

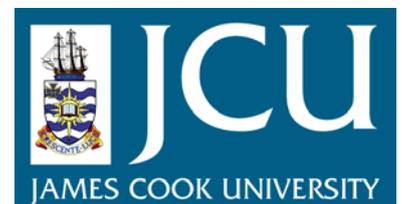
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Heavy cannabis use in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia: patterns of use, natural history, depressive symptoms and the potential for community-driven interventions

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A thesis submitted in accordance with the requirements for admission to the degree of Doctor of Philosophy

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Abstract

For Aboriginal and Torres Strait Islander (Indigenous) Australians, tobacco, alcohol and petrol misuse have received much attention. Cannabis, by contrast, has not been viewed as a major problem. However, since the 1990s it has become apparent that cannabis use is very common in some remote Indigenous communities in northern Australia. Significant associated health and social burdens are now being recognised.

Indigenous Australians, whether living in urban or rural settings, are more likely than other Australians to report cannabis use. This appears similar to recent reports of cannabis use in Indigenous populations in New Zealand, Canada and North America. Limