependence (moderate to severe AUD). Alcohol dependence can then erode the strengths of Indigenous Peoples—strong families, strong communities, strong culture, and traditional responsibilities. Concerns have been expressed about Indigenous Peoples' lack of access to appropriate treatment for alcohol dependence [3, 4]. One step towards assessing likely treatment need is to have sound estimates of the prevalence of current alcohol dependence.

The World Health Organization's (WHO) International Classification of Diseases (11th revision; ICD-11) and the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders (5th revision; DSM-5) set out guidelines for identifying alcohol dependence or moderate to severe AUDs [5, 6]. In this paper we use the ICD-11 term 'current alcohol dependence'. The World Health Organization describes dependence on alcohol as a strong internal drive to use alcohol that leads to inability to control use of alcohol, priority given to alcohol over other activities, and physiological features (e.g. 'shakes' when stopping use or first thing in the morning when waking up) [5]. However, it is not clear how well diagnostic guidelines for dependence apply to Indigenous Peoples [7].

Individuals who are dependent on alcohol typically experience greater harms than those with less severe AUDs, and require more intensive treatment [8, 9]. Globally, there is a need for reliable population data that can inform the planning of programs to prevent, identify and treat alcohol dependence [7, 10, 11]. Prevalence of current alcohol dependence (12-month) for the general population has been reported. For example, in Australia it is 1.4% [12], in New Zealand 1.3% (both using DSM-IV) [13], in Canada 4.1% (ICD-10) [14], and the United States of America (USA) 3.8% (DSM-IV) [15]. However, few studies assess the prevalence of current alcohol dependence in Indigenous communities in

colonised countries (e.g. Australia, New Zealand, Canada and USA).

A range of tools have been used to screen for, assess or diagnose alcohol dependence. Screening tools include the Alcohol Use Disorders Identification Test (AUDIT) [16], CAGE [17], and the Michigan Alcoholism Screening Test (MAST) [18]. Diagnostic tools include the WHO-Composite International Diagnostic Interview (CIDI) [19], and The Schedule for Affective Disorders and Schizophrenia (SADS) [20]. Screening tools, if accurate, are useful to give an estimate of likely prevalence of alcohol dependence and so an estimate of likely treatment needs. Diagnostic tools, again if accurate, provide actual prevalence of current alcohol dependence and so a more precise estimate of likely treatment needs. However, the majority of tools have not been validated for Indigenous Peoples, and it is unclear how suitable they are for this context. For example, tools based on the DSM-V assess whether recurrent alcohol use affects obligations at work, school, or home [6]. This could mean attending school every day, pursuing further training or university, and going to work. But, in a remote Indigenous community in Australia, for example, there may not be a secondary school, nor university, and there may be limited employment opportunities [21]. Also, for some Indigenous people priority is given to community, culture and Country over 'the home'.

To address these gaps in the literature, this systematic review aims to: 1) describe the prevalence of current (12-month) alcohol dependence in community or household samples in Indigenous Peoples in Australia, New Zealand, Canada and the USA; 2) identify which tools have been used to measure alcohol dependence for these peoples; and 3) identify if those screening or assessment tools have been validated, both for general and Indigenous populations.

Methods

This systematic review has been registered with the International Prospective Register of Systematic Reviews (Prospero; ID number: CRD42019125352) [22].

A search of the literature was completed for studies published from 1 January 1989–9 July 2020. Searches were conducted of six electronic databases (Scopus, Medline, Embase, PsycInfo, CINAHL and Web of Science).

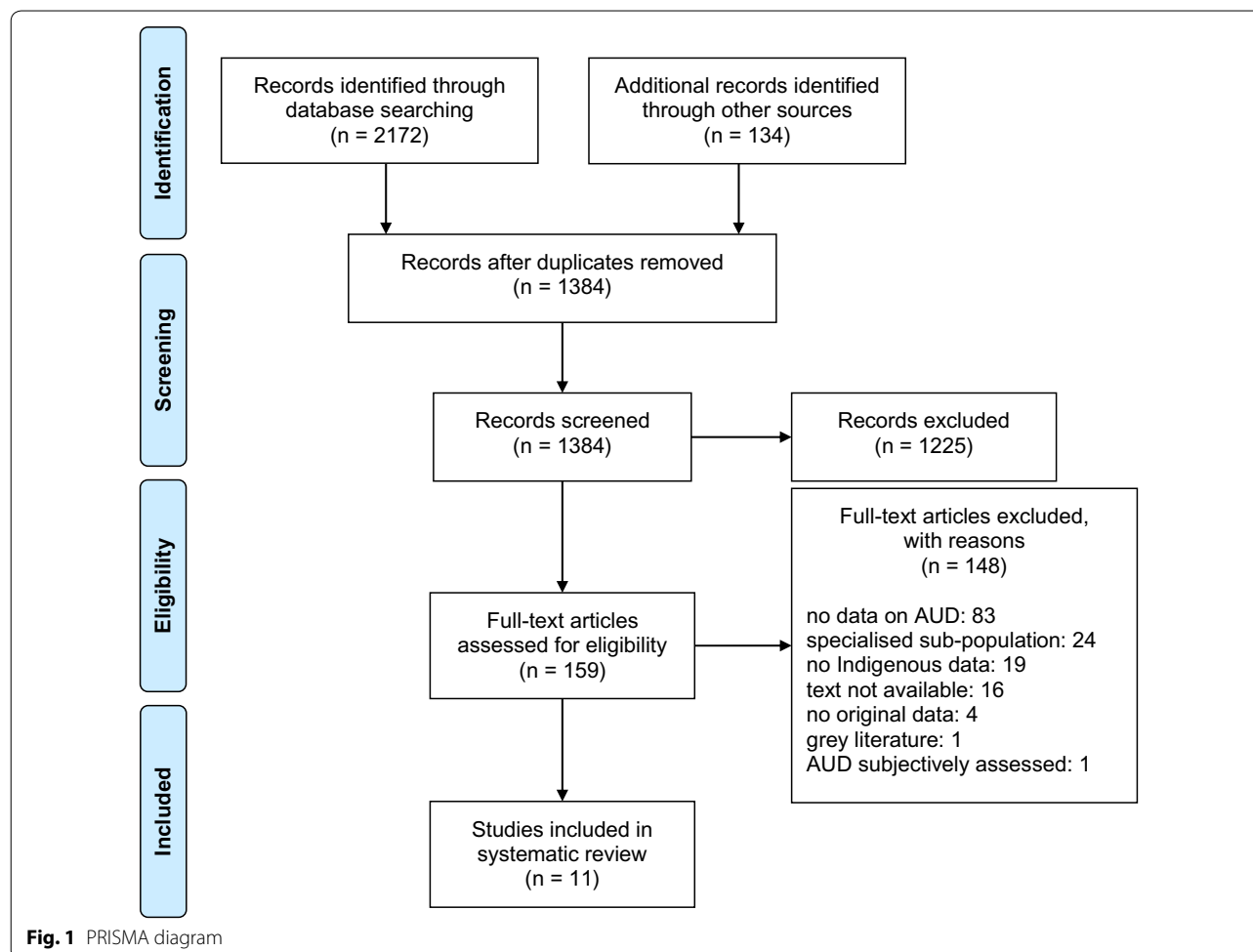
We sought feedback on the search strategy (Table 1) from experts in drug and alcohol research, and a librarian.

As shown in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram (Fig. 1), the search returned 2306 results, with 134 of these records identified through hand searching. Then 922 duplicates were removed. We screened titles and abstracts for the remaining 1384. Following title and

abstract screen, 1225 were excluded. Of the remaining 159 studies, full-text screen was completed in duplicate by two researchers. Articles were excluded if (1) they did not report on prevalence of current alcohol dependence or on validation of tools, (2) where prevalence of dependence was assessed only in a specialised sub-population (such as patients engaged in AUD treatment or prison inmates, where dependence would be expected to be

Table 1 Search strategy used for systematic review

1	Indigenous OR Aborigin* OR "First Nation*" OR "First People*" OR "Torres Strait*" OR "Oceanic ancestry group*" OR Maori* OR "Native America*" OR "American Indian*" OR "Alaska* native*" OR "Native Canad*" OR Inuit* OR Metis*
2	Austral* OR "New Zealand*" OR Aotearoa* OR USA OR "United States*" OR Alaska* OR Canad* OR "North Americ**"
3	(substance w/3 disorder*) OR alcoholi* OR AUD OR (alcohol w/3 depend*) OR (alcohol w/3disorder*) OR (alcohol w/3 withdraw*) OR (alcohol w/3 tremor*) OR (alcohol w/3 shak*) OR (alcohol w/3 addict*)
4	Tool* OR Questionnaire* OR Survey* OR Instrument* OR Criteri* OR Valid* OR SDS OR "Severity of dependence*" OR CIDI OR "Composite International Diagnostic Interview*" OR "Indigenous Risk Impact Screen*" OR "Alcohol Use Disorders Identification Test*" OR DSM OR "Diagnostic and Statistical Manual*" OR ICD OR "International classification of disease*" OR CAGE OR MAST OR "Michigan Alcohol Screening Test*" OR DASS OR "Depression Anxiety Stress Scales*" OR "Alcohol Smoking and Substance Involvement Screening Test*" OR SADQ OR "Severity of Alcohol Dependence Questionnaire*" OR "Leeds Dependence Questionnaire*" OR ASI OR "Addiction Severity Index**"



different from in the general population), (3) that did not report alcohol dependence data separately for Indigenous Peoples (from Australia, New Zealand, Canada or the United States), (4) where dependence was assessed subjectively (e.g. by clinical assessment, rather than using a tool), (5) full text not available, (6) grey literature, and (7) that did not present original data (i.e. commentary or review article). Eleven studies met criteria for inclusion in this systematic review (Fig. 1).

The following data were extracted from each included study: (1) Indigenous population(s) studied; country (or countries) of study (Australia, New Zealand, Canada, USA), (2) prevalence of current alcohol dependence in the Indigenous sample, (3) the tools used to screen, assess, or diagnose alcohol dependence, (4) the tools that have been validated in Indigenous populations to screen, assess, or diagnose alcohol dependence, and (5) the quality of the study, assessed using the Appraisal Tool for Cross-Sectional Studies (AXIS) [23]. Data were extracted in duplicate by two researchers. Differences were resolved by discussion, or where necessary by a third researcher.

Results

The 11 included studies were of populations from the USA, Canada and New Zealand (USA=8, USA/Canada=2, New Zealand=1) and were published from 1992 to 2020, inclusive (Table 2). Nine were prevalence studies, and two were validation studies. No studies were conducted in Australia.

Demographics

The majority of studies ($n=7/11$) were of one or two specific communities or tribal populations [24–30]. Four studies were national representative surveys [21, 31–33], of which two used census data [21, 31]. Of the seven local and regional prevalence studies, just one reported on the exact size of the total Indigenous population (426 persons) [25]. Of the two studies that used national census data, one did not report the total population size [31]; the other reported the total population of Native Americans as 5.2 million [21]. Where stated, sample sizes in prevalence studies ranged from 105 to 2595 persons [21, 24, 25, 28–30, 32], and in validation studies from 214 to 2854 [26, 27]. Two national studies did not report on the number of Indigenous people in their sample [31, 33]. The two reports that presented validation data drew on overlapping samples from a US Southwestern tribal population [26, 27]. Of studies confined to one or more regions, most did not describe rurality of participants. One US sample was from an urban region [24]; another US study reported that 38.2% of men and 35.9% of women were from a rural area [21].

Just under half the reports described the socioeconomic status of the sample. One US study reported that 67.8% of the sample were unemployed, 70.4% had graduated from high school and 11.4% had a university qualification [24]. In contrast, another US study reported that 43.6% of men and 50.3% of women were university educated [21]. In the latter sample, 42.4% of men and 70.1% of women had an individual income of less than \$19,000 (USD). Lastly, one US study reported 54.3% of the sample as poor [28].

Study design and recruitment

The majority of prevalence studies were cross-sectional surveys of community-based samples [24, 25, 28, 30, 32, 33], including the two studies that used US census data [21, 31]. One was a cohort study [29]. Five studies used stratified recruitment [28]; three specified this process was randomised [21, 31, 33], and one systematic [32]. Four studies used a convenience sampling strategy [24, 25], and two specified this was based on tribal rolls, attempting to contact all eligible individuals [29, 30].

Both of the validation studies [26, 27] used a range of recruitment methods, founded on pedigree-based sampling, and respondent-driven sampling.

Prevalence of current alcohol dependence

In the nine studies that reported current (12-month) alcohol dependence for the whole sample (or this information could be calculated), the prevalence varied considerably (3.8–33.3%) [21, 24, 25, 28–33]. Six studies reported the prevalence stratified by gender [21, 25, 28–30, 33]. In all but one [30], the prevalence for males was higher than for females (range: 3.0–32.8% versus 1.3–7.6%). The studies which reported on specific communities or regions typically had higher prevalence (3.8–33.3%) [24, 25, 28–30], than those which had national samples (3.9–16.6%) [21, 31–33].

Detecting alcohol dependence

All 11 studies used interviewer-administered tools to detect alcohol dependence. This included screening tools (CAGE-T, SADS-L, SMAST) and diagnostic tools (AUDADIS [Alcohol Use Disorder and Associated Disabilities Interview schedule] [34], CIDI, DIS [Diagnostic Interview Schedule] [35], UM-CIDI, WMH-CIDI) (Table 3). The CAGE-T is a variant of CAGE with an additional question (“Have you ever been treated for alcoholism?”) [27]. Three studies used tools that were administered by clinicians (e.g. psychologists, psychiatrists, or social workers) [25–27]; and two used tools administered by non-clinicians [21, 31]. Another four studies did not report who administered the tool(s) [24, 28, 32, 33]. Two studies used tools administered by

Table 2 General characteristics of the studies identified (n = 11)

Authors (year)	Country	Year/s data collected	Indigenous people	Target population	Total Indigenous population size	Indigenous sample size: n	Study design
Prevalence studies (n = 9)							
Baxter et al. (2006) [32]	NZ	2003–2004	Maori	Maori adults nationally	Not reported	2595	Cross-sectional survey
Brave Heart et al. (2016) [21]	USA	2001–2002	Native American and Alaskan Natives (NA/AN)	USA adults for national census	5.2 million (in 2010)	701	Cross-sectional survey (census)
Gill et al. (1997) [24]	USA	Not reported	Native Americans	Native Americans living in Denver	Not reported	105	Cross-sectional survey
Grant et al. (2017) [31]	USA	2012–2013	Native Americans	USA adults	Not reported	Not reported	Cross-sectional survey (census)
Grant et al. (2004) [33]	USA	1991–1992	Native American and Alaskan Natives (NA/AN)	USA adults nationally	Not reported	Not reported	Cross-sectional survey
Kinzie et al. (1992) [25]	USA	1988 (versus 1969)	Native Americans	One village in western USA	426	131	Cross-sectional survey
Spicer et al. (2003) [28]	USA	1997–1999	Native Americans	Adults in Southwest and Northern Plains tribes; compared with data collected by the National Comorbidity Survey (NCS)	Not revealed ¹	A ² . 1446 B ³ . 1638	Cross-sectional survey
Walls et al. (2020) [29]	USA and Canada	2017–2018	American Indian and First Nations Communities	Young adults from single Indigenous cultural group	Not reported	453	Cohort study
Whitbeck et al. (2006) [30]	USA and Canada	2002–2003	American Indian and First Nations Communities	Parents and caretakers from single Indigenous cultural group	Not reported	861	Cross-sectional survey
Validation studies (n = 2)							
Robin et al. (2004) [26]	USA	1989–1995	Native Americans	Southwestern and Plains adults (location not specified)	8578	A ⁴ . 456 B ⁵ . 214	Validation study
Saremi et al. (2001) [27]	USA	A ⁶ . 1991–1995 B ⁷ . 1991–1995 C ⁸ . 1992–1999	Native Americans	Location not specified	Not revealed ¹	A ⁶ . 307 B ⁷ . 275 C ⁸ . 2854	Validation study

¹ Withheld to protect the anonymity of the communities² Southwest participants (Spicer et al.)³ Northern Plains participants (Spicer et al.)⁴ Southwestern participants (Robin et al.)⁵ Plains participants (Robin et al.)⁶ Psychiatric interview only (Saremi et al.)⁷ Both CAGE and psychiatric interview (Saremi et al.)⁸ CAGE questionnaire only (Saremi et al.)

Native community interviewers [29, 30]. One used an additional tool (SMAST) that was self-administered by some or all participants [26].

Of the eight tools used all but one have been validated for general population use [17–20, 34, 35] (Table 4). Only one tool used in the studies had not been validated (WMH-CIDI), but this tool has been shown to

Table 3 Prevalence of current alcohol dependence and tools used in identified studies (n = 9)

Authors (year)	Recruitment strategy	Indigenous sample recruited			Current alcohol dependence			Interview/tool administration	Tool/s	Validated (y/n)	Validated in Indigenous communities (y/n)
		Male n (%)	Female n (%)	Age range (mean) ¹	Male n (%)	Female n (%)	Total n (%)				
Baxter et al. (2006) [32]	Stratified systematic	1048 (46.6%)	1547 (53.4%)	16-65+	Not reported	Not reported	3.9%	Interviewer-administered	WMH-CIDI (DSM-IV)	No	No
Brave Heart et al. (2016) [21]	Stratified random	314 (44.8%)	387 (55.2%)	18+	26 (8.4%) [1.84 SE]	17 (4.5%) [1.32 SE]	43 (6.1%)	Interviewer-administered (non-clinician)	AUDADIS-IV (DSM-IV)	Yes	No
Gill et al. (1997) [24]	Convenience	57 (54.3%)	48 (45.7%)	Not reported	Not reported	Not reported	35 (33.3%)	Interviewer-administered	DIS (DSM-III-R)	Yes	No
Grant et al. (2017) [31]	Stratified random	Not reported	Not reported	Not reported	Not reported	Not reported	16.6%	Interviewer-administered (non-clinician)	AUDADIS-V (DSM-IV)	Yes	No
Grant et al. (2004) [33]	Stratified random	Not reported	Not reported	18-65+	11.0%	7.4%	9.0%	Interviewer-administered	AUDADIS-IV (DSM-IV)	Yes	No
Kinzie et al. (1992) [25]	Convenience	Not reported	Not reported	Not reported	32.8%	6.2%	25 (18.8%)	Interviewer-administered (psychiatrists)	SADS-L (DSM-III-R) ²	Yes	No
Spicer et al. (2003) [28]	Stratified	A ³ 617 (43%) B ⁴ 790 (48%)	A ³ 829 (57%) B ⁴ 848 (52%)	15-45+	A ³ 75 (12.2%) B ⁴ 103 (13%)	A ³ 11 (1.3%) B ⁴ 64 (7.6%)	A ³ 86 (6.0%) B ⁴ 167 (10.2%)	Interviewer-administered	CIDI ⁵ (DSM-III-R)	Yes	No
Walls et al. (2020) [29]	Convenience roll-based	42.3%	57.0%	24-27 (26.3)	6.8%	2.3%	4.2%	Native interviewer-administered	WMH-CIDI (DSM-IV-TR)	No	No
Whitbeck et al. (2006) [30]	Convenience roll-based	236 (27.4%)	625 (72.6%)	17-77 (41 ⁶ , 39 ⁷)	3.0% [0.01 SE]	4.2% [0.01 SE]	3.8% [0.01 SE]	Native interviewer-administered	UM-CIDI (DSM-III-R)	Yes	No

¹ Mean presented where available² Expanding questions on alcohol dependence and abuse and PTSD (Kinzie et al.)³ Southwest participants (Spicer et al.)⁴ Northern Plains participants (Spicer et al.)⁵ Alcohol-dependence questions only (Spicer et al.)⁶ Men⁷ Women

Table 4 Validation studies in Indigenous communities of tools used to detect or assess dependence (n = 2)

Authors (year)	Recruitment strategy	Indigenous sample recruited			Interview/tool administration	Tool/s	Validated (y/n)	Validated in Indigenous communities (y/n)	Comment on validation
		Male n (%)	Female n (%)	Age range					
Robin et al. (2004) [26]	Other (selected from 3 multi-generational pedigrees)	A ¹ : 205 (45%) B ² : 101 (47%)	A ¹ : 251 (55%) B ² : 113 (53%)	21–50+	Interviewer-administered (clinical social worker and psychologist) SADS-L; interviewer-administered ¹ SMAST and self-administered ²	SADS-L (DSM-III-R) SMAST (DSM-III-R)	Yes	SMAST (Native American population)	Authors suggest a cut-off of ≥ 5 for Southwestern men and women; ≥ 8 for Plains men and ≥ 6 for Plains women
Saremi et al. (2001) [27]	Other (selected from 3 multi-generational pedigrees)	A ³ : 157 (51%) B ⁴ : 96 (35%) C ⁵ : 1113 (39%)	A ³ : 150 (49%) B ⁴ : 179 (65%) C ⁵ : 1741 (61%)	21+	Interviewer-administered SADS-L (psychologist) and CAGE/ CAGE-T	SADS-L and CAGE/ CAGE-T (DSM-III-R)	Yes	CAGE (Native American population)	Authors suggest a cut-off score of ≥ 2

¹ Southwestern participants (Robin et al.)² Plains participants (Robin et al.)³ Psychiatric interview only (Saremi et al.)⁴ Both CAGE/CAGE-T and psychiatric interview (Saremi et al.)⁵ CAGE questionnaire only (Saremi et al.)

be consistent with clinical diagnoses [36]. Two screening tools, SMAST and CAGE/CAGE-T, were validated in overlapping Native American tribal samples [26, 27]. Both were compared against a lifetime diagnosis of dependence, according to SADS-L, rather than against current dependence. Area under the receiver operating characteristic (ROC) curve for the SMAST for men and women was 85–86% and 82–88%, respectively [26]. However, the authors conclude that the SMAST was not a valid tool in this setting because of elevated cut-offs, and big differences in cut-offs between populations and genders. Area under the ROC curve for CAGE for men and women was 81% and 75%, respectively [27] and for the modified CAGE-T was 79% and 76%, respectively [27].

Study quality

Study quality was examined with the AXIS critical appraisal tool [23]. Aims and objectives were clear in ten of the 11 studies [21, 24–27, 29–33]. All studies were designed appropriately for their stated aims. The reference populations were clearly defined in all but one study [27], and the sample recruited was suitable for the study population for all but one study [27]. However, in four studies the sampling strategy was unlikely to represent the target population [24–27].

Methods were sufficiently described in eight studies to enable them to be repeated [21, 24, 27, 29–33] and eight studies described their basic data adequately [21, 24, 28–33]. Three studies described measures taken to address non-responders or missing data [29, 31, 32]. The results in all 11 studies were internally consistent. Only five studies mentioned funding sources or conflicts of interest [21, 27–29, 31] and three studies did not report on ethical approvals or consent [27, 32, 33].

Discussion

To our knowledge this is the first review to examine the prevalence of current (12-month) alcohol dependence and to describe how it is measured in Indigenous Peoples in similarly colonised countries. We identified 11 reports published between 1992 and 2020 among Indigenous Peoples in New Zealand, Canada, and the USA. No reports from Australia were identified. We highlight the need for more and unbiased data on prevalence of current alcohol dependence in Indigenous communities. Also screening, assessment and diagnostic tools and instruments need to be validated for Indigenous Peoples in a cross-cultural context. Indigenous Peoples need to be consulted to see how alcohol dependence criteria are translated locally. Interviewers using mainstream tools and instruments need to understand Indigenous Peoples' background and worldviews to understand alcohol dependence. Working in partnership

with local Indigenous Peoples can inform this process. A clearer understanding of the prevalence of current alcohol dependence can help inform an estimate of the type and scope of alcohol intervention and treatment services needed for each community.

Prevalence of current alcohol dependence

In all nine prevalence studies the total prevalence was similar or higher than in the general population (e.g. in the NZ study, 3.9% versus 1.3% [13]; USA only studies, 6.0–33.3% versus 3.8% [15]). As in general populations, in all but one study [30] males had a higher prevalence of dependence than females, where gender-specific prevalence was provided (3.0–32.8% versus 1.3–7.6%) [21, 25, 28, 29, 33].

Prevalence studies which used a stratified sampling strategy ($n=5$) [21, 28, 31–33] tended to report a lower prevalence of dependence than those that used convenience sampling ($n=2$) [24, 25] (3.9–16.6% versus 18.8–33.3%). However, studies using a combination of a convenience and roll-based strategy, contacting all eligible participants, reported a similarly low prevalence (3.8–4.2%) [29, 30] to studies with stratified sampling. Future studies need to strive for recruitment strategies that can yield a representative prevalence of alcohol dependence within communities. Strategies should include working with local Indigenous people, community leaders and service providers to better understand how to reach a broad range of individuals [37].

All but one [28] of the USA-only community samples, drawn from specific First Nations communities, [24, 25] had a higher prevalence of current alcohol dependence than US national surveys of First Nations peoples [21, 31, 33] (18.8–33.3% versus 6.1–16.6%). Because of selection bias applying to either individuals or whole communities the study findings may not be able to be generalised to other Indigenous communities.

Detecting alcohol dependence

All but one tool used in the included studies have been validated for general communities. This review identified two tools used to screen for dependence (SMAST, CAGE/CAGE-T) that have been validated in Indigenous communities against criteria for lifetime dependence [26, 27]. These were found to have good accuracy. Nonetheless the authors questioned the validity of SMAST because of the need for high cut-offs, which vary by community and gender [26]. The authors concluded that the modified CAGE-T did not add any diagnostic value compared to the standard CAGE [27]. Future studies are needed to validate tools against the criteria of current

alcohol dependence. This would better help inform current local prevention and treatment needs.

Some tools have been translated and validated in other languages (e.g. AUDIT, CIDI), but as complex as translation is, translating Indigenous values and worldviews (e.g. the passing on of oral lore, culture, family values, and traditional knowledge) can be a more demanding process [7]. As these values are not embedded in these tools, consultation is needed with Indigenous communities to determine how criteria of dependence could be best translated into local contexts [38]. Mainstream tools or dependence criteria may or may not be accurate when screening, assessing or diagnosing alcohol dependence in an Indigenous population. In some communities the differing context can make items used to assess dependence difficult to interpret, unless these are 'translated' through a cultural lens [39, 40]. For example, an Indigenous person's responsibilities to community and to Country may be at least as important as responsibilities 'in the home'. Furthermore, limited employment and educational opportunities in some communities may make questions about interference with work and study less relevant.

Some screening tools (e.g. AUDIT, CAGE) raise questions about feelings of guilt or shame in relation to drinking alcohol, for example, "How often during the last year have you had a feeling of guilt or remorse after drinking?" (AUDIT, Q7) [16]. If an individual indicates yes, the feeling of guilt may not necessarily relate to quantity or things said and done whilst drinking. Rather, the guilt could be from internalised racism, or internalised stigma of Indigenous people in relation to alcohol. On the other hand, an individual drinking heavily may experience no guilt or remorse if drinking large quantities is the social norm within that community. Interviewers utilising tools should consider an individual's background and worldviews and as every Indigenous community is different, interviewers benefit from training by local Indigenous people [41].

None of the eight tools used to screen, assess or diagnose alcohol dependence were developed specifically for Indigenous Peoples. In an Australian context, the Indigenous Risk Impact Screen (IRIS) is an Indigenous-specific screening tool which has been validated in an Australian Indigenous population (Queensland). However, IRIS provides a combined measure of risk from alcohol and substance use. For this reason, studies using IRIS were not included in this systematic review.

Implications for policy, practice and research

There is a need for more studies on prevalence of current alcohol dependence to inform prevention and treatment efforts in Indigenous communities internationally [42]. Assessing current prevalence is more useful than lifetime

dependence for estimating current treatment needs. Large numbers of individuals who have experienced alcohol dependence may enter stable remission and not need treatment [29, 43]. In one national study on American Indians and Alaskan Natives, the prevalence of lifetime alcohol dependence was more than three times that of current dependence (19.7% versus 6.1%, respectively) [21]. Prevalence findings inform the need for health promotion and treatment strategies. The findings can inform the balance of funding allocation between primary health care and specialist treatment services. Health promotion and treatment needs may also vary by gender or age [44]. Accordingly, to assess need, studies should stratify results by gender and age.

Researchers and clinicians should work in partnership with local Indigenous community members to take into consideration local worldviews and culture [38, 41]. They also should ensure research approaches (e.g. sampling methods and approach to recruit individuals) are co-designed with Indigenous Peoples and the local community. This may require extensive consultation with Indigenous leaders and community members over a long period time to understand the community and people. Structured interviews in the hands of a culturally-aware interviewer could also assist screening, assessment and diagnostic tools to be understood in a cross-cultural context [39, 40, 45].

Limitations

This systematic review excluded studies that examined only lifetime prevalence of alcohol dependence. A systematic review of that research would also be useful to indicate the prevalence of those who (if in remission) could relapse in the future. Another systematic review could focus on individuals with milder AUDs (harmful use or abuse). Studies of specialised sub-populations were excluded from the current study (e.g. hospital inpatients and prison inmates). The prevalence of alcohol dependence in these groups was expected to be higher than in representative community samples. It is possible that some eligible studies were overlooked, despite careful screening, because titles and abstracts did not give a clue to relevant data contained within. It is also possible that we may have missed studies that report on dependence in general populations, but have a sub-analysis reporting on Indigenous populations. Grey literature was excluded as were non-English language publications.

Conclusion

Prevalence of current alcohol dependence varied considerably depending on study methods. Future studies should strive to recruit representative samples from Indigenous communities to give a more accurate

estimate of the prevalence of current alcohol dependence. This review also highlighted the need for more alcohol dependence screening, assessment and diagnostic tools to be developed and validated by and for Indigenous populations. These tools should take into account local values and worldviews, and concepts underpinning the criteria in these tools should be clear. Leadership from local Indigenous community members, clinicians and researchers is a crucial part of future research in this area. Understanding the prevalence of current dependence can help inform communities. It can also help inform allocation of government funding for treatment needs.

Abbreviations

AU: Australia; AUD: Alcohol use disorder; AUDADIS: Alcohol Use Disorder and Associated Disabilities Interview Schedule; AUDIT: Alcohol Use Disorders Identification Test; AXIS: Appraisal Tool for Cross-Sectional Studies; CID: WHO-Composite International Diagnostic Interview; DIS: Diagnostic Interview Schedule; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICD: International Classification of Diseases; IRIS: Indigenous Risk Impact Screen; MAST: Michigan Alcoholism Screening Test; NZ: New Zealand; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; ROC: Receiver operating characteristic; SADS: The Schedule for Affective Disorders and Schizophrenia; UM-CIDI: University of Michigan-Composite International Diagnostic Interview; USA: United States of America; WHO: World Health Organization; WMH-CIDI: World Mental Health-Composite International Diagnostic Interview.

Acknowledgements

Bernadette Carr (Academic Liaison Librarian) from the University of Sydney.

Authors' contributions

TW: led the registration of the study with PROSPERO; designed the search terms with a university librarian; conducted a systematic literature search; conducted title and abstract screen, full-text screen and data extraction; conducted literature review; led the writing of the manuscript, tables and figure. KC: contributed to title and abstract screen and data extraction; provided input into PROSPERO registration; adjudicated screening and data extraction process when required; independently checked data extraction; reviewed drafts of manuscript, tables and figure; oversaw scientific integrity of the study. JC: provided input into PROSPERO registration; conducted a systematic literature search; title and abstract screen, full-text screen and data extraction; reviewed drafts of manuscript, tables and figure. KL: conceived the study; provided input into PROSPERO registration; conducted title and abstract screen, full-text screen and data extraction; reviewed drafts of manuscript, tables and figure. All authors read and approved the final manuscript.

Funding

This work was supported by the Australian National Health and Medical Research Council (NHMRC) through the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198), a Project Grant (#1087192), and a Practitioner Fellowship for K Conigrave (#1117582).

Availability of data and materials

Data for this project is stored at the University of Sydney based at Drug Health Service, KGV Building, Missenden Road, Camperdown New South Wales, 2050 Australia.

Ethics approval and consent to participate

Ethics approval was not sought as no original data were collected for this study. This study is a systematic review of existing published peer-reviewed journal articles.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Received: 4 February 2020 Accepted: 9 September 2020

Published online: 17 September 2020

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Chapter Three

3. Prevalence and correlates of alcohol dependence

The previous chapter identified 11 studies that reported varying prevalence of current alcohol dependence among Indigenous Peoples globally from similarly colonised countries (range: 3.8-33.3%; New Zealand, Canada, USA). It identified two tools that have been validated for use with Native American populations (SMAST, CAGE/CAGE-T). This systematic review showed that no previous research has been conducted in Australia to identify the prevalence of current alcohol dependence in representative community samples of Indigenous Australians. The systematic review only identified one Australian study of alcohol dependence among Indigenous Australians. However, this study was excluded as it only presented data on the lifetime prevalence of alcohol dependence, and was conducted in a community with a known high prevalence of past psychological trauma [4].

Given that lack of data, this chapter will identify the prevalence and correlates of current alcohol dependence (last 12-months) in two representative community samples of Indigenous Australians (urban and remote). We need accurate information, especially given the negative media coverage of Indigenous Australians having a “drinking problem” in Australia, of which the Australian media leads the public to believe [101, 102].

In this chapter I will: 1) identify the frequency of reported symptoms of current alcohol dependence (ICD-11) in two representative community samples of Indigenous Australians—in the state of South Australia; 2) estimate the prevalence of current alcohol dependence; and 3) describe the correlates of current alcohol dependence, including demographic characteristics and patterns of alcohol consumption.

Publication #2: Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Fitts MS, Hayman N, Lee KSK. Prevalence and correlates of alcohol dependence in an Australian Aboriginal and Torres Strait Islander representative sample: Using the Grog Survey App. Drug and Alcohol Review. 2022;41(1):125-34, <https://doi.org/10.1111/dar.13292>.

Prevalence and correlates of alcohol dependence in an Australian Aboriginal and Torres Strait Islander representative sample: Using the Grog Survey App

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Abstract

Introduction. Little is known about the prevalence of current alcohol dependence in Indigenous Australian communities. Here we identify the frequency of reported symptoms, estimate the prevalence and describe the correlates of current alcohol dependence. **Methods.** A representative sample of Indigenous Australians (16+ years) was recruited from an urban and remote community in South Australia. Data were collected between July and October 2019 via a tablet computer-based application. Participants were likely dependent if they reported two or more dependence symptoms (ICD-11; in the last 12 months), weekly or more frequently. Chi-square tests described the relationship between demographics, remoteness and alcohol dependence. Spearman correlations estimated the relationship between symptoms of dependence, consumption characteristics and demographics. **Results.** A total of 775 Indigenous Australians participated. The most frequently reported symptoms were prioritising alcohol over other things and loss of control. Overall, 2.2% were likely dependent on alcohol ($n = 17/775$). Prevalence did not vary by remoteness. Participants who drank more and more frequently tended to report more frequent symptoms of dependence. In the urban site, men tended to report more frequent symptoms of dependence than women. Age, income and schooling were not linked to dependence. **Discussion and Conclusions.** The prevalence of current alcohol dependence in this representative sample was similar to that of the general Australian and international estimates. Understanding risk factors for current alcohol dependence will be useful to inform the allocation of funding and support. Accurate estimates of the prevalence of current alcohol dependence are important to better identify specialist treatment needs. [Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Fitts MS, Hayman N, Lee K. Prevalence and correlates of alcohol dependence in an Australian Aboriginal and Torres Strait Islander representative sample: Using the Grog Survey App. *Drug Alcohol Rev* 2022;41:125–134]

Key words: Australia, Aboriginal and Torres Strait Islander people, Indigenous, alcohol dependence, prevalence.

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Received 9 December 2020; accepted for publication 16 March 2021.

Introduction

Alcohol is a leading cause of mortality globally, causing 5.3% of all deaths (aged 15+ years) [1]. In Australia, risky drinking (above recommended guidelines) is common [2] and encouraged in many peer groups [3–5]. For Aboriginal and Torres Strait Islander (hereafter Indigenous) Australians, there can be an increased risk of drinking above recommended guidelines among those who do drink [6,7]. This is linked to the effects of colonisation [8]. Loss of land and systematic oppressive government policies, including the forced removal of children—the Stolen Generations—has contributed to intergenerational trauma [9] and stress, making alcohol dependence more likely [7,10]. Most Indigenous Australians were legally banned from accessing alcohol until the 1960s. This discriminatory policy meant that for many, drinking became a symbol of one's legal right to drink. Knowing the effects of colonisation and past government policies can help to contextualise our understanding of why some Indigenous Australians may be at greater risk of developing alcohol dependence.

Globally, the World Health Organization's International Classification of Diseases (ICD) sets out guidelines to identify current alcohol dependence (ICD-11; last 12-months) [11]. Similarly, the American Psychiatric Association's Diagnostic and Statistical Manual (DSM) sets out criteria for moderate to severe alcohol use disorders (DSM-V) [12]. In earlier editions of the DSM, the closest equivalent to this was alcohol dependence. Among non-Indigenous populations globally, one in 40 people are estimated to be alcohol dependent (2.6%, aged 15+, last 12-months; ICD-10) [1]. In Australia, the prevalence of alcohol dependence is estimated at 1.4% (aged 16–85, last 12-months; DSM-IV) [13]. Among Indigenous Peoples in similarly colonised countries (New Zealand, Canada and the USA) the prevalence of current alcohol dependence varies greatly (3.8–16.6%, last 12-months; representative samples) [14]. Variance in estimates may reflect the differences in measures used and the unique challenges and strengths of Indigenous communities.

Little is known on the prevalence of current alcohol dependence in Indigenous Australian communities [14]. The available estimates are unlikely to be representative of communities. For example, previous studies have included prison populations [15,16] or people living in remote communities with a high prevalence of past psychological trauma [9]. A recent meta-analysis demonstrated large variance in alcohol consumption within and between Indigenous Australian communities [17]. Based on that, local estimates—in addition to national—are needed to improve our understanding of alcohol dependence in Indigenous Australians.

Correlational studies can help to determine which individuals are more likely to need support within a community, but little research has examined the correlates of current alcohol dependence among Indigenous Peoples from similarly colonised countries [14]. In the USA, men and individuals with lower income were at increased risk of current alcohol dependence (in two Native American samples, $n = 3084$, 1997–1999) [18]. But in Australia, no Indigenous-specific data are available on likely risk factors for current alcohol dependence [14].

To improve our understanding of current alcohol dependence among Indigenous Australians we surveyed two communities—urban and remote. We aimed to: (i) identify the frequency of reported symptoms of current alcohol dependence (ICD-11) in two representative community samples; (ii) estimate the prevalence of current alcohol dependence; and (iii) describe the correlates of current alcohol dependence.

Methods

Aboriginal leadership

This study was designed by study investigators (including KL, KC, RR, NH) in consultation with the Aboriginal Drug and Alcohol Council of South Australia (SW, JP). The lead author (TW) is an Aboriginal Australian of the Kamilaroi and Anaiwan nations.

Ethical approval

Ethical approval was obtained from the Aboriginal Health Council of South Australia (Ref: 04/15/621) and (as this was part of a larger study) from Metro South Health Human Research Ethics Committee in Queensland (Ref: HREC/16/QPAH/293).

Setting

The study was conducted in two sites in the Australian state of South Australia—urban and remote. Community names have been withheld to preserve their anonymity. There were no alcohol restrictions in either site.

Urban. A sample of Indigenous Australians was drawn from an Indigenous area (as defined by the Australian Bureau of Statistics) [19]. More than 2% of residents were Indigenous Australian [19]. The community has a range of amenities, including shopping

centres, food outlets, fuel stations, health services, government and non-government service providers, entertainment venues, parks, playgrounds, childcare services, public and private schools, and further training and education providers.

Remote. A sample of Indigenous Australians was drawn from a 'very remote' town as classified by the Australian Statistical Geography Standard [20]. The town is more than 1000 km from the nearest capital city and more than half of the residents were Indigenous Australians. The community has grocery stores, service providers including a health clinic, a public school, police station and licensed venues ('pubs').

Eligibility

To participate in the study, individuals needed to be Aboriginal and/or Torres Strait Islander, aged 16 years or older, and living in one of the two study sites (including individuals sleeping rough or 'couch surfing').

Recruitment

Research assistants confirmed an individual's eligibility and set them up with an iPad and headphones. Participants completed the App survey anonymously. No names or birth dates were recorded. On survey completion, participants were reimbursed for their time with a store voucher (\$20 for urban; \$25 for remote—reflecting higher cost of living). Recruitment was responsive to field research assistants' and local service recommendations (e.g. when to stay longer at data collection events, or to postpone events due to 'sorry business' or death in the community, or for other unforeseen community events). Research assistants received one day of face-to-face training in study methods and survey administration from two study investigators (KL, KC).

Urban. Ten research assistants (seven Aboriginal, three non-Indigenous; six men and four women) collected survey data. Aboriginal research assistants included health professionals ($n = 4$; JP), a PhD candidate ($n = 1$; TW), a medical student ($n = 1$) and a research administrative assistant ($n = 1$). Four of the Aboriginal research assistants lived and worked in the study site for more than 25 years each and had strong connections with the local Aboriginal community. The non-Indigenous staff were project officers ($n = 2$; MF) and a study investigator ($n = 1$; KL). A quota-based

convenience sample stratified by age, gender and socioeconomic status was used to recruit a representative sample [21]. Recruitment was conducted for 36 days over 3.7 months (July, September to October 2019). Recruitment included a mix of planned events in local services, local groups (cultural and hobby groups), public events in public spaces (e.g. local parklands, beaches, skate parks or shopping centres) and unplanned events in public spaces (e.g. local shopping centres, beaches, skate parks). Recruitment is described in further detail elsewhere [21].

Remote. Due to the small number of eligible community members ($n = 57$) [19], we endeavoured to recruit everyone who was eligible. Four research assistants (three Aboriginal, one non-Indigenous; two men, two women) collected survey data. Of the three Aboriginal research assistants, all were well known to the local community. There were two drug and alcohol workers ($n = 1$, local resident; $n = 1$, 10+ years visiting for work; JP) and an Aboriginal health worker. The non-Indigenous staff member was a project officer (MF). Recruitment took place over two trips totalling 14 days (July to August, October 2019). The project was promoted through local services, with recruitment taking place at planned events (e.g. barbeques at women's centre, council office, general stores) and ad hoc events in public spaces.

Data collection

Grog Survey App. Data were collected as part of a five-year Australian National Health and Medical Research Council project grant. The overall aim of that project was to develop and test a tablet computer-based App. The App was designed to help Indigenous Australians describe if they drink alcohol and if so, what they drink and how much. The App has been described in detail elsewhere [22] and has been shown to be an acceptable [23] and accurate [24] survey tool.

The App collects information on demographics (including age, gender, language spoken, highest educational attainment, individual income per week: <200; 200–399; 400–599; 600–799; 800+ \$AUD), alcohol consumption (modified Finnish method [25,26] and Timeline Followback [27]), money spent on alcohol (0–25; 26–50; 51–75; 76–99; 100+ \$AUD), frequency of symptoms of alcohol dependence (ICD-11), harms to self or others, treatment access, and participants' feedback on using the App [22]. All survey data were collected offline and synchronised daily to a secure server hosted by the University of Sydney. The App is available in plain English and

Pitjantjatjara (an Aboriginal language commonly spoken in areas bordering South Australia, Western Australia and the Northern Territory).

Symptoms of current alcohol dependence. The term ‘alcohol dependence’ has been used as a concept replacing ‘alcoholism’ or ‘alcohol addiction’ since the late 1970s [28]. There has been recognition that the concept of dependence is culture-bound to some extent [29]. However, World Health Organization studies have found substantial cross-cultural recognition of the three major criteria included in the ICD-11 definition of alcohol dependence [30]. In preparation for this study, careful consultation with Indigenous Australian community members, Indigenous (SW, JP, NH) and non-Indigenous health

professionals (KC) and researchers (KC, RR, KL) was undertaken to operationalise these guidelines for an Indigenous Australian audience.

Three dependence questions were developed and based on ICD-11 guidelines (last 12-months; Table 1) [11]. Only current drinkers (last 12-months) were asked dependence items. Participants were asked about: (i) Loss of control – ‘Some people feel like grog is the boss of them. In the last 12-months how often do you feel grog makes all the decisions (so you could not stop drinking, even if you tried)?’; (ii) Alcohol withdrawal tremors (‘grog shakes’) – ‘Some people’s hands shake when they stop drinking or before their first drink of the day. In the last 12-months how often does this happen to you?’; and (iii) Prioritising alcohol over other things – ‘Some people spend more time drinking than doing other things they need to do, like

Table 1. Comparison of items on past year alcohol dependence using the Grog Survey App with ICD-11 descriptions of alcohol dependence and DSM-5 description of alcohol use disorder

App item	ICD-11 [11,31]	DSM-5 ^a [12]
‘Some people feel like grog is the boss of them. In the last 12 months how often do you feel grog makes all the decisions (so you could not stop drinking, even if you tried)?’	Impaired ability to control use	1. Alcohol is often taken in larger amounts or over a longer period than was intended. 2. There is a persistent desire or unsuccessful efforts to cut down or control alcohol use. 4. Craving, or a strong desire or urge to use alcohol.
‘Some people’s hands shake when they stop drinking or before their first drink of the day. In the last 12 months how often does this happen to you?’	Physiological features of dependence	10. Tolerance, as defined by either of the following: a. A need for markedly increased amounts of alcohol to achieve intoxication or desired effect. b. A markedly diminished effect with continued use of the same amount of alcohol. 11. Withdrawal, as manifested by either of the following: a. The characteristic withdrawal syndrome for alcohol (refer to Criteria A and B of the criteria set for alcohol withdrawal, pp. 499–500). b. Alcohol (or a closely related substance, such as a benzodiazepine) is taken to relieve or avoid withdrawal symptoms.
‘Some people spend more time drinking than doing other things they need to do, like looking after family, culture or work. In the last 12 months how often does this happen with you?’	Increasing priority is given to use over other activities and persistence of use despite harm or negative consequences	3. A great deal of time is spent in activities necessary to obtain alcohol, use alcohol, or recover from its effects. 5. Recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school, or home. 6. Continued alcohol use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of alcohol. 7. Important social, occupational, or recreational activities are given up or reduced because of alcohol use. 9. Alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by alcohol.

^aNumbering as presented in DSM-5 Alcohol Use Disorder. Diagnostic Criteria 8 (Recurrent alcohol use in situations in which it is physically hazardous) did not align with ICD-11 and is deliberately omitted. DSM, Diagnostic and Statistical Manual; ICD, International Classification of Diseases.

looking after family, culture or work. In the last 12-months how often does this happen with you?'. Responses for each item were indicated on a five-point Likert scale ranging from: (i) never; (ii) 'once in a blue moon' (hardly ever, less than once a month); (iii) sometimes (1–3 times a month); (iv) weekly; to (v) most days or every day.

Data analysis

Data cleaning and analysis were performed using R (version 4.0.4) [32]. Age was recoded into four categories to match those of the Australian Bureau of Statistics (16–24, 25–44, 45–64, 65+ years). Completion of schooling, training and university were recoded into six categories to determine the highest level of educational attainment: university; apprenticeship or TAFE (Technical and Further Education); Year 12; Year 11; Year 10; Year 9 or below. Demographic characteristics and symptoms of dependence (among current drinkers) were described by remoteness.

Participants were classified as likely to be dependent if they reported any two or more symptoms of dependence, weekly or more frequently [11,33]. This threshold was chosen based on its face validity and because of likely impact of symptoms of this frequency on participants and their communities. Chi-square tests described the relationship between demographic characteristics, remoteness and likely alcohol dependence.

A total symptom frequency score was calculated for all current drinkers by summing the three dependence responses ('never' = 0 to 'most days or every day' = 4; maximum score of 12). Spearman correlations were used to estimate the relationship between the total symptom frequency score, alcohol consumption characteristics, gender, remoteness, age, income earned, schooling and money spent on alcohol.

Results

Participants

A total of 775 Indigenous Australians (47.1% men, 52.9% women; Table 2) completed the App from two study sites (urban 91.1%, $n = 706$; remote 8.9%, $n = 69$).

Demographic characteristics

Participants had a mean age of 37.8 years (SD = 16.2) and 40.0 years (SD = 15.1) in the urban and remote communities, respectively. Just under half of the sample

were men in both sites (urban: 47.3%; remote: 44.9%; Table 2). The majority of participants reported their highest level of educational attainment as between years 10 and 12 (urban: 51.7%; remote: 39.1%). Just under one-third (29.2%) of participants in the urban site had completed further training or university as their highest educational attainment, while approximately half (47.8%) of the remote site had completed either year 9 or lower at school. Between one in five (20.8%) and one in four (24.6%) participants worked full-time in the urban and remote communities, respectively. In the remote site, more than half (56.5%) of the participants were unemployed. In the urban site, more women (38.0%) were unemployed than men (30.6%) X^2 (df = 1) = 4.1, $P = 0.04$. Most participants earned between \$200 and \$599 each week (urban: 49.4%; remote: 53.6%), with the remainder split between earning more and earning less than this. In the remote site, approximately one-quarter of participants' first language was an Australian Aboriginal language (23.2%), but this was less common in the urban site (6.4%).

Alcohol consumption

More than one in five (23%) participants did not consume any alcohol in the last 12-months, and so were excluded from the remaining analyses. There were 597 (77%) current drinkers (urban: $n = 554$, 92.8%; remote: $n = 43$, 7.2%).

Frequency of current alcohol dependence symptoms (ICD-11)

Overall, the most frequently reported symptoms of dependence were prioritising alcohol over other things and loss of control, and then tremors (Figure 1). In the remote site, approximately one in 10 (9.3%) current drinkers experienced loss of control over their drinking most days or every day.

Prevalence of current alcohol dependence (ICD-11)

For the overall sample, 2.2% were likely alcohol dependent ($n = 17/775$; urban and remote). Similar proportions were likely dependent in each site (urban: 2.3%, $n = 16/706$; remote: 1.4%, $n = 1/69$).

Among current drinkers, 2.8% were likely alcohol dependent ($n = 17/597$; urban and remote). Similar proportions of current drinkers were likely dependent in each site (urban: 2.9%, $n = 16/554$; remote: 2.3%, $n = 1/43$).

Table 2. Participant demographic characteristics (n = 775)

Variable	Urban (n = 706) n (%)	Remote (n = 69) n (%)	Total (n = 775) n (%)
<i>Age, years</i>			
16–24	188 (26.6)	12 (17.4)	200 (25.8)
25–44	276 (39.1)	28 (40.6)	304 (39.2)
45–64	191 (27.1)	25 (36.2)	216 (27.9)
65+	51 (7.2)	4 (5.8)	55 (7.1)
<i>Gender</i>			
Female	372 (52.7)	38 (55.1)	410 (52.9)
Male	334 (47.3)	31 (44.9)	365 (47.1)
<i>Level of highest educational attainment</i>			
University	38 (5.4)	—	38 (4.9)
TAFE ^a or apprenticeship	168 (23.8)	9 (13.0)	177 (22.8)
Year 12	97 (13.7)	6 (8.7)	103 (13.3)
Year 11	124 (17.6)	13 (18.8)	137 (17.7)
Year 10	144 (20.4)	8 (11.6)	152 (19.6)
Year 9 or below	135 (19.1)	33 (47.8)	168 (21.7)
<i>Employment status</i>			
Full-time	147 (20.8)	17 (24.6)	164 (21.2)
Part-time	36 (5.1)	6 (8.7)	42 (5.4)
Casual	30 (4.2)	1 (1.4)	31 (4.0)
'Work for the dole'/CDP ^b	4 (0.6)	6 (8.7)	10 (1.3)
Other	5 (0.7)	—	5 (0.6)
None	484 (68.6)	39 (56.5)	523 (67.5)
<i>Individual weekly income (\$AUD)</i>			
<200	137 (19.4)	10 (14.5)	147 (19.0)
200–399	193 (27.3)	15 (21.7)	208 (26.8)
400–599	156 (22.1)	22 (31.9)	178 (23.0)
600–799	80 (11.3)	9 (13.0)	89 (11.5)
>800	140 (19.8)	13 (18.8)	153 (19.7)
<i>Language spoken at home</i>			
English	651 (92.2)	51 (73.9)	702 (90.6)
Aboriginal or Torres Strait Islander	45 (6.4)	16 (23.2)	61 (7.9)
Other	10 (1.4)	2 (2.9)	12 (1.5)

^aTAFE, Technical and Further Education; ^bCDP, Community Development Program (Australian Government remote employment and development service).

Correlates of current alcohol dependence (ICD-11)

Table 3 shows the correlations between the total symptom frequency score (0–12), and alcohol consumption characteristics, gender, remoteness, age, income, level of completed schooling and money spent on alcohol. Individuals who consumed more alcohol when they drank and who drank more frequently, reported more frequent symptoms of dependence. There was a moderate to strong correlation between each of the three dependence symptoms ($r_s = 0.54$ – 0.63). Men tended to drink more frequently and have more drinks per occasion or per day than women, but men were only slightly more likely to report symptoms of dependence. Age was not linked to total symptom frequency score in either study site (urban: $r_s = 0.06$, $P = 0.13$; remote: $r_s = 0.11$, $P = 0.49$). In the urban site, men reported more frequent symptoms of dependence than women ($r_s = 0.12$, $P = 0.004$). Individuals who drank more

frequently or consumed more drinks per occasion, spent more money on alcohol.

Discussion

We aimed to measure the proportion of Indigenous Australians in two communities who are dependent on alcohol and how dependence is associated with demographic factors. We found that the prevalence of likely current alcohol dependence in these representative samples is similar to that of the general Australian population [13]. This is important to inform planning for treatment services and health promotion strategies. This finding is also important given the common negative stereotyping of Indigenous Australians and their use of alcohol as portrayed in Australian society and media [7,34]. As expected, symptoms of dependence

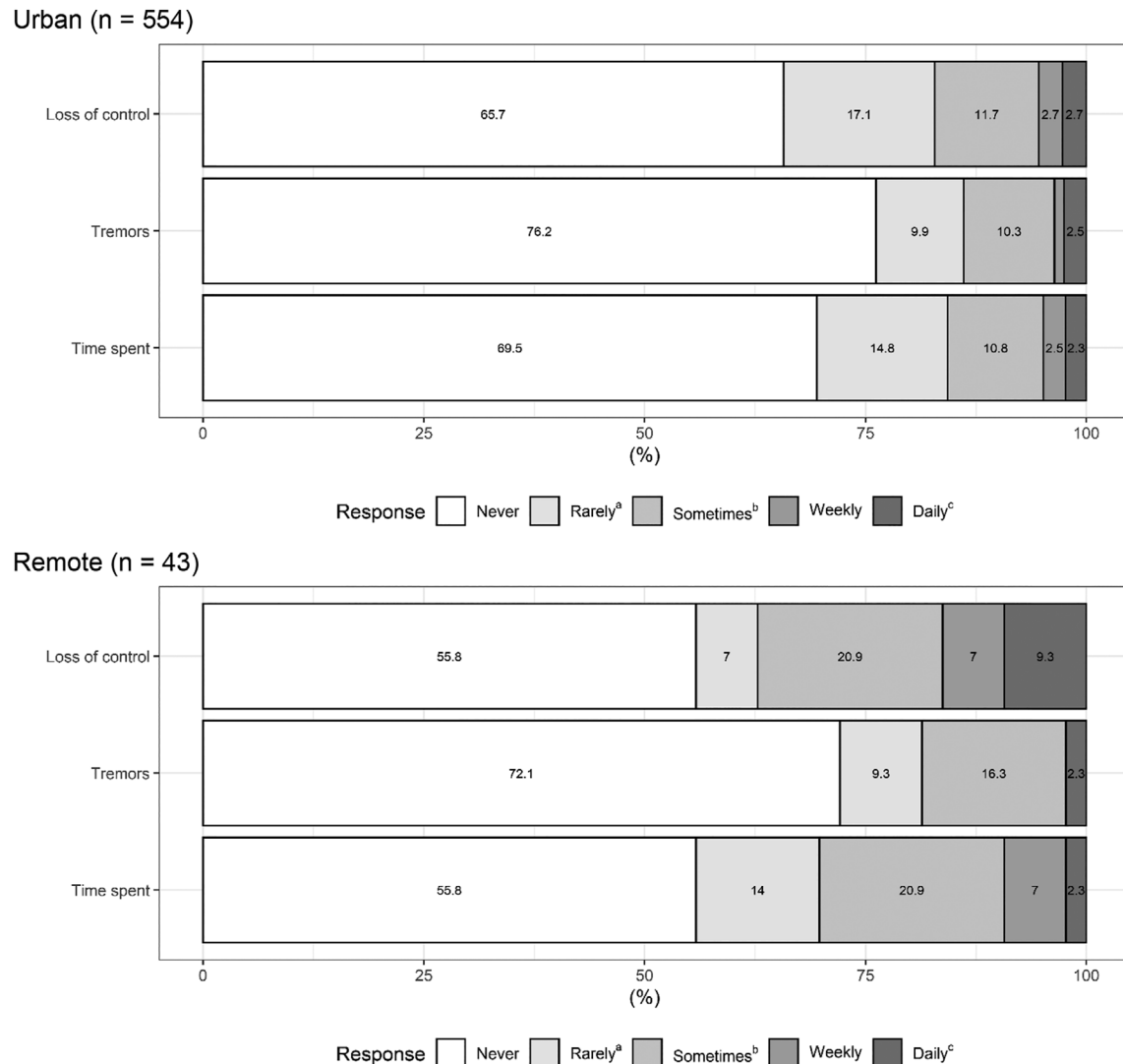


Figure 1. Frequency of alcohol dependence symptoms (ICD-11) among current drinkers (n = 597) by remoteness. Urban (n = 554). Remote (n = 43). ^a‘Once in a blue moon’ (hardly ever, less than once a month). ^bSometimes (1–3 times a month). ^c Most days or every day. ICD, International Classification of Diseases.

were more common in those who drink more alcohol more frequently. Also, in the urban site, men were more likely to be dependent. These data help us to understand who might be at increased risk of developing current alcohol dependence, and to tailor prevention and treatment efforts accordingly.

Frequency of current alcohol dependence symptoms (ICD-11)

Alcohol withdrawal tremors (‘grog shakes’) were the least reported dependence symptom. This is perhaps not surprising as episodic drinking can be common for

Indigenous Australians [22] and tremors are typically seen in people with chronic daily heavy alcohol consumption [6]. Withdrawal is also not an essential feature for a diagnosis of alcohol dependence [33] and is not always experienced when a dependent drinker stops drinking [35].

One in 10 (9.3%) individuals in the remote sample reported loss of control most days or every day. Loss of control is a key feature of alcohol dependence [36]. However, in some cultures, people freely admit to drinking alcohol with the goal of losing control [37]. In an Australian Indigenous context, loss of control can be a form of escapism—from trauma, racism and systematic government oppression [38]. Whether the loss of control preceded or resulted from alcohol

Table 3. Spearman correlations of alcohol dependence symptoms (ICD-11), alcohol consumption characteristics and demographics among current drinkers (n = 597)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Loss of control	—											
2. Tremors	0.54*	—										
3. Time spent	0.63*	0.60*	—									
4. Symptom frequency score	0.86*	0.75*	0.84*	—								
5. Drinking frequency	0.24*	0.23*	0.30*	0.30*	—							
6. Drinks per occasion	0.19*	0.18*	0.24*	0.25*	0.23*	—						
7. Drinks per day (mean)	0.27*	0.26*	0.34*	0.35*	0.87*	0.66*	—					
8. Male	0.05	0.10*	0.11*	0.12*	0.24*	0.25*	0.31*	—				
9. Remote	0.08*	0.03	0.09*	0.08	0.05	0.04	0.06	−0.01	—			
10. Age	0.08*	0.09*	0.09*	0.07	0.01	−0.19*	−0.07	−0.05	0.02	—		
11. Income	−0.12*	−0.11*	−0.11*	−0.13*	0.06	−0.08*	−0.02	0.02	0.05	0.33*	—	
12. Schooling	−0.19*	−0.19*	−0.22*	−0.21*	−0.06	−0.06	−0.07	−0.05	−0.09*	−0.23*	0.11*	—
13. Money spent on alcohol	0.21*	0.18*	0.24*	0.27*	0.37*	0.42*	0.48*	0.12*	0.14*	−0.08	0.06	−0.05

Note. * $P < 0.05$; loss of control, diminished control over drinking; tremors, alcohol withdrawal tremors; time spent, prioritising alcohol over other things; symptom frequency score, total score of three dependence responses, ranging from 0 to 12; drinking frequency, number of drinking occasions per month; drinks per occasion, number of standard drinks per drinking occasion; drinks per day, number of standard drinks averaged across all days; male, binary, participant is male; remote, binary, participant is from a remote area; age, age in years; income, individual weekly income categories, recoded 1–5; schooling, years of completed schooling; money spent on alcohol, recoded 1–5; male and remote were coded as dummy variables, to find the values for females, and urban areas, these correlations can be multiplied by −1. ICD, International Classification of Diseases.

dependence we cannot say from this study. However, in our sample, frequency of loss of control correlated well with the frequency of other dependence symptoms.

Prevalence of current alcohol dependence (ICD-11)

The prevalence of current alcohol dependence in this representative sample is similar to both general Australian and worldwide estimates (1.4% and 2.6%, respectively) [1,13]. We found a lower prevalence of current alcohol dependence compared with Indigenous Peoples from New Zealand, Canada and the USA. Among these Indigenous Peoples, studies that used stratified sampling or methods that involved contacting all eligible participants (representative samples) reported prevalences of 3.8–16.6% [14]. More work is needed to co-design studies with Indigenous researchers, communities and Elders, and to use representative sampling and recruitment methods that best suit the local context.

Correlates of current alcohol dependence (ICD-11)

Identifying factors that are linked to increased risk of current alcohol dependence can help to determine where prevention and treatment efforts should be targeted. In the urban area, we found men tended to report more frequent symptoms of dependence than women, which is consistent with previous literature of general populations [39,40]. Overall, there was heavier drinking among males than among females reporting dependence symptoms. We also found that people who earned more money each week or had a higher education were less likely to report symptoms of dependence. In keeping with this, US studies of First Nations [18] and general populations [39] have found that individuals who had either not graduated from high school [18] or had a lower income [18,39] had a higher risk of current alcohol dependence. It is not clear if educational attainment or income earned can be protective against alcohol dependence, or if risk factors in the family environment (e.g. an immediate family member being alcohol dependent) make it harder for individuals to stay in school or pursue higher education, or if early alcohol-related problems interfere with both education and employment.

Among the overall sample, age was not associated with dependence. This is consistent with findings from earlier US-based studies (with both First Nation American [41] and general populations [40]). However, other general population studies, including an

Australian national survey [13], found alcohol dependence was more prevalent in young people (aged under 30) [13,41,42] or older people (aged 50–64) [42]. Further study of the distribution of dependence across age groups would be useful. In the meantime, our finding illustrates the importance of appropriate treatment and specialist care that is accessible to individuals across all ages.

Implications for policy, practice and research

While this study helps to address the gap in understanding alcohol dependence in Indigenous communities, more research on dependence among Indigenous Australians conducted with study communities is needed. Specifically, researchers should consider recruiting representative samples across multiple communities that can reflect the diverse history, experiences, remoteness, living situations and policies affecting Indigenous Australians being surveyed. In both research and clinical settings, tools to screen for or assess dependence may need to be operationalised for Indigenous Australians so they can more accurately detect current alcohol dependence [14].

Limitations

This study presents data from one urban and one remote community of Indigenous Australians from one state of Australia and therefore is not generalisable to other Indigenous communities in Australia. It is possible some participants could have completed the survey more than once, however, recruitment strategies were designed to minimise this occurring. For example, research assistants, who were known in each study site, greeted each participant before setting them up on an iPad. At the time of data collection, the App was not able to systematically record refusals to take part in a survey. A modification has since been made to the App. Prevalence estimates could have been affected to some degree by non-response in the urban setting. This is unlikely to be the case for the remote community as our sample exceeded the local population according to the 2016 Australian Census of Population and Housing [19]. Alcohol dependence in this study was defined as two or more symptoms reported occurring at least weekly or more frequently. Different thresholds for symptom frequency will result in different prevalence estimates. The alcohol dependence items have not been formally validated, however, each dependence item showed a correlation, as expected, with other dependence items, gender, and with

indicators of drinking. Also, ICD-11 dependence features were operationalised with input from Aboriginal health professionals (JP, SW, NH).

Conclusion

This study found that prevalence of current alcohol dependence in two representative samples of Indigenous Australians was similar to that of general Australian populations but just less than Indigenous populations internationally. Understanding factors that increase an individual's risk of developing current alcohol dependence can help inform where funding and support is most needed in Indigenous communities. Accurate estimates of the prevalence of current alcohol dependence can better inform planning for specialist treatment needs.

Acknowledgements

The authors acknowledge the community and people who participated in the project, without their support this project would not have been possible. This work is supported by the National Health and Medical Research Council via the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198), a Project Grant (#1087192) and a Practitioner Fellowship for KC (#1117582). RR's work is supported by the Centre for Alcohol Policy Research from the Foundation for Alcohol Research and Education.

Conflict of interest

The authors have no conflicts of interest.

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Chapter Four

4. Associated harms and getting help for drinking

The previous chapter identified the prevalence and correlates of current alcohol dependence in a representative sample of Indigenous Australians—in urban and remote South Australia. It showed that, among the entire sample, one in 45 individuals (2.2%; $n = 17/775$; aged 16 years and older) were likely dependent on alcohol. Also, those who drank higher quantities of alcohol and drank more frequently tended to report more frequent symptoms of dependence. This prevalence of dependence is similar to the Australian general population (1.4%, aged 16 years and older) [49]. However, there remained a gap as previous research had not examined the associations of current alcohol dependence with harms and getting help for drinking among Indigenous Australians. Given the stigma associated with alcohol dependence and individual accounts of limited accessibility of treatment options, it is important to identify supports Indigenous Australians are aware of or would recommend.

Thus, this chapter aims to identify: 1) the association between alcohol dependence and harms to self or others in a representative sample of Indigenous Australians; 2) if dependent drinkers are more or less likely to get help for their drinking than non-dependent drinkers; and 3) what local treatment options for Indigenous Australians the whole sample was aware of, or would recommend to help people cut down or stop drinking.

Publication #3: Weatherall TJ, Conigrave JH, Conigrave KM, Perry J, Wilson S, Room R, Chikritzhs T, Lee KSK. Alcohol dependence in a community sample of Aboriginal and Torres Strait Islander Australians: harms, getting help and awareness of local treatments.

Addiction Science and Clinical Practice 16, 65 (2021). <https://doi.org/10.1186/s13722-021-00274-2>.

RESEARCH

Open Access



Alcohol dependence in a community sample of Aboriginal and Torres Strait Islander Australians: harms, getting help and awareness of local treatments

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Abstract

Background: Few studies have examined links between current alcohol dependence and specific harms among Indigenous Australians. We investigated these associations as well as help seeking for drinking, awareness of local treatments and recommendations to help family or friends cut down or stop drinking in two Indigenous communities.

Methods: A representative sample of Indigenous Australians was surveyed in one urban and one remote community in South Australia. Data were collected via the Grog Survey App. Participants were dependent if they reported two or more symptoms of alcohol dependence (ICD-11). Pearson chi-square tests were used to describe relationships between employment by gender, and dependence by awareness of medicines and local treatment options. Multivariate logistic regressions were used to predict the odds of dependent drinkers experiencing harms and getting help for drinking, controlling for age, gender, schooling and income.

Results: A total of 775 Indigenous Australians took part in the study. After controlling for confounders, dependent drinkers were nearly eight times more likely to report a harm and nearly three times more likely to get help for their drinking—compared with non-dependent drinkers. Participants recommended accessing local support from an Aboriginal alcohol and other drugs worker, or a detoxification/ rehabilitation service.

Discussion and conclusions: More support and funding is needed for Indigenous Australians to ensure local treatment options for dependent drinkers are readily available, appropriate and accessible. Involvement of local Aboriginal or Torres Strait Islander health professionals in delivery of care can help ensure that it is appropriate to an individual's culture and context.

Keywords: Aboriginal and Torres Strait Islander, Indigenous, Alcohol dependence, Harms, Treatment

Background

Globally, Indigenous Peoples who drink alcohol are at increased risk of developing dependence due to colonisation [1], government policies [2], ongoing trauma, and social disadvantage [3]. Globally, more Indigenous Peoples tend to be dependent (range: 3.8–16.6%; representative samples) compared to non-Indigenous people (2.6%)

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[4, 5]. Similarly, using established measurement criteria [6, 7], past studies with representative samples have indicated that slightly more Aboriginal and Torres Strait Islander (hereafter 'Indigenous') Australians are dependent compared to the general Australian population (2.2% versus 1.4%) [8, 9]. Indigenous Australians are aware of the impact alcohol has on them and their communities [10]. Impacts include a range of potential harms—physical, mental, social and emotional—to the drinker and to those around them [5]. To better reduce the harms from alcohol, it is important to improve our understanding of individuals who are dependent on alcohol, their reported harms, and access to treatment.

Many mainstream treatment options can benefit Indigenous Australians [11, 12]. However, culturally appropriate options are not always available, and this might make some Indigenous Australians feel uncomfortable, unwelcome, or prevent effective communication between health providers and Indigenous clients. The best way to provide primary care treatment for alcohol dependence for Indigenous Australians has had little study [13], and there is evidence to suggest that some Indigenous Australians might seek support outside routine healthcare settings. For example, people might seek help or advice for alcohol dependence from family or friends, Elders or spiritual leaders, the internet, or from culturally appropriate phone-based support [14].

Globally, Indigenous Peoples may experience greater barriers to getting help for alcohol dependence [15, 16]. These barriers include lack of information on local treatment options, stigma associated with alcohol dependence or with relapse prevention medicines [17], and treatments that may not be culturally-informed [18]. For the general Australian population, it can take 18 years for an individual to access help for alcohol use disorders [19]. While medicines to prevent relapse were first approved in Australia in 2003 [20, 21], they have had limited use [21]. For Indigenous Australians, there can be limited knowledge of or access to relapse prevention medicines or at-home withdrawal management [22, 23]. Additional challenges are a lack of services [24, 25] or treatment approaches that respect culture or are tailored for Indigenous contexts [22, 24].

Indigenous Australians who drink alcohol may have different patterns of drinking from the general population (e.g. episodic versus regular drinking, dependence or abstinence) [26, 27]. Accordingly, they may experience different harms and need access to different types of treatment. Globally, harms are more likely expected with dependence. However, Indigenous Australians who are heavy episodic drinkers (but not necessarily dependent), also report physical and social harms, and sometimes even more so than those who are dependent on

alcohol (hereafter 'dependent drinkers') [10]. It cannot be assumed that Indigenous Australians who need help for their drinking are accessing help. This is likely due to historical traumas experienced by Indigenous Australians that may cause them to lose trust in the health care system [28]. Also, sometimes Indigenous Australians get help for drinking at the request of family, friends or legal reasons [29, 30]. It is important to understand who might benefit from treatment from primary health services (i.e. episodic heavy drinkers) versus those who might require treatment in specialised treatment services (i.e. dependent drinkers).

However, we are not aware of any population-level research that has looked at the harms experienced by Indigenous Australians who are dependent on alcohol compared to non-dependent drinkers. Additionally, it is not clear what support and treatment options Indigenous Australians are aware of or would recommend for alcohol dependence [13]. To address these gaps, we surveyed two community samples of Indigenous Australians to explore: (1) the magnitude of associations between alcohol dependence and harms; (2) whether dependent drinkers are more or less likely to get help for their drinking; and (3) whether the community are aware of local treatment options, and their recommendations on where family or friends can get help to cut down or stop drinking.

Methods

Aboriginal leadership

This study was designed by study investigators (including KL, KC, SW, RR, TC) in consultation with the Aboriginal Drug and Alcohol Council of South Australia (SW, JP). The lead author (TW) is an Australian Aboriginal woman from the Kamilaroi and Anaiwan nations with lived experience in both urban and remote Aboriginal communities.

Ethical approval

Ethical approval was obtained from the Aboriginal Health Council of South Australia (Reference: 04/15/621) and as this was part of a larger study, from Metro South Health Human Research Ethics Committee in Queensland (Reference: HREC/16/QPAH/293).

Setting

The study was conducted in two sites, one urban and one remote (community names are withheld to preserve their anonymity), in South Australia. There were no alcohol restrictions in the urban or remote sites. In the urban site, a sample of Indigenous Australians was drawn from an Indigenous area (as defined by the Australian Bureau of Statistics) [31], where more than 2% of residents were Indigenous Australian [31]. In the remote site, a sample

of Indigenous Australians was drawn from a ‘very remote’ town as classified by the Australian Statistical Geography Standard [32], where more than 50% of residents were Indigenous Australian.

Eligibility

Participants were Aboriginal and/or Torres Strait Islander, aged 16 years or older, and currently living in one of the two study sites (including people that had no fixed address).

Recruitment

Research assistants confirmed each individual’s eligibility and set them up with an iPad and headphones. Participants completed the App anonymously. No names or birth dates were recorded. On completion, participants were reimbursed for their time with a store voucher (\$20 for urban; \$25 for remote—reflected higher cost of living). Research assistants received one day of face-to-face training in study methods and survey administration from study investigators (KL, KC). Recruitment has been described in detail elsewhere [8].

Urban

A quota-based convenience sample stratified by age, gender and socioeconomic status was used to recruit a representative sample [33]. Ten research assistants (7 Aboriginal, 3 non-Indigenous; 6 men and 4 women) collected survey data. Four Aboriginal research assistants resided and/or worked in the study site (JP) and another three were project officers (TW). Non-Indigenous staff included two project officers and a study investigator (KL). Recruitment took 36 days over 3.7 months (July, September to October 2019) and included a mix of planned events (in local services, community groups and public spaces) and unplanned events in public spaces (e.g. skate park, beach).

Remote

As there were only 57 eligible people [31] in the remote community, we aimed to recruit everyone. Four research assistants (3 Aboriginal, 1 non-Indigenous; 2 men, 2 women) collected survey data. The three Aboriginal research assistants were well known to the community and included two drug and alcohol workers and an Aboriginal health worker. The non-Indigenous staff member was a project officer. Recruitment took place on two occasions totalling 14 days (July/August, October 2019) and included a mix of planned events (e.g. barbeques at local women’s centre, council office, general stores) and unplanned events (e.g. driving around town).

Data collection

Grog Survey App

Data were collected as part of a five-year Australian National Health and Medical Research Council project grant: The Grog Survey App (note: ‘grog’ is a commonly used term for alcohol). The overall aim of that larger project was to develop and test a tablet-based App to help Indigenous Australians describe their drinking (or abstinence). The App is an acceptable [34] and accurate [35] survey tool for Indigenous Australians and has been described in detail elsewhere [36].

The App collects information on demographics (including age, gender, language spoken, highest educational attainment, and individual income per week: <200; 200–399; 400–599; 600–799; 800+ \$AUD), alcohol consumption (modified Finnish method [37–39]), money spent on alcohol (0–25; 26–50; 51–75; 76–99; 100+ \$AUD), frequency of symptoms of alcohol dependence (ICD-11), harms to self or others, treatment access, and participants’ feedback on using the App [36]. All survey data were collected offline and synchronised daily to a secure server hosted by the University of Sydney. The App can read out survey questions in plain English and Pitjantjatjara (an Aboriginal language commonly spoken in South Australia, Western Australia and the Northern Territory), in male and female audio.

Symptoms of current alcohol dependence

The term ‘current alcohol dependence’ is used in this study to refer to people who drink alcohol and are dependent (in the last 12-months). The World Health Organization’s International Classification of Diseases describes three key features of current alcohol dependence (ICD-11) [6]. To operationalise these for Indigenous Australian participants, Indigenous Australian community members were consulted, as were Indigenous (SW, JP) and non-Indigenous health professionals (KC) and researchers (KL, RR, TC).

Only participants who drank alcohol in the last 12 months (hereafter ‘current drinkers’) were asked dependence items. Participants were asked about: (1) Loss of control—“Some people feel like grog is the boss of them. In the last 12 months how often do you feel grog makes all the decisions (so you could not stop drinking, even if you tried)?”; (2) Alcohol withdrawal tremors (‘grog shakes’)—“Some people’s hands shake when they stop drinking or before their first drink of the day. In the last 12 months how often does this happen to you?”; and (3) Prioritising alcohol over other things—“Some people spend more time drinking than doing other things they need to do, like looking after family, culture or work. In the last 12 months how often does this happen with you?”. Responses for each item were indicated on a

five-point Likert scale ranging from: (a) never; (b) 'once in a blue moon' (hardly ever, less than once a month); (c) sometimes (1–3 times a month); (d) weekly; to (e) most days or every day.

Harms

Current drinkers were asked about harms to self or others from drinking: "Grog sometimes gives people worries or problems. In the last 12 months (that is from after (event name) last year until now) has grog given you any of these problems?". Responses included: (a) Someone hit me; (b) I fell down; (c) I had a road accident; (d) My money runs out because it goes on grog; (e) The kids in my house get scared by my drinking; (f) I get into trouble with police or security guards. More than one harm could be selected, or the respondent could answer: (g) no.

Getting help

Current drinkers were asked: "Have you ever got help about drinking—like from a clinic, counsellor, rehab, detox or hospital?" (yes/no). If yes, current drinkers were then asked: "What made you get help?". One response could be selected: (a) it was my choice; (b) family or friend pushed me; or (c) someone official pushed me (like welfare, police, or courts).

Awareness of or recommendations for local treatment options

All participants (including non-current drinkers and lifetime abstainers) were asked: "How far does a person need to travel to get to a rehab to stop drinking?" ('rehab' is commonly used to refer to an alcohol and other drug residential rehabilitation service). Responses were indicated using a slider (10 m to 3000 kms). The actual distance to the nearest Indigenous-specific residential rehabilitation service for the urban community was 300 km and 60 km for a mainstream service (one-way). For the remote site it was 800 km and 740 km, respectively for Indigenous-specific and mainstream services (one way).

All participants were asked two questions about relapse prevention medicines and grog shakes: "Can a person get a medicine to stop the grog shakes from a doctor around here?" and "If a person is finished with the grog shakes and wants to stay away from grog, can a doctor around here give them medicine to help?". Responses included: (a) no; (b) yes; or (c) I don't know.

All participants were asked: "If a friend or family wants to cut down or stop drinking, where should they get help?". Responses included: (a) Aboriginal alcohol and drug worker; (b) Aboriginal health or mental health worker; (c) nurse or doctor; (d) counsellor; (e) friend, family; (f) Elder; or (g) minister or pastor (at least one response had to be selected, and more than one response

could be selected). All participants were then asked: "Where else could they get help?". Responses included: (a) day centre; (b) detox or rehab; (c) hospital; (d) AA or SMART Recovery groups; (e) men's or women's groups; (f) internet or phone helpline; or (g) other (at least one response had to be selected, and more than one response could be selected).

Data analysis

Data cleaning and analysis were performed using R (version 4.0.4) [40]. Remote and urban samples were combined. A binary variable was constructed ('remoteness') to denote where participants were recruited from. This variable was used as a confounder in further analyses. Age was recoded into four categories (16–24, 25–44, 45–64, 65+ years old). Completion of highest level of educational attainment was recoded into six categories: university; TAFE (Technical and Further Education) or apprenticeship; Year 12; Year 11; Year 10; Year 9 or below. Participants were classified as likely dependent if they reported any two or more of the three key features of dependence, weekly or more frequently [6, 41]. This threshold was chosen based on face validity and likely impact of symptoms of this frequency on participants and their communities.

Demographic characteristics were described by drinking status (dependent drinkers, non-dependent drinkers, and non-current drinkers including lifetime abstainers), because alcohol consumption can vary greatly within and between communities [27]. We performed Pearson chi-square tests to describe sample characteristics, including, whether relationships exist between employment status and gender; awareness of medicines and location (responses: 'no' and 'I don't know' were combined); awareness of medicines and dependence status; and awareness of or recommendations for local treatment options to cut down or stop drinking and dependence status.

Proportions of reported harms were described by dependence status (for current drinkers only, dependent compared with non-dependent drinkers). Logistic regressions were used to predict the odds of experiencing harms for dependent drinkers (1) compared to non-dependent drinkers (0); and to predict the odds of seeking help for drinking among dependent drinkers (1) compared to non-dependent drinkers (0). Logistic regressions controlled for age, gender, schooling, and individual income. Logistic regressions did not control for remoteness, due to their being only one remote dependent drinker.

Results

Participant characteristics

A total of 775 Indigenous Australians completed the App (urban: $n=706$, 91.1%; remote: $n=69$, 8.9%; Table 1).

Table 1 Participant demographics by drinking status ($n=775$)

Variable	Current drinkers ^a		Non-current Drinkers ^c
	Dependent ^b	Non-dependent	
	$n=17$ n (%)	$n=580$ n (%)	$n=178$ n (%)
Remoteness			
Urban	16 (94.1%)	538 (92.8%)	152 (85.4%)
Remote	1 (5.9%)	42 (7.2%)	26 (14.6%)
Age groups			
16–24	2 (11.8)	158 (27.2)	40 (22.5)
25–44	7 (41.2)	255 (44.0)	42 (23.6)
45–64	8 (47.1)	140 (24.1)	68 (38.2)
65+	0 (0.0)	27 (4.7)	28 (15.7)
Gender			
Female	6 (35.3)	294 (50.7)	110 (61.8)
Male	11 (64.7)	286 (49.3)	68 (38.2)
Level of highest educational attainment			
University	0 (0.0)	30 (5.2)	8 (4.5)
TAFEd or apprenticeship	1 (5.9)	133 (22.9)	43 (24.2)
Year 12	1 (5.9)	87 (15.0)	15 (8.4)
Year 11	3 (17.6)	105 (18.1)	29 (16.3)
Year 10	4 (23.5)	115 (19.8)	33 (18.5)
Year 9 or below	8 (47.1)	110 (19.0)	50 (28.1)
Employment status			
Full-time	0 (0.0)	142 (24.5)	22 (12.4)
Part-time	1 (5.9)	36 (6.2)	5 (2.8)
Casual	0 (0.0)	29 (5.0)	2 (1.1)
Work for the Dole/ CDP ^e	1 (5.9)	7 (1.2)	2 (1.1)
Other	0 (0.0)	4 (0.7)	1 (0.6)
Not employed	15 (88.2)	362 (62.4)	146 (82.0)
Individual weekly income (\$AUD)			
< 200	4 (23.5)	108 (18.6)	35 (19.7)
200–399	4 (23.5)	151 (26.0)	53 (29.8)
400–599	6 (35.3)	128 (22.1)	44 (24.7)
600–799	1 (5.9)	68 (11.7)	20 (11.2)
> 800	2 (11.8)	125 (21.6)	26 (14.6)

^a Individuals who had any alcohol in the last 12-months

^b Reported two or more symptoms of alcohol dependence, weekly or more frequently (ICD-11)

^c Individuals who did not have any alcohol in the last 12-months, including lifetime abstainers

^d TAFE: Technical and Further Education

^e CDP: Community Development Program (Australian Government remote employment and development service)

Approximately half of the participants were men ($n=365$, 47.1%). Mean age was 38 years ($SD=16.1$). More than three-quarters of participants had completed education beyond Year 10 ($n=607$, 78.3%) and over a quarter were employed either full-time or part-time ($n=206$, 26.6%). Demographics of dependent, non-dependent and non-current drinkers are presented in Table 1. One in 45 ($n=17$, 2.2%) participants were likely dependent on alcohol and more likely to be men, have lower education, and be unemployed.

Association between harms and current alcohol dependence ($n=597$)

More than a quarter of all current drinkers reported at least one harm from alcohol in the last 12-months ($n=162$, 27.1%; Table 2). The most reported harm was spending too much money on alcohol ($n=68$, 11.4%). Of the dependent drinkers, three-quarters reported at least one harm in the last 12-months ($n=13/17$, 76.5%), with the most reported harm being getting into trouble with police or security guards ($n=7$, 41.2%). No dependent drinkers reported falling down. One in four non-dependent drinkers reported at least one harm in the last 12-months ($n=149/580$, 25.7%), with the most reported harm being spending too much money on grog ($n=64$, 11%).

In a series of multivariable logistic regressions, we examined links between alcohol dependence and reported harms adjusting for demographics (age, gender, schooling, and individual income). Adjusted and unadjusted estimates were similar. Due to there being few dependent drinkers in our sample ($n=17/597$), there was a large degree of uncertainty in our findings i.e., confidence intervals were wide. As shown in Table 3, after

Table 2 Frequency of self-reported harms among dependent and non-dependent drinkers^a ($n=597$)

	Dependent ^b $n=17$ n (%)	Non-dependent $n=580$ n (%)	Total $n=597$ n (%)
Reported a harm	13 (76.5)	149 (25.7)	162 (27.1)
Specific harms ^c			
Someone hit me	2 (11.8)	40 (6.9)	42 (7.0)
Fell down	0	45 (7.8)	45 (7.5)
Had road accident	1 (5.9)	6 (1.0)	7 (1.2)
Money goes on grog	4 (23.5)	64 (11.0)	68 (11.4)
Kids scared	5 (29.4)	17 (2.9)	22 (6.7)
Trouble with police	7 (41.2)	33 (5.7)	40 (3.7)

^a Individuals who had any alcohol in the last 12-months

^b Reported two or more symptoms of alcohol dependence, weekly or more frequently (ICD-11)

^c More than one specific harm could be selected

Table 3 Odds of self-reported alcohol-related harms among alcohol dependent drinkers compared to non-dependent drinkers (n = 597)

Outcome	OR [95% CI] (unadjusted)	OR [95% CI] (adjusted)
Reported any harm	9.4 [3.27, 33.78]*	7.84 [2.64, 28.73]*
Specific harms		
Someone hit me	1.8 [0.28, 6.68]	1.6 [0.24, 6.15]
Had road accident	5.98 [0.31, 37.94]	5.24 [0.25, 40.3]
Money goes on grog	2.48 [0.68, 7.25]	1.98 [0.51, 6.15]
Kids scared	13.8 [4.03, 42.04]*	10.29 [2.82, 33.33]*
Trouble with police	11.6 [3.99, 32.22]*	11.17 [3.67, 32.68]*

*p < 0.05; All coefficients describe the effect of being a dependent drinker (1) compared to a non-dependent drinker (0); Odds ratios were calculated using logistic regressions; OR (controlled) = logistic regression results controlled for age, gender, schooling and individual income; Age = age in years; School = years of completed schooling (from completed no schooling to Year 12); Individual income = weekly income categories (\$AUD: < 200; 200–399; 400–599; 600–799; 800+; recoded 1–5); Only current drinkers were included in analysis; Alcohol dependence = reported two or more symptoms of alcohol dependence (ICD-11; in the last 12-months), weekly or more frequently; There was insufficient data to estimate the value of the harm, “I fell down” (so this variable was omitted from this table)

adjustment, dependent drinkers were nearly eight times more likely than non-dependent drinkers to report a harm (OR = 7.84; 95% CI 2.64, 28.73). Dependent drinkers were ten times more likely to report children in their house being scared by their drinking (OR = 10.29; 95% CI 2.82, 33.33) and 11 times more likely to report trouble with police or security guards (OR = 11.17; 95% CI 3.67, 32.68). Three harms were not significantly associated with dependence (‘someone hit me’, ‘had a road accident’ and ‘money goes on grog’).

Association between getting help and current alcohol dependence (n = 597)

More than one in five current drinkers reported getting help for their drinking at some time in their life

(n = 133/597, 22.3%; non-dependent: n = 124/580, 21.4%; dependent: n = 9/17, 52.9%). Of those who received help for their drinking, the majority were men (n = 83/297, 62.4%). Among dependent drinkers, reasons for getting help were evenly split across: ‘it was my choice’, ‘family/ friends pushed me’ or ‘someone official pushed me’ (each n = 3). Among non-dependent drinkers, ‘it was my choice’ was the most commonly reported reason for getting help (n = 86/124, 69.4%).

As shown in Table 4, after controlling for confounders, dependent drinkers were nearly three times more likely than non-dependent drinkers to get help for their drinking (OR = 2.96; 95% CI 1.06, 8.38). The patterns of results were similar for unadjusted and adjusted odds ratios (controlling for age, gender, schooling, and individual income). Due to the large uncertainty resulting from the small number of dependent participants it was not clear if dependent people sought help for different reasons than non-dependent people.

Awareness of or recommendations for local treatment options to help Indigenous Australians cut down or stop drinking (n = 775)

Residential rehabilitation services (n = 775)

Awareness varied widely as to where the nearest residential rehabilitation services were, either Indigenous-specific or mainstream. Responses ranged from 0–3000 km.

Of the 706 urban participants, just 24 (3.5%; all of whom were non-dependent or non-current drinkers) correctly estimated that a residential rehabilitation service was 50–75 km from the urban site (a mainstream service was 60 km away). Just six individuals (0.8%; all of whom were non-dependent or non-current drinkers) estimated that a residential rehabilitation service was 200–400 km away (an Indigenous-specific service was 300 km away). Most dependent drinkers (n = 13/16, 81.2%) overestimated the availability of residential

Table 4 Odds of seeking help for drinking among alcohol dependent drinkers compared to non-dependent drinkers (n = 597)

Outcome	OR [95% CI] (uncontrolled)	OR [95% CI] (controlled)
Got help for drinking	4.14 [1.55, 11.23]*	2.96 [1.06, 8.38]*
Reasons for help seeking help (n = 133)		
Why: “It was my choice”	0.22 [0.04, 0.88]*	0.24 [0.05, 1.01]
Why: “Family/friends pushed me”	1.8 [0.36, 7.29]	1.79 [0.34, 7.89]
Why: “Someone official pushed me”	5.14 [0.98, 22.58]*	5.39 [0.77, 33.71]

*p < 0.05; All coefficients describe the effect of being a dependent drinker (1) compared to a non-dependent drinker (0); Odds ratios were calculated using logistic regressions; OR (controlled) = logistic regression results controlled for age, gender, schooling and individual income; Age = age in years; School = years of completed schooling (from completed no schooling to Year 12); Individual income = weekly income categories (\$AUD: < 200; 200–399; 400–599; 600–799; 800+; recoded 1–5); Only current drinkers were included in analysis; Alcohol dependence = reported two or more symptoms of alcohol dependence, weekly or more frequently (ICD-11; in the last 12-months); Got help about drinking = “Have you ever got help about drinking—like from a clinic, counsellor, rehab, detox or hospital?”; 133 current drinkers said yes, they got help for their drinking

rehabilitation services, reporting that a residential rehabilitation service was within 25 km of their community.

Of the 69 remote participants, just ten (14.5%; all of whom were non-dependent or non-current drinkers) estimated that a residential rehabilitation service was 650–900 km from the remote site (a mainstream service was 740 km away and an Indigenous-specific service was 800 km away). The one dependent drinker in this site said that a residential rehabilitation service was 5 km from the remote site.

Medicines to stop grog shakes or stay away from alcohol

More than a quarter of dependent drinkers ($n=5/17$, 29.4%) and half of the non-dependent or non-current drinkers ($n=395/758$, 52.1%), said that medicines to stop 'grog shakes' could be accessed from a local doctor (Fig. 1). But this difference was not statistically significant ($X^2(1, n=775)=2.6$, $p=0.11$). Similarly, perceived accessibility of medicines to stop grog shakes did not vary by remoteness ($X^2(1, n=775)=0.6$, $p=0.43$).

Similar proportions of dependent drinkers and non-dependent or non-current drinkers said that medicines 'to stay away from grog' could be accessed from a local doctor ($n=7/17$, 41.2%; $n=328/758$, 43.3%). Perceived accessibility of these relapse prevention medicines did not vary by dependence status ($X^2(1, n=775)=0$, $p=1$) or by remoteness ($X^2(1, n=775)=0.7$, $p=0.4$).

Other supports to help friends or family cut down or stop drinking

The two most recommended supports to help friends or family cut down or stop drinking were: an Aboriginal alcohol and other drugs worker, and detoxification/rehabilitation service (Fig. 1). Non-dependent and non-current drinkers were more likely than dependent drinkers to recommend accessing support for drinking from an Aboriginal health worker ($X^2(1, n=775)=12.42$, $p<0.001$), counsellor ($X^2(1, n=775)=6.51$, $p=0.011$), or men's or women's groups ($X^2(1, n=775)=7.60$, $p=0.006$; Fig. 1).

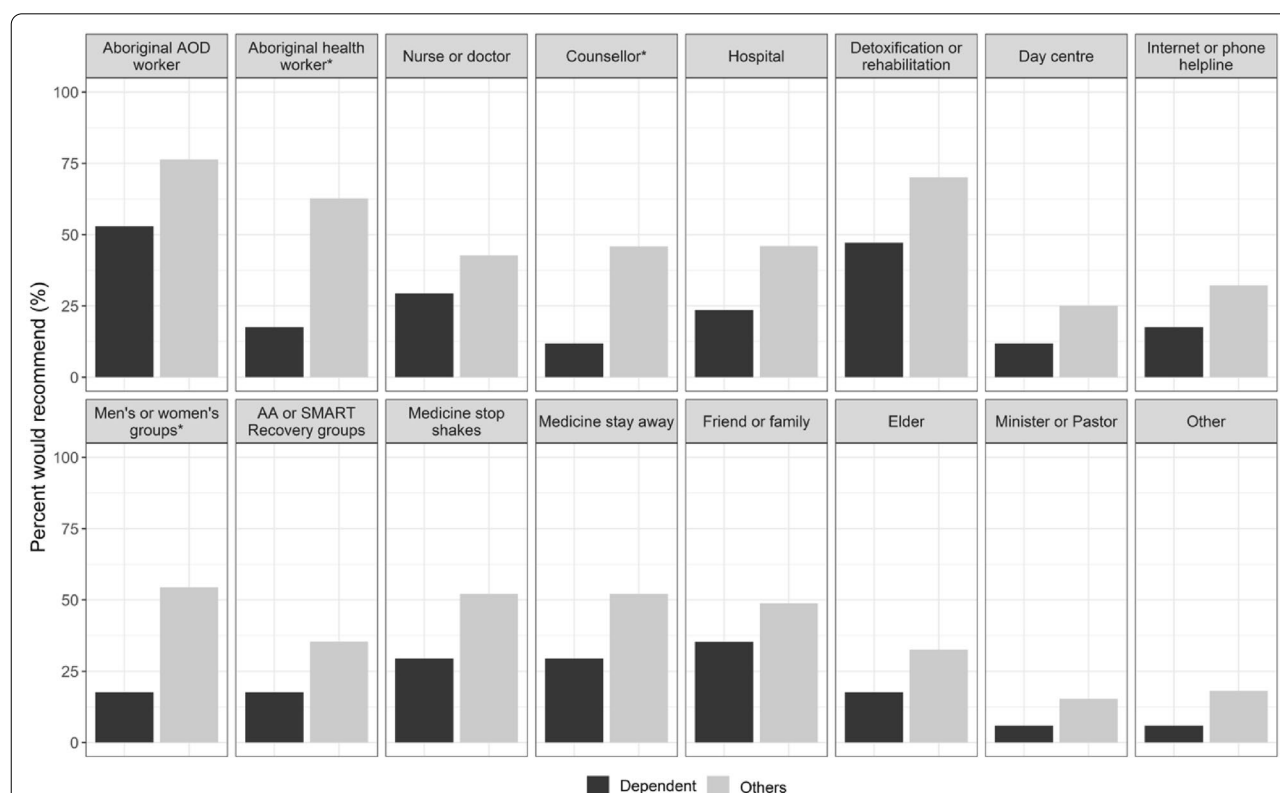


Fig. 1 Where Indigenous Australians recommend others can access local support, stratified by drinking status ($n=775$). * $p<0.05$, statistically significant based on chi-square tests; Alcohol dependence = reported two or more symptoms of alcohol dependence, weekly or more frequently (ICD-11; in the last 12-months); Others = non-dependent drinkers, individuals who have not had any alcohol in the last 12-months and lifetime abstainers; Aboriginal AOD worker = Aboriginal alcohol and other drugs worker; AA = Alcoholics Anonymous (mutual support programme); SMART Recovery = Self Management and Recovery Training (mutual support programme); Medicine to stop shakes = diazepam; Medicine to stay away = relapse prevention pharmacotherapies (i.e. naltrexone or acamprosate)

Discussion

We aimed to explore if Indigenous Australians who met the criteria for current alcohol dependence are more or less likely to experience harms and access support. We found that dependent drinkers were more likely to report harms from drinking and were also more likely to have had treatment for their drinking. Participants were most likely to recommend getting help from an Aboriginal alcohol and drug worker, or a detoxification/residential rehabilitation service. However, among the entire community sample, dependent drinkers were less likely to select any recommendations for help for drinking compared to non-dependent current drinkers and non-drinkers. It is important that early intervention and treatments are available, appropriate, and accessible for Indigenous Australians.

Association between harms and current alcohol dependence

We found dependent drinkers were nearly eight times more likely than non-dependent drinkers to report an alcohol-related harm. Dependent drinkers were more likely to report children in their house being scared by their drinking and more likely to report having trouble with police or security guards. It is well known that harms from drinking go beyond the drinker, they affect children, families and communities [42]. In Indigenous Australian contexts, social issues may also contribute to family harms experienced [43]. For example, overcrowding in houses [1] may mean there are more people who drink alcohol in a house and more shared alcohol available—all with children in the home. Overcrowded houses also potentially encourage dependent drinkers to consume alcohol in public places, such as parks and beaches. As dependent drinkers typically consume more alcohol and more often, this can lead to antisocial behaviours involving security or police [44]. Behaviours such as public drunkenness are common in many cities in general in Australia. However, Indigenous Australians may be targeted by police because of social disadvantage, and at times because of discrimination and racism [45]. More support is needed to help individuals, families and whole communities to address past traumas and social issues that are linked to or exacerbated by alcohol-related harms [1, 46, 47].

Association between getting help and current alcohol dependence

Even though drinking can harm their loved ones, barriers may prevent some Indigenous Australians from getting help for their drinking. Also, some people may not feel comfortable accessing help for drinking at mainstream services. For example, many Indigenous Australians

experience trauma from past government policies (e.g. the forced removal of children) [10]. Consequently, individuals may be concerned that their children will be taken away if they disclose any risky drinking [48]. Despite this, when compared to non-dependent drinkers, dependent drinkers were approximately three times more likely to receive help for their drinking. It is positive that in this community, Indigenous Australians who were dependent on alcohol sought help despite many barriers to accessing treatment and past experience of traumas. In the general Australian population, it can take up to 14 years for an individual to seek treatment for alcohol dependence [19]. In Indigenous Australian contexts, reasons for seeking help vary from because they want to, at the request of others (e.g. family, friends, government officials) [49], or because of pressure from others to address their drinking [50, 51]. Individuals may not always recognise the need to get help for their drinking [52]. Communities would benefit from improved screening, brief interventions and health promotion initiatives offered by local Aboriginal Community Controlled Health Organisations and suitable mainstream services [10, 53]. To achieve this, specific alcohol-related government funding and support would be needed in every Indigenous community, given the varying patterns of drinking within and between communities [22, 54, 55].

Awareness of or recommendations for local treatment options

Participants were more likely to recommend getting help for alcohol from either an Aboriginal alcohol and drug worker, or detoxification/ residential rehabilitation service. While drug and alcohol counsellors were highly recommended by Indigenous Australians in our sample, they may be difficult to access due to long waiting-lists [56]. The majority of participants did not know how far away a residential rehabilitation service was from their community. Some treatment options (e.g. residential rehabilitation services) may be hundreds of kilometres away from some communities [29]. Also, there could be a gap between what treatment dependent drinkers need or want and what is actually available locally [24].

Most participants believed that relapse prevention medicines could be accessed from a local doctor. However, while participants in our sample knew that medicines to stop tremors or prevent relapse were available, they may not understand how they work, nor feel confident to take them [57]. We identified that dependent drinkers were less likely to recommend any kind of help than others. This could reflect negative experiences in the health system, a lack of a desire for help, doubts about being able to make changes, or not understanding available supports [22]. Indigenous communities across

Australia need treatment options that are readily available, readily accessible and culturally appropriate [24, 58].

Implications for policy, practice and research

Alcohol-related policies aimed at Indigenous Australians need meaningful and active engagement from local Indigenous community members, leaders and elders [59]. Local treatment options should be tailored to reflect Indigenous values—strong families, caring for Country and belonging [43]. More work is needed to support health services to improve alcohol screening and provide alcohol brief interventions to Indigenous clients [60]. Community-level surveys could be used to monitor the prevalence of alcohol dependence and potential treatment needs in larger representative samples of Indigenous Australians [61]. Future research is needed to identify the effectiveness of brief interventions, treatment in different settings, and other supports—all guided by local community members, Elders and local cultural protocols.

Limitations

This study was based on self-reported data from two Indigenous communities located in one Australian state and may not generalisable to other communities. The urban and remote samples were combined in some analyses, however, there were little differences between these two communities with regards to schooling, licensed venues, and alcohol restrictions. The remote community had only one dependent drinker, so analyses were not adjusted for remoteness. The number of dependent drinkers was small ($n=17$), resulting in wide confidence intervals. Larger scale studies of representative samples of Indigenous Australians would be useful for more accurate estimates of the associations between dependence and harms and treatment access.

Conclusion

Using a representative sample of Indigenous Australians from two communities, we found that dependent drinkers were more likely to report harms and more likely to have received help for their drinking. However, dependent drinkers were less likely to recommend available support than others. More support is needed to help communities address past traumas and social issues that may be linked to alcohol-related harms [46] and barriers to getting help for drinking. Communities also need increased awareness of available local treatment options for alcohol dependence. Finally, investment in treatment and support for alcohol dependence by governments and developed with Indigenous community members [59] could help ensure that local treatment options are available, accessible and appropriate.

Abbreviations

AA: Alcoholics Anonymous (mutual support programme); ACHSA: Aboriginal Health Council of South Australia; AOD: Alcohol and other drugs; CDP: Community Development Program (Australian Government remote employment and development service); CI: Confidence intervals; DF: Degrees of freedom; DSM: American Psychiatric Association's Diagnostic and Statistical Manual; ICD: World Health Organization's International Classification of Diseases; JC: James H. Conigrave; JP: Jimmy Perry; KC: Katherine M. Conigrave; KL: K.S. Kylie Lee; OR: Odds ratio; RR: Robin Room; SD: Standard deviation; SMART Recovery: Self Management and Recovery Training (mutual support programme); SW: Scott Wilson; TAFE: Technical and Further Education; TC: Tanya Chikritzhs; TW: Teagan J. Weatherall.

Acknowledgements

The community and people who participated in the project who remain anonymous. Without them and the support of the local services this project would have been impossible. Michelle Fitts from Menzies School of Health Research (Alice Springs). Taleah Reynolds from the University of Sydney. Mustafa Al Ansari from the University of Sydney. The National Health and Medical Research Council via the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198), a Project Grant (#1087192), and a Practitioner Fellowship for K Conigrave (#1117582). R Room's work is supported by the Centre for Alcohol Policy Research from the Foundation for Alcohol Research and Education.

Authors' contributions

TW: Assisted to recruit participants to complete the survey App; conducted the data analyses with oversight from JC; wrote a first draft of the paper. JC: Conceptualised the data analyses, conducted data cleaning and ensured quality control of the data; reviewed drafts of manuscript, tables and figure. KC: Designed the study; input into App design; reviewed drafts of manuscript, tables and figure. JP: Input into App design; assisted to recruit participants to complete the survey App; reviewed drafts of manuscript, tables and figure. SW: Co-conceived the idea of the App; designed the study; input into App design; reviewed drafts of manuscript, tables and figure. RR: Designed the study; input into App design; reviewed drafts of manuscript, tables and figure. TC: Designed the study; input into App design; reviewed drafts of manuscript, tables and figure. KL: Co-conceived the idea of the App; designed the study; led input into App design; assisted to recruit participants to complete the survey App; reviewed drafts of manuscript, tables and figure. All authors read and approved the final manuscript.

Funding

This work is supported by the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198), the National Health and Medical Research Council (NHMRC) through a Project Grant (#1087192), a Practitioner Fellowship for K Conigrave (#1117582). R Room's work is supported by the Centre for Alcohol Policy Research from the Foundation for Alcohol Research and Education. T Chikritzhs' work is supported by the Australian Government under the Drug and Alcohol Program (NDRI core funder) and Curtin University, Western Australia.

Availability of data and materials

Data for this project is stored at the University of Sydney based at Drug Health Services, KGV Building, Missenden Road, Camperdown, New South Wales, 2050, Australia.

Declarations

Ethics approval and consent to participate

Aboriginal Health Council of South Australia (ACHSA: 04/15/621) and Metro South Health Human Research Ethics Committee (Queensland; HREC/16/QPAH/293). Consent to participate was obtained from participants via the App, the data collection tool. Participants read and/or listened (via headphones) to a consent statement read out on the App. They then select to say 'OK' (to provide consent to take part) or 'no' (to not provide consent to take part and thus not progress with the survey). In addition, a Participant Information Statement form was shown to each participant by a research assistant.

Participants were given a copy of this form to keep. Both ethics committees did not require parental consent for participants aged 16–17 years.

Consent for publication

Not applicable.

Competing interests

The authors have none to declare.

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Received: 15 July 2021 Accepted: 21 October 2021

Published online: 29 October 2021

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Chapter Five

5. General discussion and conclusion

5.1. Overview

This thesis has three aims. First, to systematically review the prevalence of alcohol dependence and identify how dependence was measured among Indigenous Peoples from similarly colonised countries. Second, to identify the prevalence and correlates of alcohol dependence in a community sample of Indigenous Australians. Third, to identify the associations between alcohol dependence, harms and getting help for drinking in a community sample of Indigenous Australians. Chapter 2, demonstrated that the prevalence of current alcohol dependence among Indigenous Peoples globally varies widely and few tools have been validated for Indigenous Peoples [69, 103]. Chapters 3 and 4, showed that the prevalence in a representative community sample of Indigenous Australians was similar to that of the general Australian population (aged 16+). Also, dependent drinkers were more likely to report harms and more likely to get help for their drinking.

5.2. Global prevalence and how alcohol dependence is measured

Prevalence of alcohol dependence among Indigenous Peoples globally

In Chapter 2, a PRISMA-informed systematic review of the prevalence of alcohol dependence among Indigenous Peoples from similarly colonised countries was conducted. Retrieved studies mostly from the USA (n=8), USA/Canada (n=2) and one from New Zealand. No studies were from Australia. Of the included studies, the prevalence of alcohol dependence varied widely (3.8-33.3%; Chapter 2, Table 3). This large variance could be explained by varying study methods used by each study. For instance, a lower prevalence was found among studies that used a stratified sample or that set out to contact all eligible study

participants, compared with studies that used convenience sampling (3.8%-16.6% versus 18.8-33.3%). Therefore, prevalence data from representative community samples are needed that reflect the diversity in and between Indigenous communities [104]. This could in turn help provide access to accurate data to better inform community needs, treatment service needs and allocation of relevant government funding [16].

How alcohol dependence is measured among Indigenous Peoples globally

As presented in Chapter 2 (the PRISMA-informed systematic review), just two validated tools were used to identify alcohol dependence among Indigenous Peoples from similarly colonised countries. The two tools, SMAST and CAGE, have been validated for Native American populations [69, 103]. Whilst the screening tools were validated for Native Americans, in Australia these tools are not commonly used, thus highlighting the need for existing tools to be validated for Indigenous populations.

It is important to consider how the unique historical traumas, experiences and worldviews of Indigenous Peoples impacts their responses to survey tools [105]. For example, Indigenous Peoples had their land forcibly removed, their children stolen [96, 106] and they still experience racism and discrimination today [8, 9, 107]. Consequently, they may use alcohol to cope with anxiety and stress [108]. To address these impacts, tools used to identify alcohol dependence need to be validated for Indigenous Peoples. Additionally, survey tools could be operationalised or developed with Indigenous Australians, health professionals and community members to better identify alcohol dependence.

5.3. A community sample of Indigenous Australians: prevalence, symptoms and correlates of current alcohol dependence

Prevalence of alcohol dependence

Chapter 3 provides data on the prevalence of current alcohol dependence (in the last 12-months) in an urban and remote representative community sample of Indigenous Australians (aged 16+). Previous studies have reported a high prevalence of current alcohol dependence among Indigenous Australian prison populations (22.5%, 2003-2004 data, aged 18+) [31]. Similarly, a high prevalence of lifetime alcohol dependence was reported in remote communities with known high rates of psychological trauma (33.5%, aged 18+) [4]. The prevalence of current alcohol dependence in this research was similar to the global general population prevalence (2.2%, aged 16+ versus 2.6%, aged 15+, respectively) [18] and to the Australian general population (1.4%, 2007 data, aged 16+, WMH-CIDI) [49]. However, the prevalence of alcohol dependence in this research is substantially lower compared to a 2019 study of the general Australian population (9.9%, 2019 data, aged 14+). The 2019 study used a screening tool, ASSIST-Lite, and reported data on individuals aged 14+ [23].

So why is the low prevalence of current alcohol dependence reported in this representative community sample in Chapter 3 significant? It is important because in Australia Indigenous people and individuals with an alcohol use disorder (including alcohol dependence) are often stigmatised and discriminated against [49, 109, 110]. Also, the media plays into the narrative that Indigenous Australians have a ‘problem’ with alcohol. The community-held perception that Indigenous Australians are more likely to be dependent than others, are false for these communities—and perhaps for other Indigenous Australian communities. Therefore, the narrative that Indigenous Australians are more likely to be ‘alcoholic’ is not only unhelpful, but also inaccurate, and needs to change [111]. So what needs to happen next? There is a need for accurate prevalence data on current alcohol dependence among Indigenous Australians. This accurate data could help combat negative stereotypes and stigma [9, 111].

Accurate prevalence data could also inform local prevention or treatment efforts, and also help inform what community subgroups (for example, young people or older people, or individuals with a lower income) could benefit from tailored alcohol-related support. Whilst prevalence data can inform specific health promotion efforts, it is important that services and clinicians continue to provide health promotion, screening and care to all community members who may benefit.

Symptoms of alcohol dependence

Chapter 3 reported on the frequency of symptoms of current alcohol dependence (in the last 12-months) among Indigenous Australians. The tool used to collect this data, the Grog Survey App, used ICD-11 alcohol dependence criteria operationalised for an Indigenous Australian context. In this study, the most commonly reported characteristics of alcohol dependence were prioritising alcohol over other things (“spending more time drinking than looking after family, culture or work”) and loss of control (“grog is the boss”). Whilst these symptoms are core characteristics of alcohol dependence (ICD-11) [34], perhaps one could argue that these occurred as a result of intoxication during episodes of heavy drinking, which might only happen one or two times per month, rather than being an intrinsic feature of dependence [27, 59, 64]. Similarly, individuals might admit that when they drink they want to lose control [58] or to escape from psychological trauma, stress or pain [112]. The prevalence of two or more features of dependence occurring weekly or more frequently was similar to the general community prevalence of alcohol dependence. This would support the interpretation that these features related to dependence rather than simply to drinking to intoxication.

In this study, tremors when stopping drinking (“grog shakes”) were the least reported dependence symptom. Similarly, in a remote Indigenous community in Queensland a primary health care service documented no evidence of withdrawal symptoms after alcohol supply was temporarily stopped [65]. In general populations, drinking higher quantities of alcohol is associated with severe withdrawal tremors, however episodic drinkers might not experience withdrawal at all [113]. So, as episodic drinking is more common among Indigenous Australians, it is perhaps not surprising that alcohol withdrawal tremors were the least reported symptom [76]. However, the presence and severity of alcohol withdrawal symptoms should still be assessed in a clinical setting as episodic drinkers might experience subtle symptoms of dependence [113]. Clinicians who are making these assessments should consider how these symptoms of alcohol dependence might manifest differently in an Indigenous Australian context and how their treatment needs may differ accordingly.

Correlates of alcohol dependence

To better inform community needs, it is important to understand what factors might put Indigenous Australians at risk of developing current alcohol dependence. No previous studies have reported on correlates of current alcohol dependence among Indigenous Australians. Chapter 3 showed that individuals who drink more alcohol, more frequently, also tended to report more frequent symptoms of alcohol dependence. This is in keeping with research in general populations where it was reported that individuals who drank higher quantities of alcohol were more likely to be dependent [114]. In Chapter 3, in the urban site men, more than women, were more likely to report symptoms of dependence ($r_s = 0.12$, $P = 0.004$). This is also similar to studies of general populations where men, individuals with lower income and younger people were more likely to be dependent [115]. It is important to identify factors that might put Indigenous Australians at increased risk of developing current alcohol

dependence so we can better assess individual and community needs. This can then help inform local health promotion and treatment efforts. Community needs that are potentially modifiable sociodemographic factors, for example housing, education and income, can help tailor prevention and treatment to specific demographic groups.

5.4. A community sample of Indigenous Australians: harms and getting help

Associations between harms and alcohol dependence

In Chapter 4, dependent drinkers were nearly eight times more likely than non-dependent drinkers to report harm. They were 11 times more likely to report trouble with police or security guards, and ten times more likely to report children being scared by their drinking. Although the prevalence of alcohol dependence was low in our sample, those with dependence did experience greater harms. To reduce harms, communities could benefit from access to a full range of care, from prevention through to specialist treatment services and alcohol-related care tailored to local community needs [98, 99]. For example, brief interventions for non-dependent drinkers [116] and specialised treatment for dependent drinkers [113].

The association of dependence with getting into trouble with police or security guards could also be occurring in other Indigenous Australian communities [8]. Why might this be the case? Well, in Australia some Indigenous communities have restrictions on how much alcohol can be purchased and on where alcohol can be consumed [117]. For example, alcohol cannot be consumed in certain communities, or on specific roads or streets, or even in private settings in residential houses. As a consequence, police may be called to confiscate alcohol from Indigenous Australians drinking in public areas or private dwellings [117]. To illustrate, an individual might purchase alcohol in town and walk some two or three kilometres only for

police to come along and say they are in a “no alcohol zone” and confiscate their alcohol [117]. Alcohol could also be confiscated by police from a vehicle if someone is just driving through a “no alcohol zone”, even though they are not consuming it (personal communication with a remote Aboriginal Health Practitioner). When this happens it can be aggravating. Since Indigenous Australians face social issues, such as overcrowded dwellings, they may be more likely to drink in public places. In other instances, trouble with security may happen for Indigenous Australians who are from rural or remote areas, “the bush”, and they do not meet dress requirements for urban “pubs or clubs”. Regardless of the potential of over-policing of Indigenous Australians [61, 118], in the study communities those with dependence were more likely to report trouble with police and security. In summary, improved knowledge on the associations of alcohol dependence can better support Indigenous Australians who are experiencing alcohol-related harms. Importantly, support could include addressing social issues, offering health promotion, brief interventions and treatment options for Indigenous Australians.

Associations between getting help and alcohol dependence

In Chapter 4, dependent drinkers were nearly three times more likely than non-dependent drinkers, to receive help for their drinking. In the App, participants were asked if they ever received help ‘like from a clinic, counsellor, rehab, detox or hospital’. An individual who completed the App could have received help during an adult health check, via individual conversations with Aboriginal AOD workers, or because of concern about medical problems [50]. In contrast, the findings from Chapter 4 suggest that almost half of dependent drinkers reported not receiving help for their drinking indicating an unmet need for treatment options. Considering that dependent drinkers have an inability to control their alcohol use, they need help to cut down and stop drinking [37]. In Australia, in mainstream settings it can take 14

years for an individual to get help for alcohol dependence [119]. Additionally, Indigenous Australians are less likely to access help from mainstream services for a range of health problems [99]. Thus to ensure Indigenous Australians are getting help for their drinking, support may need to be designed in partnership with mainstream services, Indigenous communities, and/or ACCHOs [98, 106, 120]. Support could include ‘home detox’ facilities or specialist services [92, 121], general practitioners increasing screening rates for alcohol [16, 122] or offering pharmacotherapies [123], or collaborating with local mainstream services [124]. Ultimately, alcohol care should cater to family, cultural or spiritual obligations that are priorities for Indigenous Australians [125].

In Chapter 4 the most recommended options to get help for drinking were from an Aboriginal alcohol and drug worker, or detoxification/ residential rehabilitation service. In our study sites, participants appeared to be aware of different support and treatment options to cut down or stop drinking alcohol. For individuals who need to leave their community or Country to access treatment, it is important to consider services that encourage individuals to continue their treatment. This is important because Indigenous Australians may leave treatment to go to see family (personal communication with Jimmy Perry, Aboriginal Drug and Alcohol Council of South Australia). For example, studies of Aboriginal community controlled residential rehabilitation services (in NSW, Australia) describe culturally safe and flexible treatment that encourages family or friends to visit, or supports individuals to continue their treatment [99, 126]. Thus, services that are designed with community needs in mind will be enablers to help Indigenous Australians to continue with their treatment and maintain connection with their family, friends and Country [99, 126]. In keeping with this, governments should prioritise funding for treatment and support that align with Indigenous

community priorities—treatments Indigenous Australians want, would use and are on Country [63, 126].

5.5. Reflexive statement

As an Aboriginal person I was aware that I needed to try and remain neutral, consider my personal experience, but also represent my people respectfully. In this section I reflect on the journey that brought me to where I am today. I grew up in an urban Aboriginal community and also lived in a remote Aboriginal community. I have seen the impact and stigma alcohol has on Aboriginal families and individuals. I thought that I would be in a unique position to do this research as an Aboriginal person as I live and breathe this. I am an Aboriginal person whose life has been impacted by alcohol and now I am researching Indigenous Australians and alcohol. During my candidature I found that my position as an Aboriginal person shaped my research. For example, during data collection, some participants wanted to share their stories with me about their past alcohol use, or about so-called ‘alcoholics’ they knew. One older gentleman (aged 60+) told me about his experience with alcohol while I set him up on an iPad to complete a survey. He told me about how alcohol was a part of his family’s lives and how he had witnessed domestic violence against his mother when he was young which he attributed to alcohol. I felt it brought sadness to him. In another example, a mother and her two daughters completed the App. The mother really wanted her partner to also complete the App because he “was an ‘alcoholic’ and needed help with his drinking”. I said to the mother that it will probably be hard because her and her daughters would now be talking about the App and the feedback they received on their drinking from the App, but her partner would not know what they were talking about. She said yes, that is what will happen, but “he is the one who needs the most help”. I encouraged this woman to go to a local event being held the next day so that her partner could complete the App. She said she would try and get him to

go.

During my candidature I had a number of similar conversations with participants, colleagues and with my family and friends. When writing up results and analyses in this thesis, I would recall these conversations, visualise the participants themselves at each data collection event. I would reflect on Aboriginal participants telling me to write the “true” story and show that not all Aboriginal people are ‘alcoholics’. In the literature I read about the impact on Indigenous Australians from stigma and discrimination related to drinking. I also reflected on my personal experiences of alcohol in relation to the analysis contained in this thesis. It was important for me to have an ‘open mind’ so I did not inadvertently bring further stigma or discrimination to the stories told to us by study participants via their completing the App. I feel blessed that the participants shared their stories with me and saw this research as an opportunity to represent our people positively. The study participants, my fellow researchers, my family and friends have spurred me on during this PhD journey and helped me to get to the finish line.

5.6. Study implications

There are several implications arising from this thesis.

Practice

Indigenous-specific survey tools, or tools that have been operationalised or validated for Indigenous Australians should be used by health professionals to better collect accurate population or community survey data on self-reported alcohol use. The Grog Survey App is one such tool. It is designed specifically for Indigenous Australians. The App has been designed to enable it to be translated into other languages and can be made suitable if an individual’s first language is not English [27, 77]. The App was developed in consultation

with Indigenous health professionals, community members and is visually appealing and engaging [76]. The only other validated tool for screening alcohol dependence among Indigenous Australians is IRIS (Indigenous Risk Impact Screen), but it screens for alcohol and drugs together and does not ask about how much people drink [33]. In settings where IRIS or The Grog Survey App is not available, health workers and clinicians may be able to operationalise survey questions for Indigenous Australians.

In light of the lower prevalence of alcohol dependence found in study communities, health professionals and clinicians should help Indigenous Australians who do drink to rethink their drinking. This could involve offering brief interventions, including tips to reduce drinking, discussing the harmful effects of alcohol, or reflect on the recommended government guidelines for alcohol consumption [22]. Particular attention should also be made to operationalise Australia's national guidelines for Indigenous Australian communities. For example, identifying standard drinks in alcohol that can be purchased locally, calculating standard drinks when using non-standard drinking containers. Health professionals using operationalised guidelines and tools should consider that individuals might be sharing alcohol or drinking from non-standard drinking containers [59].

Community

In keeping with the relatively low prevalence of current alcohol dependence found in this sample (Chapter 3), support is needed to help whole communities identify and reflect on risky (non-dependent) drinking and to reduce harms from alcohol. Health service staff could be supported to engage with local community members and Elders to build a rapport with them, get to understand local cultural protocols and to create local opportunities for local community members to inform alcohol-related health promotion programs [127].

Leadership from local Indigenous Australian community members, Elders and relevant services is needed to help individuals rethink their drinking [61]. At a community level, communities should be supported to identify goals, strategies and interventions needed to address local alcohol-related harms [96]. For example, programs that create connections to community and culture, or programs that address social norms.

Policy

Policy-makers should consult more effectively [128] with community members to build suitable prevention strategies and treatment services that suit local contexts [129]. This needs to be done in a way that prioritises the self-determination of Indigenous Australians in the alcohol policy process [128, 129]. Indigenous Australians were prevented from receiving an education, being employed and having housing, and have suffered significant loss and pain from past government policies. To help cope with these losses, pain and injustice some individuals have turned to alcohol to cope. Therefore, policy-makers need to address the social and structural determinants of health in communities to support efforts to respond to alcohol dependence [26]. For example, create opportunities for education, employment, housing and cultural connectedness. This investment can build protective factors when Indigenous Australians face challenges.

There is an unmet need for alcohol-related treatment including residential rehabilitation services in Australia [16]. Some services may be hundreds or thousands of kilometres away from communities. More flexible funding options are needed to help Indigenous Australians feel comfortable to attend treatment services. In turn, services providing alcohol care need to

be culturally appropriate [106], cater to client needs and where possible, be closer to a client's community or Country.

More consultation is needed by policy makers with Indigenous Australian community members, Elders and the right community representatives to better plan for alcohol-related care in each community [129]. Given the diversity of Aboriginal and Torres Strait Islander communities Australia-wide, iterative collaboration with community members is needed that prioritises family, cultural and spiritual obligations in delivery of alcohol care [63].

Further research

Research methods are needed to better suit Indigenous communities that are the focus of studies. For example, research should be conducted in collaboration with communities and co-designed with Indigenous Australians [66]. This could include projects being conceived by communities, or Indigenous-led, or co-led, and using survey tools that are Indigenous-specific or have been operationalised for Indigenous Australians [75].

Prior to recruitment, research project staff should work collaboratively with local Indigenous Australian organisations and services. Researchers should consider and implement the knowledge and recommendations from local Indigenous research assistants [75, 130]. Indigenous research assistants can then further develop their research skills to pursue opportunities in research (e.g. via publications, or by enrolling in a Masters or Doctor of Philosophy, or as an early career researcher). Much more is needed to build on current efforts to grow the capacity of Indigenous researchers to lead the way in alcohol research.

Future research projects seeking prevalence data on Indigenous Australians should include understanding how to ask about alcohol dependence and operationalise survey tools for Indigenous Australians. This was done in this research. The Grog App used operationalised ICD-11 dependence criteria for Indigenous Australians. Individual characteristics of alcohol dependence can be understood differently across cultures [58]. Researchers need to see the importance of understanding Indigenous Australians' values, what impacts them and their history, and thus get more accurate prevalence data [75, 130].

5.7. Limitations

A number of study limitations need declaring. The systematic review presented in Chapter 2 did not include grey literature due to time constraints. It also did not report on the prevalence of lifetime alcohol dependence, only current (last 12-months). Lifetime dependence is difficult to interpret as it includes individuals who have recovered along with those who have current dependence. Also, our focus on current dependence enabled a deeper exploration of current treatment needs. The prevalence data presented in Chapter 3 was specific to two communities in South Australia (urban and remote) and so is not generalisable to other Indigenous Australian communities. This is due to diversity within and between Indigenous Australian communities. For example, some communities have alcohol restrictions or different services available (e.g. primary and secondary schools, higher education options, employment options). Also, communities have different histories and impacts from colonisation, forcibly being removed from their Country/ homelands, or impacts from the Stolen Generations.

In this thesis ICD-11 terminology is used for alcohol dependence rather than DSM-V, which describes a continuum of severity of alcohol use disorders [35]. Using ICD-11 to identify the

prevalence of alcohol dependence was used as the clear cut-offs are easier to use to inform communities and policy makers of the results. Using a dichotomous approach (dependent vs non-dependent) versus a continuum of severity, mild to severe, has not been discussed with Indigenous Australian communities. By observation, having a cut-off has the potential to more easily and clearly inform primary care clinicians of a client's needs. However, the concept of the continuum of severity is useful, for example, when training health professionals or in communities where there are alcohol restrictions. In this context, an individual's dependence may not be clear-cut and may only be evident when alcohol is readily available. However, further consultation with Indigenous Australian communities is needed to help communities understand this continuum and what this means for treatment options.

Whilst previous studies have used DSM and ICD criteria to screen for dependence, validation studies showing that these classifications match clinical diagnoses are needed. The dependence survey items in the App had not been formally validated, and doing so is difficult due to a lack of a clear gold standard. However, the three dependence questions contained in the App were operationalised from three ICD-11 dependence criteria as a result of extensive consultation with researchers, academics and Aboriginal health professionals. Also, the correlations reported in Chapter 3 demonstrate convergent validity, that is, participants who reported drinking more and more often also reported more frequent symptoms of dependence. Finally, when participants were asked about recommendations for help to cut down or stop drinking (in Chapter 4) an option was not provided for "traditional healers".

5.8. Conclusion

This research reported that the prevalence of current alcohol dependence among Indigenous Peoples globally from similarly colonised countries varied widely and showed that few tools have been validated for Indigenous Peoples. Indigenous-specific survey tools or operationalisation of existing tools are needed when asking Indigenous Peoples about alcohol consumption or dependence symptoms. Consideration needs to be made into how the characteristics of alcohol dependence can be interpreted differently in a cross-cultural context. Accurate prevalence data can then be used to inform treatment needs, including unmet needs. Communities need support from government and service providers to address social issues that exacerbate alcohol-related issues. Indigenous Australians need support and treatment options that are readily available, accessible and culturally appropriate. Identifying these needs could help with funding and resource allocation.

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Appendices

Appendix A: Ethical approvals

The following appendix contains ethical approvals from: 1) Aboriginal Health Council of South Australia (Reference: 04/15/621); and 2) Metro South Health Human Research Ethics Committee in Queensland (Reference: HREC/16/QPAH/293).



7 September 2015

Prof. Katherine Conigrave
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**RE: Better methods to collect self-report data on alcohol use behaviours
from Aboriginal and Torres Strait Islander Australians
Reference No: 04-15-621**

Dear Katherine,
Thank you for submitting your response in relation to issues raised by AHREC.

I am pleased to inform you that the response met with support and the Committee has decided that your application be recommended for approval. Please be advised that the duration of approval is from 7 September 2015 until the expected completion date of your project indicated as 31 May 2020.

In accordance with the NHMRC guidelines, we require regular reports from principal researcher(s); please find the 'Annual Progress or Final Report' template available at <http://ahcsa.org.au/research-overview/ethical-review-ahrec/>. We wish you well with the project and look forward to receiving your progress reports.

If you require further information, please do not hesitate to contact the Executive Officer, Dr Gokhan Ayturk, on 08 8273 7200 or email Gokhan.Ayturk@ahcsa.org.au.

Sincerely yours,

Ms Kim Morey
Chairperson - AHREC



AHREC is a sub-committee of AHCSA

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Prof K Conigrave
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Dear Prof Conigrave

HREC Reference number: HREC/16/QPAH/293

Project Title: Developing better methods to collect self-report data on alcohol and other drug use among Aboriginal and Torres Strait Islander peoples

Thank you for submitting the above research protocol to the Metro South Human Research Ethics Committee for ethical and scientific review. This protocol was first considered by the Human Research Ethics Committee (HREC) at the meeting held on 7 June 2016.

You are reminded that this letter constitutes ethical approval only. You must not commence this research protocol at a site until separate authorisation from the Metro South Chief Executive or Delegate of that site has been obtained.

A copy of this approval must be submitted to the Research Governance Office(r)/Delegate of the relevant institution with a completed Site Specific Assessment (SSA) Form for authorisation from the Chief Executive or Delegate to conduct this research at the Inala Indigenous Health Service.

If this study currently receives grant funding, please remember to forward a copy of this approval letter to the relevant Grants Office of the Administering Institution(s) for the grant.

I am pleased to advise that the HREC has granted approval of this research protocol. The documents reviewed and approved include:

Document	Version	Date
Cover letter		19 April 2016
Letter of Approval from Aboriginal Health Research Ethics Committee, South Australia (for noting)		7 September 2016
NEAF (AU/1/C78529)		19 April 2016
Participant Information and Consent Form – Stage 1	2a	26 April 2016
Research Protocol		n.d.
Survey Items		20 April 2016
Verbal Script Participant Recruitment – Stage 1	2	19 April 2016
Letter in response to HREC comments		24 June 2016

This HREC approval is valid from 28 June 2016 until 28 June 2019.

Please note the following conditions of approval:

1. The researcher must provide an annual report to the HREC and a final report on completion of the study in the specified format. Approval is contingent upon submission of this.
2. The Principal Investigator will immediately report anything which might warrant review of ethical approval of the protocol in the specified format, including unforeseen events that might affect continued ethical acceptability of the protocol. Serious Adverse Events must be notified to the HREC as soon as possible. In addition the Investigator must provide a summary of the adverse events, in the specified format, including a comment as to suspected causality and whether changes are required to the Patient Information and Consent Form. In the case of Serious Adverse Events occurring at the local site, a full report is required from the Principal Investigator, including duration of treatment and outcome of the event.
3. Amendments to the research protocol which may affect the ongoing ethical acceptability of a protocol must be submitted to the HREC for review. Amendments should be accompanied by all relevant updated documentation and a cover letter from the principal investigator, providing a brief description of the changes, the rationale for the changes, and their implications for the ongoing conduct of the study. Hard copies of the cover letter and all relevant updated documents, with *tracked changes*, must also be submitted to the HREC office as per standard HREC SOP.
4. Amendments to the research protocol which only affect the ongoing site acceptability of the protocol are not required to be submitted to the HREC for review. These amendment requests should be submitted directly to the Research Governance Office/r.
5. Proposed amendments to the research protocol which may affect both the ethical acceptability and site suitability of the protocol must be submitted firstly to the HREC for review and, once HREC approval has been granted, then submitted to the Research Governance Office/r.
6. Amendments which do not affect either the ethical acceptability or site acceptability of the protocol (e.g. typographical errors) should be submitted electronically (track changes) and in hard copy (final clean copy) to the HREC Coordinator. These should include a cover letter from the Principal Investigator providing a brief description of the changes and the rationale for the changes, and accompanied by all relevant updated documents with tracked changes.
7. The HREC will be notified, giving reasons, if the protocol is discontinued at a site before the expected date of completion.
8. The Principal Investigator will provide at least, an annual report to the HREC on the anniversary of the approval and at completion of the study in the specified format.
9. If you require an extension for your study, please submit a request for an extension in writing outlining the reasons. Note: One of the criteria for granting an extension is the compliance with the approval's conditions including submission of progress reports.
10. Any research study that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects on health outcomes ([WHO / ICMJE 2008 definition](#)) should be registered, including early phase and late phase clinical trials (phases I-III) in patients or healthy volunteers ([WHO Recommendation](#) / [ICMJE policy](#)). If in doubt, registration is recommended. All studies must be registered prior to the study's inception, i.e. prospectively.
<http://www.anzctr.org.au/>

Should you have any queries about the HREC's consideration of your protocol please contact the Metro South HREC Office on 07 3443 8049.

Please note that the Metro South HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*, *NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007)* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Attached is the HREC Composition (Attachment I).

Once authorisation to conduct the research has been granted, please complete the Commencement Form (Attached) and return to the Metro South Human Research Ethics Committee.

The Metro South HREC wishes you every success in your research.

Yours sincerely,



A/Prof Richard Roylance
Chair
Metro South Hospital and Health Service
Human Research Ethics Committee (EC00167)
Centres for Health Research
Princess Alexandra Hospital

28/6/2016



Appendix B: Participant information sheet

The following appendix contains the participant information sheet that was given to all individuals before they consented to take part in the study.



Information sheet

Project: Better ways to ask Aboriginal and Torres Strait Islander Australians about their alcohol use

Researcher: Prof. Kate Conigrave

Introduction

You are invited to take part in a study on finding better ways to ask people about their alcohol use. The study is being led by Prof Kate Conigrave from the University of Sydney. In this study we are testing out a computer tool that makes it easier for people to record what they drink. We are doing this so that communities can have a tool to help them find out about how many people in the community have problems with alcohol. This can help communities find better ways to prevent alcohol problems or to help people with problems. The computer tool may also help clinics to find out more easily who needs help with drinking problems.

What happens in the study

If you decide to be in this study, you will answer some questions on a computer. The computer will ask you about:

- How much alcohol you drink
- What sort of times you drink (for example, with friends or alone; payday or funerals)
- Any problems that alcohol causes you.

We will also ask you whether you think the computer is easy or hard to use.

The computer survey takes about 20 minutes each time. At the end, you will be given a store voucher for \$25 to thank you for your time.

We are not offering help with drinking. But we will give you some feedback on your drinking through the computer.

It is your choice

You do not have to take part in this study – it is your choice. If you decide you want to take part, you can pull out at any time. You don't have to tell us why.

What you say is private

The computer will 'read out' the questions to you through headphones. You then touch the answer you want on the screen. No one needs to watch you putting in the answers. Your name doesn't get put into the computer.

What people say in this study will be used to test out this computer tool. It will also be used to give feedback to communities and to health agencies on how many people might have problems with alcohol. We won't write anything in our report that names you or identifies you in any way.

Further information

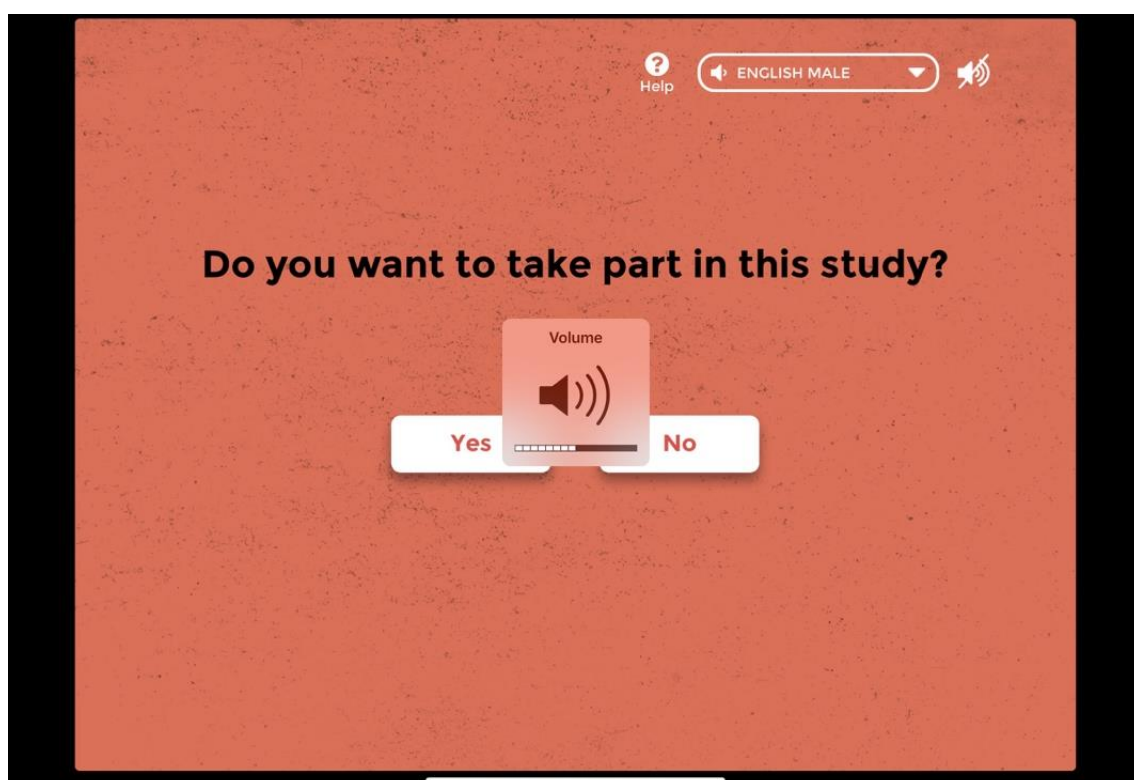
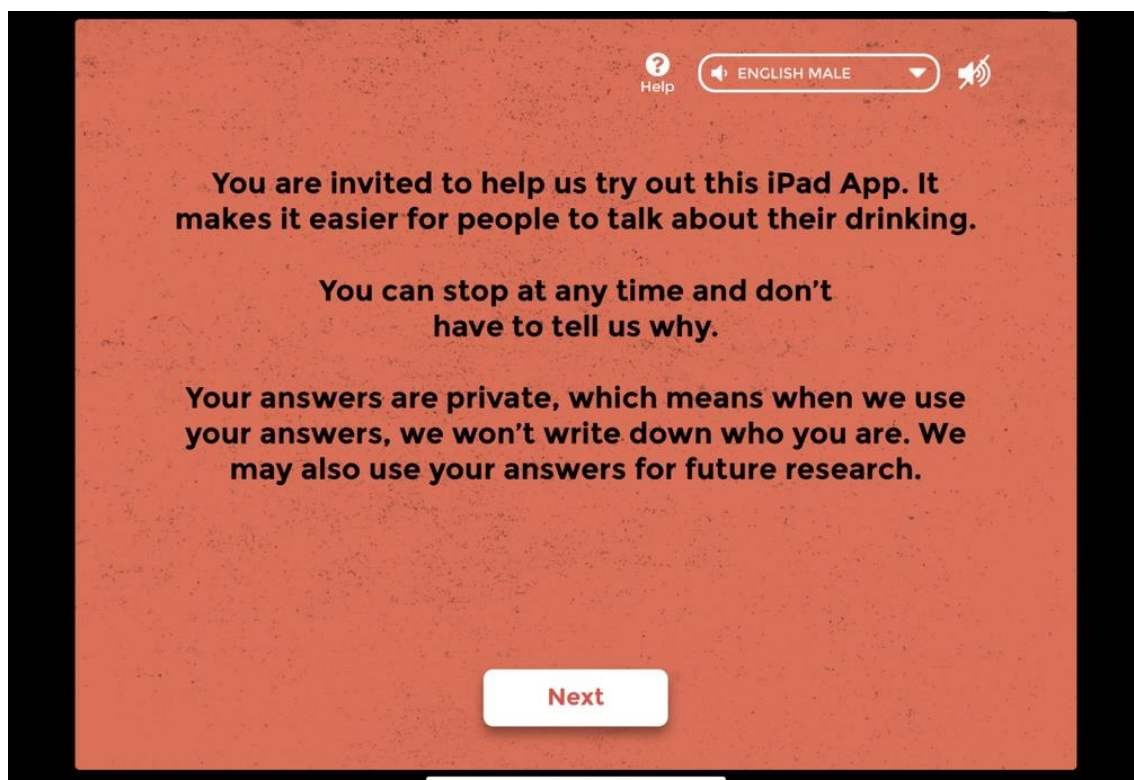
If you have any problems or complaints about this study, you can call any one of these people and tell them:

- Prof Kate Conigrave (the study's director) on (02) 9515 8650.
- In South Australia: the Aboriginal Health Research Ethics Committee on (08) 8273-7200

You can keep this information sheet.

Appendix C: Consent process

The following appendix contains screenshots from the Grog Survey App, the data collection tool used in this study. The first screenshot is the consent statement that individuals could read and/or listen to. The second screenshot is where individuals would select ‘Yes’ (to provide consent) or ‘No’ (to not provide consent).



Appendix D: The Grog Survey App survey items

The following appendix contains all survey items in the Grog Survey App, the data collection tool used in this study.

Grog Survey App

24/06/2020

Introduction

RA

1. Choose community location

<Free text>

2. Please select the participant's gender

<Male>

<Female>

3. Is the participant

<Aboriginal>

<Torres Strait Islander>

<Aboriginal and Torres Strait Islander>

<non-Indigenous>

4. How did the participant hear about us?

<Facebook>

<Poster/postcard>

<Friend or family>

<Researcher>

<Local service>

<Saw us>

<Never heard of us before>

<Other>

5. Where is the participant being surveyed?

<Clinic or other treatment centre>

<Shop or post office>

<At a house>

<Park, bush, beach>

<School or community college>

<Festival or community event>

<Youth or community centre>

<Detention centre or prison>

<Other>

6. The survey is ready for the next person to complete. Pass it to them now.

<NA>

Consent

7. Please select the language for audio

<English>

<Aboriginal (Pitjantjatjara)>

8. You are invited to help us try out this iPad App. It makes it easier for people to talk about their drinking.

You can stop at any time and don't have to tell us why.

Your answers are private, which means when we use your answers, we won't write down who you are. We may also use your answers for future research.

<NA>

9. Do you want to take part in this study?

<Yes>

<No>

10. You don't want to complete the app survey. Please give this iPad back to the person who handed it to you.

<NA>

Demog

11. If you need help, ask the person who handed you this iPad. First we'll ask some questions about you.

<NA>

12. How old are you?

<{Slider 16 to 100}>

13. When is your birthday?

<{select [month/day]}>

14. Where do you usually live?

<Town or city>

<Aboriginal community>

<Outstation>

<Parkland or scrub>

<Other>

15. What is your post code?

<{4 digits number (postcode)}>

<I don't know>

16. What is your suburb or community?

<Free text>

17. What language do you speak at home?

<English>

<An Aboriginal or Torres Strait Islander language>

<Another language>

18. How far did you go in school? (Just tell us the highest year you finished)

<I've never been to school>

<Year 1>

<Year 2>

<Year 3>

<Year 4>

<Year 5>

<Year 6>

<Year 7>

<Year 8>

<Year 9>

<Year 10>

<Year 11>

<Year 12>

19. Have you done any training or study after school (choose any that is right for you)

<Training>

<University>

<No, I didn't do any training or study after school>

20. Training

<I'm doing TAFE or apprenticeship now>

<I started but did not finish TAFE or apprenticeship>

<I completed TAFE or apprenticeship>

<Training through CDP>

21. University

<I am studying at Uni now>

<I started but didn't finish a degree at uni>

<I finished a degree at uni>

22. Do you have a paid job?

<Yes>

<No>

23. Can you tell me more about your paid job?

<I work full-time>

<I work part-time>

<I work some of the time (casual)>

<I'm on Work for the Dole or CDP>

<Other>

24. Do you have any other ways of getting money? (You can choose more than one)

<No – I look after the kids>

<No – I don't get any money>

<Royalities, corporations or gate money>

<I'm on Centrelink – like the dole, family allowance or a pension>

<From family>

<From friends>

<Other>

25. How much money do you earn each week? (this is the amount you receive as cash or into your bank account)

<0-\$199>

<\$200-\$399>

<\$400-\$599>

<\$600-\$799>

<\$800 or more>

<I don't want to answer>

26. How much money do you earn each fortnight? (this is the amount you receive as cash or into your bank account)

<\$0-\$399>

<\$400-799>

<\$800-1199>

<\$1200-1599>

<\$1600 or more>

<I don't want to answer>

27. On a day when you drink, how much money do you spend on grog?

<\$0 - \$25>

<\$26 - \$50>

<\$51 - \$75>

<\$76 - \$99>

<\$100 or more>

<I don't want to answer>

28. Is there any chance you could be pregnant now?

<Yes>

<No>

29. Do you use condoms, the rod, the pill or something from the doctor to stop you getting pregnant?

<Yes>

<No>

Alcohol

Consumption

30. Thanks. Now I'm going to ask you about any grog you might drink.

<NA>

31. Some people drink grog most days, while others drink 'once in a blue moon'. How often have you had any grog in the last 12 months?

<Never>

<Once in a blue moon (less than once a month)>

<Sometimes (2-4 times a month)>

<2-3 times per week>

<Most days or every day>

32. Can I check, in the last 12-months (since [event name] last year), at special events like sporting carnivals, weddings or funerals, have you had any grog at all?

<Yes I've had some grog in the last 12 months>

<No, I had no grog at all in the last 12 months>

33. In your life, have you ever had any grog at all?

<Yes>

<No>

34. Can you tell me one type of grog that you drink most often?

<Beer>

<Full-strength beer>

<Mid-strength beer>

<Low-strength beer>

<Wine>

<Red wine>

<White wine>

<Sparkling wine>

<Spirits>

<Straight spirits>

<Mixed drinks>

<Port or sherry>

<Cider>

35. How much grog do you have on a typical day when you drink? Choose whichever answer is closest.

<1 or 2 standard drinks>

<3 or 4 standard drinks>

<5 or 6 standard drinks>

<7, 8 or 9 standard drinks>

<10 or more standard drinks>

36. How often would you drink ‘this much grog or more’ in one day (24 hours)?

<Never>

<Once in a blue moon (Hardly ever, less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

37. Can I ask you about the last day you had any grog. Where were you drinking? (you can choose more than one)

<House, camp>

<Scrub, bush>

<Park, beach>

<Hotel, club, pub or bar (licensed premises)>

<Restaurant/café>

<Car or other vehicle>

<Other>

38. When was the last day you had any grog? (Choose the last day when you had a drink)

<grog calendar>

39. How many people were you drinking grog with? (Dag how many people were in your drinking circle)

<{Slider to choose how many people in drinking group - from “just you” to “9+ other people”}>

40. What types of grog were you drinking that day? (Choose all types of grog you drank that time)

<Beer>

<Wine>

<Port or sherry>

<Spirits>

<Cider>

<Other>

41. What types of [grog type] were you drinking that day?

<{grog drinks guide}>

42. What did you mostly drink [grog type] out of?

<{grog container guide}>

43. How much grog did you put in it?

<{slider to fill container}>

44. How much [grog type] did you drink that last day?

<{slider to select grog quantity}>

45. Just want to check, is this what you had or what the whole group had?

<Just me>

<The group>

46. How many people were you drinking grog with? (Dag how many people were in your drinking circle)

<{Slider to choose how many people in drinking group - from “just you” to “9+ other people”}>

47. On that day was that ALL YOU had to drink?

<Yes, that’s all I had to drink>

<No, I drank other grog too>

48. What else were you drinking that day?

<Beer>

<Wine>

<Port or sherry>

<Spirits>

<Cider>

<Other>

49. Thanks. Before that, when was the last day you had any grog. Can you show me when that was?

<grog calendar>

50. Thanks. Before that, when was the last day you had a drink?

<grog calendar>

51. What about the time before that?

<grog calendar>

52. Thanks. People drink different amounts of grog at different times. Pick any of these that are true for you. (you can choose more than one)

<I drink more when I'm happy (sporting carnivals, weddings, parties)>

<I drink more when times are bad (stressing out, funerals, feeling alone)>

<I drink more when I'm bored>

<I drink more when there's more money>

<My drinking never changes>

53. Some people have times when they don't drink at all. In the last 12 months, [since RELEVANT EVENT last year], have you had a time when you had no grog at all?

<Yes>

<No>

54. How long was your longest time of not drinking in the last 12 months?

<1 day>

<2 days>

<3 days>

<4 days>

<5 days>

<6 days>

<1 week>

<2 weeks>

<3 weeks>

<4 weeks>

<5 weeks>

<6 weeks>

<7 weeks>
<2 months>
<3 months>
<4 months>
<5 months>
<6 months>
<7 months>
<8 months>
<9 months>
<10 months>
<11 months>

55. Which of these reasons explains why you didn't drink? (you can choose more than one)

<Health reasons>
<Because of family and friends>
<Because of court or prison>
<Grog costs too much>
<Because of where I was living>
<Other reasons>

56. Health reasons (you can choose more than one)

<I got really sick>
<I want to be healthy>
<I've been hurt by someone else's drinking>
<The doctor or health staff told me to stop or slow down>
<I was in rehab or detox>
<I got pregnant>
<Someone close to me got pregnant>
<Other>

57. Because of family and friends (you can choose more than one)

<Death or illness in the family>
<I saw arguments or fights when people drink>
<Caring for kids or grandkids>

<To be a good example for the kids>

<Someone close to me got pregnant>

<Other>

58. Because of court or prison (you can choose more than one)

<I had court coming up>

<I stopped when I was in prison>

<I stopped while I was on parole>

<Other>

59. Because of where I was living (you can choose more than one)

<I moved to a different community>

<Alcohol restrictions in my area>

<I started spending time with different people>

<Other>

60. Which of these reasons explain why you never had a drink?

<Health reasons>

<Because of family and friends>

<I have seen bad examples of what grog can do>

<Grog costs too much>

<It's hard to get grog where I live>

<Other reasons>

61. Health reasons (you can choose more than one)

<I want to be healthy>

<I was worried I might get problems with grog or be an 'alcoholic'>

<I was pregnant or might get pregnant>

<I've been hurt by someone else's drinking>

<My health is bad for other reasons, and I can't drink>

<Other reasons>

62. Because of family and friends (you can choose more than one)

<I wanted to be there to help family>

<I saw arguments or fights when family drink>
<To be a good example for the kids>
<I got pregnant or wanted to get pregnant>
<People around me don't drink>
<Other>

63. Other reasons (you can choose more than one)

<I'm not interested in drinking>
<I've no particular reason for not drinking>
<Because of my culture>
<Because of my religion>
<I don't like the taste>
<Other>

64. People stop drinking grog for different reasons. Which of these reasons explain why you stopped drinking? (you can choose more than one)

<Health reasons>
<Because of family and friends>
<Because of court or prison>
<Grog costs too much>
<Because of where I was living>
<Other reasons>

65. Health reasons (you can choose more than one)

<I got really sick>
<I want to be healthy>
<I've been hurt by someone else's drinking>
<The doctor or health staff told me to stop or slow down>
<I was in rehab or detox>
<I got pregnant>
<Someone close to me got pregnant>
<Other>

66. Because of family and friends (you can choose more than one)

<Death or illness in the family>
<I saw arguments or fights when people drink>
<Caring for kids or grandkids>
<To be a good example for the kids>
<Someone close to me got pregnant>
<Other>

67. Because of court or prison (you can choose more than one)

<I had court coming up>
<I stopped when I was in prison>
<I stopped while I was on parole>
<Other>

68. Because of where I was living (you can choose more than one)

<I moved to a different community>
<Alcohol restrictions in my area>
<I started spending time with different people>
<Other>

Dependence

69. Thanks for telling me about how much you drink. Some people drink grog because they want to. Some people drink because they need to. These next questions are about what it's like for you in the last 12 months [since EVENT NAME last year]

<NA>

70. Some people feel like grog is the boss of them. How often do you feel grog makes all the decisions? (so you could not stop drinking, even if you tried)

<Never>
<Once in a blue moon (Hardly ever, less than once a month)>
<Sometimes (1-3 times a month)>
<Weekly>
<Most days or every day>

71. Some people's hands shake when they stop drinking or before their first drink of the day. In the last 12 months, how often does this happen to you?

<Never>

<Once in a blue moon (Hardly ever, less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

72. Some people spend more time drinking than doing other things they need to do, like looking after family, culture or work. In the last 12 months, how often does this happen to you?

<Never>

<Once in a blue moon (Hardly ever, less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

Harms

73. You have not had any grog in the past 12 months. But maybe people around you drink. In the last 12 months [that is, since... insert relevant known community event/holiday... last year] has any drinker given you worries? (You can choose more than one)

<No>

<Yes, a drinker has hit me or got in a fight with me>

<Yes, my money runs out because it goes on someone's grog>

<Yes, the kids in my house have been scared by a drinker>

<Yes, other worries like stress>

74. In the last 12 months, how often has a drinker hit you or been in a fight with you?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

75. In the last 12 months, how often have you been to hospital or clinic because you got hit or in a fight with a drinker?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

76. In the last 12 months, how often did your money run out because it all went on someone's grog?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

77. In the last 12 months, how often have kids in your house been scared by a drinker?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

78. In the last 12 months, how often have you felt stressed out by a drinker?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

79. The next few questions ask about when you used to drink.

<NA>

80. Back when you drank grog, did your drinking hurt you or hurt someone else? (You can choose more than one)

<No>

<Yes, I got in a fight>

<Yes, I fell down>

<Yes, I hit someone or something>
<Yes, all my money went on grog>
<Yes, the kids in my house were scared when I was drinking>
<Yes, I got into trouble with police or security guards>

81. Back when you drank grog, you told us you got in a fight. Did you need to go to the hospital or clinic?

<Yes>
<No>

82. How many times did you go to the hospital or clinic because you got into a fight when you were drunk?

<1 time>
<2 times>
<3 or more times>

83. Back when you drank grog, you told us you fell down. Did you need to go to hospital or clinic?

<Yes>
<No>

84. How many times did you go to hospital or clinic because you fell down when drinking?

<1 time>
<2 times>
<3 or more times>

85. Back when you drank grog, how often would money run out because it went on grog?

<Once in a blue moon (less than once a month)>
<Sometimes (1-3 times a month)>
<Weekly>
<Most days or every day>

86. Back when you drank grog, how often did kids in your house get scared by your drinking?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

87. Back when you drank grog, how often did you get into trouble with police or security guards?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

88. Grog sometimes gives people worries or problems. In the last 12 months [that is from after [event name] last year until now] has grog given you any of these problems? (You can choose more than one)

<Someone hit me>

<I fell down>

<I had a road accident>

<My money runs out because it goes on grog>

<The kids in my house get scared by my drinking>

<I get into trouble with police or security guards>

<No>

89. In the last 12 months, did you end up in hospital or clinic because you got hit when drinking?

<Yes>

<No>

90. How many times did you go to hospital or clinic because you got hit when drinking?

<1 time>

<2 times>

<3 or more times>

91. In the last 12 months, did you end up in hospital or the clinic because you fell down when drinking?

<Yes>

<No>

92. How many times did you go to hospital or clinic because you fell down when drinking?

<1 time>

<2 times>

<3 or more times>

93. In the last 12 months, how often do you run out of money because it all goes on grog?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

94. In the last 12 months, how often do kids in your house get scared by your drinking?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

95. In the last 12 months, how often do you get into trouble with police or security guards when drinking?

<Once in a blue moon (less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

96. Sometimes, when people drink, they end up using other drugs like ice, heroin, pills or gunja. How often has this happened to you in the last 12 months?

<Never>

<Once in a blue moon (Hardly ever, less than once a month)>

<Sometimes (1-3 times a month)>

<Weekly>

<Most days or every day>

Treatment

97. Thanks for all your answers so far. The next questions are about getting help for drinking

<NA>

98. Have you ever got help about drinking – like from a clinic, counsellor, rehab, detox or hospital?

<Yes>

<No>

99. What made you get help?

<It was my choice>

<Family or friend pushed me>

<Someone official pushed me (like welfare, police, or courts)>

100. If someone around here wants to give away their drinking or cut down, how easy is it to get help ?

<Very easy, there is lots of help available>

<Easy, there is some help available>

<Not sure what help is available>

<Hard, there is not much help available>

<Very hard, there is no help available, or it's a long way from here>

101. How far does a person need to travel to get to a rehab to stop drinking

<Slider from 10m to 3000km>

<I don't know>

102. Can a person get a medicine to stop the grog shakes from a doctor around here?

<Yes>

<No>

<I don't know>

103. If a person is finished with the grog shakes and wants to stay away from grog, can a doctor around here give them medicine to help?

<Yes>

<No>

<I don't know>

104. If a friend or family wants to cut down or stop drinking, where should they get help? (you can choose more than one)

<Aboriginal alcohol and drug worker>

<Aboriginal health or mental health worker>

<Nurse or doctor>

<Counsellor>

<Friend, family>

<Elder>

<Minister or Pastor>

105. Where else could they get help? (you can choose more than one)

<Day centre>

<Detox or rehab>

<Hospital>

<AA or SMART Recovery groups>

<Men's or Women's groups>

<Internet or phone helpline>

<Other>

Feedback

Satisfaction

106. How easy was it to use this iPad to answer our questions?

<Image of big frown>

<Image of small frown>

<Image of straight face>

<Image of small smile>

<Image of big smile>

107. Was it okay for us to ask these questions?

<Image of big frown>

<Image of small frown>

<Image of straight face>

<Image of small smile>

<Image of big smile>

108. Were the questions easy to understand?

<Image of big frown>

<Image of small frown>

<Image of straight face>

<Image of small smile>

<Image of big smile>

109. Any other comments?

<free text>

Appendix E: Key features of the Grog Survey App

The following appendix contains some key features of the Grog Survey App, the data collection tool used in this study. It demonstrates the effort taken to make the App a visually appealing and engaging survey tool for Indigenous Australians.

1. Images change depending on participant gender
2. Check questions to ensure respondent understanding of question
3. Ability to report group drinking and visual display of group size
4. Drinks guide containing most common types and brands of alcohol for each location
5. Ability to choose non-standard drinking containers and fill them up with slider
6. Ability to review and confirm selection for each reported drinking occasion

The image displays six screenshots of the GROC SURVEY app interface, arranged in a 3x2 grid. Each screenshot shows a different question and its corresponding interactive elements.

- Screenshot 1:** Question: "Have you had any grog at all in the last 12 months? (since the Easter holidays last year)". Options: Yes, No. A woman is shown holding a glass of wine.
- Screenshot 2:** Question: "Can I check, in the last 12-months (since the Easter holidays last year), at special events like sporting carnivals, weddings or funerals, have you had any grog at all?". Options: Yes, I've had some grog in the last 12 months; No, I had no grog at all in the last 12 months. A "Next" button is visible.
- Screenshot 3:** Question: "How many people were you drinking grog with? (Drag how many people were in your drinking circle)". A slider shows 3 people. A group of three men is shown.
- Screenshot 4:** Question: "What types of grog were you drinking that day? (Choose all types of grog you drank that time)". Options: Beer, Wine, Port or Sherry, Spirits, Other. A "Next" button is visible.
- Screenshot 5:** Question: "How full of white wine was your soft drink / water bottle when you had a drink that day?". A slider shows a bottle filled with white wine.
- Screenshot 6:** Question: "The last day I drank grog (yesterday) I had...". Options: Full strength beer (Can 375mL), White wine - Soft drink / water bottle (600mL). A "Confirm" button is visible.

Appendix F: The Grog Survey App validation study

The following appendix contains the publication, on which I am co-author, demonstrating the accuracy of the Grog Survey App as a tool for Indigenous Australians to describe their drinking.

Lee KSK, Conigrave JH, Callinan S, Wilson S, Room R, Perry J, Slade T, Chikritzhs TN, Hayman N, **Weatherall TJ**, Leggat G, Gray D, Conigrave KM. Asking about the last four drinking occasions on a tablet computer as a way to record alcohol consumption in Aboriginal and Torres Strait Islander Australians: a validation. *Addiction Science and Clinical Practice*. 2019;14(1):15. doi.org/10.1186/s13722-019-0148-2

RESEARCH

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Asking about the last four drinking occasions on a tablet computer as a way to record alcohol consumption in Aboriginal and Torres Strait Islander Australians: a validation

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Abstract

Background: Alcohol consumption among Indigenous Australians can be irregular, depending on social and geographic context. The Finnish method uses the last four drinking occasions to estimate drinking quantity and pattern. The Grog Survey App is an interactive and visual tablet computer application which uses touch-screen technology to deliver questions on drinking.

Methods: Alcohol consumption recorded on the Grog Survey App using the last four occasions (Finnish) method was compared with a clinical interview conducted by an Indigenous Australian health professional. To assess convergent validity, Spearman's ranked correlations between consumption estimates from the App and from interview were calculated. Sensitivity and specificity analyses were used to compare how well the App and clinical interview agreed when classifying drinkers' risk. To assess criterion validity, average grams alcohol per day as estimated by the App (and by interview) were compared against presence of self-reported withdrawal tremors (from App or interview). Test-retest reliability was assessed by correlations between measures of alcohol consumption recorded on two occasions.

Results: The App recorded higher numbers of standard drinks consumed per drinking occasion than the interview. There was reasonable agreement between the App and interview across common reference periods (sensitivity 92.7%, specificity 69.8%, short-term risk; sensitivity 70.7%, specificity 68.8%, long-term risk). Average consumption recorded by the App was as good or better predictor of withdrawal tremors than consumption as estimated by interview.

Conclusions: The Finnish method, as delivered by the App, offers an innovative way to collect survey data on alcohol in a population with an intermittent drinking pattern.

Keywords: Aboriginal, Indigenous, Alcohol, Consumption, Measurement, Survey

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Background

Alcohol is consistently reported as a key concern for Aboriginal and Torres Strait Islander (Indigenous) peoples in Australia [1, 2] and for many indigenous populations worldwide [3]. Reliable population estimates of alcohol use among Indigenous peoples are needed to inform efforts to prevent and treat risky drinking or alcohol use disorders. However, estimates from the largest (and often quoted) national survey in Australia have been reported to underestimate alcohol consumption by over 200% for Indigenous males and 700% for females [4]. Deficits in this and other household surveys [4–6] may have contributed to chronic under-funding of alcohol prevention and treatment services.

A range of survey items have been used to assess alcohol consumption in general populations. Most include an assessment of the overall frequency of drinking and the usual quantity consumed on each occasion (quantity-frequency), or alternatively, how often certain amounts of alcohol are consumed on a weekly or monthly basis (graduated-frequency) [7]. Both methods pose challenges with a population such as Indigenous Australians, and other culturally and linguistically diverse peoples, where drinking is often episodic and irregular [8] and where there is not necessarily a 'usual' drinking pattern. The timing of drinking may be influenced by unpredictable circumstances such as funerals. 'Timeline Followback' is a detailed retrospective diary, where the participant is asked to describe the circumstances and level of consumption of each drinking occasion during a specific timeframe [9]. However this can be relatively time consuming to deliver [10]. An alternative, the 'Finnish' method, asks about alcohol consumption on the last four drinking occasions [11]. Both Timeline Followback and Finnish methods can be delivered in a conversational approach that may be suited to the storytelling traditions of Indigenous peoples.

Most of these approaches to assessing drinking ask participants to describe their consumption in 'standard' drinks [6], requiring mental arithmetic for conversions. Even in general populations, some authors suggest that self-reporting standard drinks (rather than specific containers and types of alcohol) may lead to underestimates of consumption [12]. Indigenous Australians may use a wide range of drinking containers, each holding from between 1.5 and 20 standard drinks, making the conversion more difficult. Also, in settings where sharing of alcohol is common, the challenges of estimating quantity consumed are increased [6].

There is a lack of validated tools to assess alcohol consumption in Australia's Indigenous peoples, or in similarly colonised peoples (e.g. Canadian First Nations or New Zealand Māori). It is unclear whether tools validated

for non-Indigenous settings are suitable in these contexts [13, 14]. A small number of tools have been developed specifically to collect alcohol consumption data in Indigenous Australians but validation data are minimal. For example in remote Western Australia (WA), the Questionnaire for Alcohol Research in the Kimberley (QARK) [15] distinguishes between intermittent drinking (i.e. around regular occasions, like payday), and episodic drinking (i.e. irregular or sporadic occasions). It drew on Timeline Followback elements to ask about drinking contexts. While the validity of QARK was checked during survey development, including by comparison with alcohol sales figures, validation data were not published. In another survey on alcohol (and other drug use) 10% of Indigenous people in the Northern Territory (NT Australia; non-urban areas) were interviewed [16]. The alcohol questions were loosely based on a quantity-frequency measure with an additional one-week retrospective diary. Questions were tailored to the population (e.g. providing images of non-standard drinking containers; allowing for sharing of drinks; and distinction between pay-/pension-week versus non-pay/non-pension-week). However, no formal validation study was conducted.

A number of shorter screens for risky drinking have been used among Indigenous Australians, including the first three (consumption) questions of the Alcohol Use Disorders Identification Test (AUDIT-C) [17, 18]. However, data on how consumption assessed in this way compared with estimates from other methods or 'gold standards' are limited. In regional New South Wales (NSW, Australia), one study showed that a modified version of AUDIT-3 captured a longer period of drinking than did a 7-day retrospective diary, although AUDIT-3's response categories provide only broad information on drinking. Furthermore, AUDIT's frequency response categories assume drinking regularity [19]. The 7-day retrospective diary method (as delivered on a touchscreen computer in an Aboriginal community controlled health service) missed nearly a third (31%) of current drinkers as they did not consume any alcohol in the last week [20].

In any population, collecting reliable self-report data on alcohol use is complex given the potential sensitivity of this topic. These concerns can be greater among Indigenous populations because of experience of racism, fear of consequences of admitting to heavy drinking, and shame over harms from drinking [21]. For all these reasons, it is important to ensure methods to collect drinking data ensure privacy and are appropriate in a cross-cultural context [13]. In studies of sensitive topics, touch-screen tablet devices may increase confidence in confidentiality and anonymity [21–23]. In addition, programming can cater for lack of comfort with written language or numeracy in populations which are educationally disadvantaged

or do not speak the majority language. Visual images can allow participants to estimate container sizes for alcohol and sharing of drinks [21]. Tablet devices can also reduce missing data [24] and potentially streamline the survey experience for both participants and research assistants. In addition, pre-recorded translation can remove the need for and expense of translation at the point of survey administration, and can help to standardise translation and maximise respondent privacy [22].

The Grog Survey App [the App] was developed in response to the need for an easy-to-use tool to help Indigenous Australians report on their drinking in a household survey environment [21]. “Grog” is a colloquial name for alcohol. The App presents an adaptation of the Finnish method to ask participants to describe their drinking on the last four occasions in the past 12 months [11]. The current study compares alcohol consumption as estimated by the Finnish method and recorded on the App with a clinical interview conducted by an Aboriginal health professional. As there are no validated instruments to measure alcohol consumption in Indigenous Australians, clinical interview by a health professional with understanding of local culture and context was chosen as a recognised [25–27] and culturally appropriate method.

Methods

Study methods were designed by investigators in consultation with the Aboriginal Drug and Alcohol Council of South Australia; the Aboriginal Drug and Alcohol Network, representing Aboriginal alcohol and other drug workers in NSW; and the Aboriginal Health Council of South Australia (AHCSA), the peak body for ACCHSs in South Australia (SA). Ethical approval was obtained from ACHSA and from the Metro South Health Human Research Ethics Committee in Queensland.

Recruitment

To assess the validity of the Finnish method as delivered by the App with a range of drinkers, stratified sampling was used. We aimed to recruit: 20 non-drinkers, 40 non-dependent drinkers and 40 dependent drinkers in each of two states by word-of-mouth in each service. Most of the analyses involved in validating and shortening the scale used in the pilot study require little statistical power. For instance, for the reliability analysis, in order to have sufficient power (80%) to identify a correlation of 0.4 where $r=0.8$, and $\alpha=.05$ a sample size of 46 is required (calculated using the ‘pwr’ package in R). Greater sizes were sought to try to allow analysis of differences between urban and remote sites in sampling, and because of anticipated challenges in ensuring complete data collection.

In urban Queensland (Qld), recruitment was based in an Indigenous primary health care service and surrounding community. In South Australia (SA), recruitment centred on a regional ACCHS and a remote Aboriginal community-controlled drug and alcohol day centre (a drop-in service). Individuals were eligible for inclusion if they self-identified as being Aboriginal or Torres Strait Islander and were 16+ years. Exclusion criteria included obvious intoxication. Participants were reimbursed for their time and travel expenses with a store voucher.

Each participant also took part in a semi-structured clinical interview, typically within 2–7 days of completing the App. We set out to have half the participants complete the App before the interview, and half afterwards. To assess the test–retest reliability of App responses, participants were asked to complete the App twice within 2–7 days.

Data collection and instruments

Grog Survey App

The development of the App and selection of its survey items have been described elsewhere [21]. Broadly, the App presented questions on demographics, alcohol consumption (10 items), alcohol dependence (3 items based on ICD-11 [28]), harms to self or others, treatment access and participants’ feedback on using the App.

The App ‘reads out’ the questions in English or in Pitjantjatjara (a language spoken in a region of NT, SA and WA). The App was designed to take no longer than 20 min to complete. Aboriginal field research assistants handed the tablet computer to participants, with brief guidance, then stood to one side, in case there were any challenges. Individuals with no prior computer contact were able to use the App without assistance [29]. The App is designed to work ‘offline’ (without access to the internet) and data are synchronised at the end of each working day to a secure encrypted server at the University of Sydney.

- Alcohol consumption

Using an adaptation of the Finnish method of assessing drinking, the App asks respondents to show the date of their four most recent drinking occasions within the last twelve months. Participants are then asked how much alcohol they consumed on each of these occasions. Participants select pictures of the type of alcohol, the container they drank it out of, and how full the container was with alcohol [21]. The App also allowed the participant to describe the alcohol consumption of their drinking group, if that was easier for them, and to then show their share.

- Alcohol withdrawal tremors ('grog shakes')

Participants were asked: "Some people's hands shake when they stop drinking or before their first drink of the day. How often does this happen to you?" Responses were indicated on a five-point Likert scale ranging from 'never' to 'most days or every day'.

Data collection for the survey App was facilitated by five Aboriginal research assistants (1 male and 2 female, SA; 2 female, Qld) who were either Aboriginal health workers [3] or Aboriginal health professionals working in drug and alcohol [2]. One day of face-to-face training was provided on how to use the App and on study methods. These research assistants introduced each participant to the App then sat a short distance away to ensure privacy, ready to respond if questions arose.

Clinical interview

The clinical interview was conducted by two female Aboriginal health professionals (one in each state), each with knowledge of local culture, context and language. In keeping with past research with Aboriginal respondents [30], this was considered the most suitable reference standard. It was not considered appropriate to have a non-Indigenous addiction psychiatrist or psychologist, as the gap in cultural understanding and trust can interfere with assessment quality, particularly in remote regions, but even in urban settings [25]. A semi-structured framework was used by the health professional to record notes on their findings (available from the authors on request). This framework was derived from one used by a respected Aboriginal alcohol and drug worker in regional NSW. It was adapted with the help of the two Aboriginal health professionals, in order to better fit the needs of the recruitment sites. The two Aboriginal health professionals agreed on the goal of a conversational clinical interview of 30 min or less.

Consistent with local clinical practice, the interviewer assessment of drinking focused on the past 14 days. Notes on drinking quantity were recorded on a 2-week calendar showing the days of the week (from Monday to Sunday in each row) so that the client could look along with the interviewer. The approach used was similar to the Timeline Followback [9]. If no drinking, or atypical drinking had taken place in the previous 1–2 weeks, the interviewer asked about an additional 2 weeks (i.e. 3–4 weeks in total).

On each drinking day, the interviewer recorded 'long-hand' what the participant drank, for example, "two longnecks of West End", which is the local term for 2 × 750 mL bottles of a brand of full-strength beer. To maximise participant engagement and to keep the interview short, interviewers did not convert responses to

Australian standard drinks (10 g ethanol). This was later done by a research assistant (TW).

Interviewers also assessed dependence, by asking current drinkers if they experienced tremors when they stop drinking or cut down. Clarification on the interviewers' clinical notes was sought by one author (KC) if needed. Data entry was conducted by a research assistant.

Analysis

Standard drinks were calculated by the App itself. All other analyses were performed in the R statistical programming language [31]. As there was a lack of a clear gold standard in use identified for Indigenous samples, validity was determined by triangulating the Finnish method with multiple outcomes. The primary outcomes used to compare the Grog App and clinical interview, was the classification of drinking risk, as defined by current Australian guidelines [32]. We also looked at the Spearman correlations of estimates of consumption from each measure with each other, and to the frequency of withdrawal tremors. Steiger's z-test [33] was used to test for significant differences between the correlations of consumption data and the presence of withdrawal tremors, between the App and clinical interview.

The mean number of standard drinks that participants consumed on drinking occasions was calculated by taking the average of the number of standard drinks consumed on the most recent four drinking occasions. The last four occasions (Finnish) method of assessing consumption does not use a fixed reference period. Non-drinking days are recorded between the interview and most recent occasion. However, necessarily, the reference period ends with the fourth most recent drinking occasion. On average, this results in over-estimates of drinking frequency. To reduce this bias, for each individual, we extended the reference time period by adding half of the average gap between their drinking occasions to their reference period. To calculate the frequency of drinking occasions, the total number of recorded occasions was then divided by the total reference period (in days). To calculate average daily consumption, we multiplied the average quantity each individual consumed per occasion, by their frequency of drinking occasions.

Following data cleaning, estimates of alcohol consumption by the last four occasions method were compared to estimates from the clinical interview. We examined the correlation between the two estimates of both drinking intensity (drinks per drinking occasion) and average daily consumption for each person.

Sensitivity and specificity were calculated to compare the extent to which the App agreed with the clinical interview when classifying drinkers' risk (as defined by the National Health and Medical Research Council

[32]). The clinical interview was used as the reference standard. To assess convergent validity, we compared alcohol consumption estimated by the App, against the presence of withdrawal tremors (recorded on the App or in the interview). We also compared consumption measured by clinical interview against withdrawal tremors. Finally, test–retest reliability was assessed by correlating consumption across the two occasions when participants used the App.

Classification of drinking risk

Short-term risk from drinking was defined as consumption of more than four drinks on any occasion [32]. Long-term risk from drinking was defined as average consumption of more than two drinks per day [32]. Both these criteria are in keeping with Australian guidelines to reduce the risk from drinking [32]. In addition, a short-term high risk threshold of more than 10 drinks per day was examined based on the higher odds of motor vehicle accidents at 11+ drinks per day in a meta-analysis [34]. Long-term high risk was defined by average daily consumption of more than five standard drinks was examined. This cutoff was based on a meta-analysis showing increased relative risk of cancers at that level [35].

Reference period matching

Comparisons of App and interview consumption initially considered all recorded drinking data. However, because the clinical interview focused on the last 7–29 days while the App collected data on four occasions which could be spread across the year, comparisons were then repeated using only those days which were examined by both the App and interview. To account for differences in participants' recall of when these occasions occurred, a buffer of 3 days was included. For example, if a date logged in the App occurred within 3 days of a date in the corresponding clinical interview (whether consumption was zero or higher), it was included in the analyses. The median number of matched days was 23.5. All participants had one or more matched days.

Results

Overview

Data cleaning and exclusions

A total of 238 participants completed both the App and clinical interview. Of these, 32 cases were excluded because the hand-recorded information required to match the individuals' interview and App responses was incomplete or incorrect (gender, age or interview location). Most of these cases were from a remote location where external events disrupted the pen-and-paper

participant registration. After exclusions the final sample size was 206 participants.

Handling of outliers

Twelve participants reported drinking more than 100 Australian standard drinks on a single occasion on the App. These quantities seem unlikely (based on clinical experience [KC], and personal communication with a medical director of a residential detoxification unit). However, as we are using non-parametric analytic methods the influence of outliers is minimal. Accordingly, these cases were included in the analyses initially, then analyses repeated with them excluded.

Sample characteristics

Just over half (51.9%) of the sample were male. Ages ranged from 18 to 78 years (mean = 39.3; SD = 14.6). Almost half (47.6%) of the sample were from urban areas; 16.5% from regional, and more than a third (35.6%) from remote areas (Table 1). More than four in ten (42.2%, $n = 87$) participants completed the App first, while nearly six in ten (57.3%, $n = 118$) completed the interview first. In one case it was not clear which was completed first (time not recorded on the interview notes). Gender, drinking status, and age did not vary based on whether subjects completed the interview or App first (two Chi

Table 1 Characteristics of Aboriginal or Torres Strait Islander participants who completed the Grog Survey App ($n = 206$)

Variable	n	Percent
Sex		
Male	107	51.9
Female	99	48.1
Age (years)		
16–19	8	3.9
20–39	106	51.5
40–59	71	34.5
60+	21	10.2
Remoteness		
Regional	34	28.2
Remote	74	47.1
Urban	94	24.8
Highest completed school year		
Year 9 or below	58	28.2
Year 10 or Year 11	97	47.1
Year 12	51	24.8
Employment status		
Employed	77	37.4
Unemployed	129	62.6
Total	206	100.0

squares and a spearman correlation respectively; all $p > .9$; calculations used app data, these relationships were also non-significant using interview data).

Drinking status

The App and interview agreed on participants' drinking status in 94.7% of individuals. In total, 156 participants (75.7%) were identified as having consumed alcohol in the last 12 months by both the App and interview. The App identified more participants as drinkers than the interview—80.6% ($n=166$) and 76.2% ($n=157$) respectively. Interviewers recorded at least 14 days of drinking data for 86.5% of drinking participants. For the majority of drinkers (75.4%), the Grog App covered a reference period equal to, or longer than the clinical interview.

Consumption level

The App tended to record a higher median number of standard drinks per drinking occasion than the clinical interview (median=17.0, IQR=[10.5, 27.9]; median=15.4, IQR=[9.6, 23.2], respectively, matched reference periods). The greatest number of standard drinks consumed on a single occasion for each participant also tended to be higher for the App than for the interview (median=14.8, IQR=[4.1, 28.4]; median=14.0, IQR=[1.8, 23.2]; respectively, matched reference periods). On the App, males and female drinkers recorded a similar median number of standard drinks per occasion (males 17.0, IQR=[11.8, 28.4]; females 16.5, IQR=[7.7, 26.0]; matched reference periods). In the interview, male drinkers reported a higher median number of standard drinks per occasion than female drinkers (males 16.6, IQR=[11.5, 26.7], females 12.8, IQR=[8.0, 22.1]; matched reference periods).

Across all data, drinkers on the App recorded a median of four drinking occasions (IQR=[4.0, 4.0]) per participant compared with one (IQR=[1.0, 3.0]) for the interview. In keeping with this, nearly one in five (18.6%, $n=29$) of those who reported consuming any alcohol in the last 12 months on the App did not report any drinking occasions during the four-week retrospective diary. All of these participants recorded at least one drinking occasion on the App.

Because most drinkers were not daily drinkers, despite high drinks per drinking day, average daily consumption was low. The recorded average consumption was slightly higher on the App than on clinical interview (App median=1.5, IQR=[0.3, 3.8]; median of 1.1, IQR=[0.2, 2.1]; respectively; matched data).

Table 2 Percentage of drinkers classified at each level of risk

	All data		Matched time periods	
	App	Interview	App	Interview
Short-term risk	95.5	76.3	75.2	71.9
Long-term risk	48.1	28.2	41.8	26.8
High-risk: short-term	81.4	64.7	62.7	62.1
High-risk: long-term	22.4	8.3	21.6	10.5

Only participants who completed both App and interview were included, who were identified as drinkers in both App and interview ($n=156$)

Proportion of participants classified as risky drinkers

As the App recorded a higher quantity per drinking occasion, and a higher number of occasions, it tended to identify slightly more participants as being at risk, across all risk classifications, even when the time frames examined were matched (Table 2).

During the matched data periods, the App found 76.7% of drinking males and 69.7% of females met one or more criteria for being at risk, compared to the interview which identified 74.4% of males and 65.2% of females as at risk.

Agreement between consumption data

The average daily consumption recorded for individuals by the App and by interview was moderately correlated ($r=.52$). Correlations were greater when only data from matched time periods were used ($r=.62$) (Table 3).

The App appeared to be highly sensitive in detecting at risk drinkers, as identified by the clinical interview, across all risk categories. The App detected 37 more risky drinkers than the interview if time periods were not matched. However, when only common reference periods were used the App identified only 10 more people at risk. This corresponded to an improvement in both sensitivity and specificity. Across all risk categories, when all data from drinkers was used, the sensitivity was 97.5% and the specificity was 10.8%; (95% CI [92.8, 99.5])

Table 3 Correlations in reported amount consumed between App and interview

Drinker status	All data	Matched time periods
All participants	.68*	.72*
Drinkers	.52*	.62*

* $p < 0.01$; Correlations are Spearman rho (r_s). $n=206$, and 156, all participants and drinkers, respectively

Table 4 Sensitivity and specificity of the App in detection of risky drinking, where the clinical interview is used as the reference test

Risk	All data		Matched time periods	
	Sens.	Spec.	Sens.	Spec.
Short-term risk	0.97 [0.93, 0.99]	0.11 [0.03, 0.25]	0.93 [0.86, 0.97]	0.70 [0.54, 0.83]
Long-term risk	0.70 [0.55, 0.83]	0.61 [0.51, 0.70]	0.71 [0.54, 0.84]	0.69 [0.59, 0.77]
High-risk: short-term	0.93 [0.86, 0.97]	0.40 [0.27, 0.54]	0.88 [0.80, 0.94]	0.79 [0.67, 0.89]
High-risk: long-term	0.69 [0.39, 0.91]	0.82 [0.75, 0.88]	0.81 [0.54, 0.96]	0.85 [0.78, 0.91]

Sens = Sensitivity; Spec = Specificity; drinking subjects only; n = 156; 95% confidence intervals are presented within square brackets

Table 5 The relationship between alcohol withdrawal tremors and average alcohol consumption per day for participants at long-term risk

	Consumption recorded by App	Consumption recorded by interview
Tremors reported on App	0.51*	0.29*
Tremors reported on interview	0.40*	0.32*

* $p < .05$; correlations are Spearman rho; n = 88. This analysis only considers matched time periods as symptoms of dependence are sensitive to whether heavy drinking was recent or not

and [3.03, 25.4], respectively). When common reference periods were used, across all risk categories, the sensitivity was 92.7% and the specificity was 69.7% (95% CI [86.2, 96.8], and [53.9, 82.8] respectively). The sensitivity and specificity for each risk category is presented in Table 4.

Correlation of average daily alcohol consumption and withdrawal tremors

To assess criterion validity of the App's estimate of alcohol consumption, we compared average daily consumption measured by the App (and by the interview) with the presence of withdrawal tremors, as recorded on either the App or interview. Participants were more likely to report the presence of tremors when using the App than when responding to the interview (17.0% and 7.2% respectively; $r_s = 0.48$).

Average consumption recorded by the App was as good or better a predictor of withdrawal tremors than was consumption recorded by the interview (Table 5). This was consistent regardless of whether tremors were recorded by the App or interview ($p = 0.02$ and 0.44 respectively; Steiger's z-test).

Grog Survey App test-retest

In total, 194 participants completed the App twice, with a median of three days ($IQR = [2.0, 6.0]$) between administrations (range 1–51 days). Almost eight out of 10 (78.4%,

$n = 152$) participants completed the App twice within a week. Average consumption was well correlated across the two App administrations ($r_s = .81$, $n = 181$, all participants; $r_s = .81$, $n = 147$, drinkers only).

Discussion

To our knowledge, this is the first study to formally report on testing the validity of an instrument designed to assess alcohol consumption in detail in Aboriginal and Torres Strait Islander Australians, or perhaps in Indigenous populations worldwide. The Finnish method of assessing consumption appears well suited to drinking which may be irregular and tied to external or social events. The App offers an innovative and interactive way to deliver these alcohol consumption questions. It appears to offer considerable potential to collect household survey data on drinking in a population where existing approaches have been found unsuitable [5, 36].

Finnish method used by the App versus retrospective diary in the clinical interview

The Finnish method as administered on the App had high sensitivity for short-term risk (0.93, 0.88; 95% CI [0.86, 0.97], and [0.80, 0.94], respectively; NHMRC short-term risk and high-risk short-term; matched time periods). When time periods were matched, the App also had good specificity compared with the clinical interview for long-term risk (0.69, 0.85; 95% CI [0.59, 0.77], and [0.78, 0.91], respectively; for NHMRC long-term risk and high-risk long-term). Low specificity for short-term risk (0.11, 0.40 for risk and high-risk respectively; 95% CI [0.03, 0.25] and [0.27, 0.54]) is likely to be due to the longer reference period (up to 12 months) in those who completed the App compared with those who completed a clinical interview (2–4 weeks). Consumption as estimated by the App appears well correlated with alcohol withdrawal tremors. This suggests both internal consistency (in the case of within-App comparison), and criterion validity (in the case of comparison with tremor as reported in the clinical interview). Test re-test reliability was also

good, particularly given that consumption may vary from day-to-day.

The App recorded higher median consumption per drinking occasion than the retrospective diary did in the clinical interview, even when examining matched time periods. There are a number of reasons that suggest that the higher prevalence of risky drinking estimated by the App may be more accurate than the clinical interview. Firstly, this is consistent with the high prevalence of alcohol-related harms observed in Indigenous Australians [2]. Secondly, past research shows that the manual conversion of beverages consumed and drinking containers into standard drinks often results in an under-reporting of quantity [37]. The App uses a visual and interactive system to record drinking quantity and computes the standard drink equivalent. Slightly more participants undertook the interview first which could have inflated performance of App or explain higher consumption reported on the App (i.e. by memory prompting).

The longer reporting period offered by the last four occasions method, as delivered on the App, compared with interview allows greater ability to detect infrequent, irregular, episodic drinking that is still high quantity. This pattern is common in this population [38]. A standard quantity-frequency method (e.g. asking how many standard drinks a person usually consumes; or how often they drink above a risk threshold) may miss high-risk episodic drinking occasions. It may also be difficult for irregular drinkers to answer questions on frequency of drinking. For instance, a drinker who consumes alcohol for 12 days in a row then nothing for 90 days may have difficulty selecting from survey response options such as “weekly” or “monthly”.

Comparison with other tools to measure alcohol consumption

There are similarities between the Finnish method as delivered on the App and paper-and-pen survey tools previously used to record detailed alcohol consumption in Indigenous Australians in remote WA [15] and non-urban NT [16]. These older surveys both made no assumptions about ‘regular’ drinking patterns and provided options to enquire about episodic drinking (e.g. during pay/pension weeks). Both also enquired about sharing of drinks and asked about drinking context and incorporated a visual approach (e.g. pictures of alcohol types or common containers). Accordingly, they did not assume comfort with mental arithmetic or literacy.

The App also has similarities with an approach developed in Thailand to measure alcohol consumption that varies with cultural or other holiday periods in Thailand—the context-specific quantity-frequency method [39].

Tablet computer as the delivery tool

Computer administration means that separate data entry of responses is not required, which reduces opportunity for human error. Computer administration also takes away the need for participants or interviewers to follow complicated survey instructions (e.g. ‘If no, skip to question 12’). Audio recordings enable standardisation of verbal presentation of questions.

Limitations

Just a small proportion (an estimated 10%) of individuals approached declined to take part in the study. However, reasons for refusal were not systematically collected.

We chose to compare the App to a clinical interview. However, there is no perfect ‘gold standard’ against which the App can be compared. We cannot assume a mainstream gold standard, such as CIDI-SAM [40] will be valid in this context [13, 30]. Clinical interview by an Indigenous health professional is recognised as a valid reference standard for research in Indigenous settings [25, 30]. It allowed communication which avoided major cultural and language gulfs. This same gold standard was used in the development of the Indigenous Risk Impact Screen (IRIS), a tool to measure alcohol and other drug and mental disorders risk [30]. As in our study, in Schlesinger’s [30] the clinical interviews were conducted by experienced Indigenous (generalist) health professionals rather than alcohol and other drug workers. Specialised Indigenous alcohol and other drug workers are not available in all communities around Australia.

The clinical assessment against which the App was compared included a 2–4 week retrospective diary. Retrospective diaries are commonly used to assess Aboriginal and Torres Strait Islander drinking patterns in clinical practice and in research. In research settings shorter reference periods are often used to shorten interview time, or to avoid over-reliance on memory. In this sample, the Grog App reported that several participants only drank a few times a year (albeit in large quantities). As a result, the 2–4 week retrospective diary recorded during the clinical interview, would not have adequately captured the drinking patterns of those who had not regularly consumed alcohol over that time period.

To adjust for this limitation, our sub-analyses were restricted to data from the App which was recorded in the same reference periods as recorded in the clinical interview. While this resulted in data-loss, as expected, it greatly improved sensitivity and specificity of the Grog App compared to the retrospective diary. This finding is relevant to researchers and clinicians, indicating that in samples with irregular drinking, detection of risky drinking may become less reliable with shorter reference

periods. In future research it will be useful to compare the findings of the Grog App to instruments which may be better able to capture irregular drinking patterns. One potential example is AUDIT-C, though as discussed earlier, most response categories on this instrument assume some regularity of drinking.

Despite using stratified sampling, the research assistants were only able to recruit small numbers of drinkers who were drinking within recommended limits. It would be good to repeat this validation with a sample with a greater range of drinking patterns. For example, a sample with higher socio-economic stratum, may have a greater range of drinking patterns [41].

Fourteen individuals reported what we considered unrealistically high amounts per drinking occasion (100+ standard drinks) on the App. On clinical interview, all of these individuals were classified at short-term risk (median of 22.5 standard drinks per drinking occasion) and 79% at long-term risk from drinking. While it is not clear why these individuals reported drinking such high amounts on the App, repeating the analysis with their exclusion did not greatly change results.

Future research could use additional sources of validation as set out in the LEAD paradigm (Longitudinal, Expert and All Data), such as longitudinal data on which drinkers experience harms over the coming months or years [42]. Use of sales data for validation is difficult, as few communities with high proportions of Indigenous individuals in Australia currently have unrestricted access to local alcohol, so supply may be illicit.

Implications for policy, practice and further research

This survey tool is likely to be valuable not just for Indigenous Australians, but in other contexts, such as developing countries, where alcohol is consumed in non-standard containers or episodically. Even for general populations, the visual interface provided by the App greatly simplifies reporting, regardless of comfort with writing or numbers. The tablet-computer platform is likely to save errors in data recording and data entry [24]. This is particularly important in remote communities or in the developing world, where the interview environment is often not a controlled one.

There has been considerable interest from Aboriginal and Torres Strait Islander primary healthcare services to use the App as a screening tool while clients wait to be seen by their health professional. Next steps are to refine the App based on suggestions received during the testing phase. Then the practical feasibility of the App as a survey tool will be examined. Further research on shortened versions to use as clinical screening tools will also occur. The survey App will be made available as a private iPad download from the 'App Store' initially, to ensure ongoing

quality control. Features in this refined version will include options for individuals to generate a summary report on their answers (which could then be shared with their health professional, with that individual's consent). It will also include a feature for communities to collect their own Grog App data, and to generate a community-level summary report on drinking in their community.

Conclusion

The Finnish method of assessing drinking as delivered on the Grog Survey App is the first approach to be formally tested for collecting a detailed assessment of alcohol consumption in Indigenous Australians, and possibly in Indigenous peoples worldwide. The last four occasions method appears to better cater for episodic and irregular drinking than a retrospective diary (as is often used in clinical interview). The visual and interactive interface of the App is likely to assist with accuracy and comfort with reporting drinking, regardless of literacy or numeracy. This household survey tool is likely to be of interest to researchers, communities, health services and policy-makers seeking to assess alcohol consumption in vulnerable and marginalised populations worldwide.

Authors' contributions

KS: literature review, drafted paper, synthesised co-authors' comments. JHC: led quantitative analysis and write up of results, designed tables, reviewed drafts of paper. SC: key to reviewing alcohol survey items featured in the iPad application, substantial input into analysis, results and tables, reviewed drafts of paper. SW: initiated idea for grant application that this study is funded by, reviewed drafts of paper, key to process of developing and implementing the iPad application. RR: key to reviewing alcohol survey items featured in the iPad application, substantial input into analysis, results and tables, reviewed drafts of paper. JP: key to process of developing and implementing the iPad application and ensuring that alcohol survey items fit with Aboriginal health professional best practice, reviewed draft of paper. TS: substantial input into study design and into analysis, results and tables, reviewed draft of paper. TNC: key to reviewing alcohol survey items featured in the iPad application, substantial input into analysis results and tables, reviewed draft of paper. NH: key to process of developing and implementing the iPad application and ensuring that alcohol survey items fit with Aboriginal health professional best practice, reviewed draft of paper. TW: collated by hand clinical interviews received from Indigenous health professionals, including calculating consumption (in Australian standard drinks), data entry of these interview data into SPSS, reviewed draft of paper. GL: exploratory data analysis, reviewed draft of paper. DG: key to reviewing alcohol survey items featured in the iPad application, and ensuring that alcohol survey items fit with Aboriginal health professional best practice, reviewed draft of paper. KMC: key to reviewing alcohol survey items featured in the iPad application, and ensuring that alcohol survey items fit with best clinical practice, substantial input into analysis, reviewed several drafts of paper including tables. All authors read and approved the final manuscript.

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Acknowledgements

This work was supported by the National Health and Medical Research Council (NHMRC) through a Project Grant (#1087192), the Centre of Research Excellence in Indigenous Health and Alcohol (#1117198) and a Practitioner Fellowship for K Conigrave (#1117582). Chikritzhs and Gray are supported by funding from the Australian Government under the Substance Misuse Prevention and Service Improvement Grants Fund. Room and Callinan are supported by funding from the Foundation for Alcohol Research and Education (FARE) and the Australian Research Council (for Callinan, DE180100016). We would like to acknowledge the help of: the communities and services who took part and who remain anonymous; of Steve Ella; and of Mustafa Al-Ansari, Catherine Zheng, Monika Dzidowska and Summer Loggins from the University of Sydney; and of Mira Branezac from NSW Health's Drug and Alcohol Health Services Library.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

Data for this project is stored at the University of Sydney based at Drug Health Service, KGV Building, Missenden Road, Camperdown New South Wales, 2050 Australia.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethical approvals and consent to participate were provided from two ethics committees: Aboriginal Health Council of South Australia (ACHSA: 04-15-621) and Metro South Health Human Research Ethics Committee (Queensland; HREC/16/QPAH/293).

Funding

This work was supported by the Australian National Health and Medical Research Council (NHMRC; Project Grant ID#1087192 and a Practitioner Fellowship for K Conigrave ID# 1117582).

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 5 October 2018 Accepted: 26 March 2019

Published online: 01 May 2019

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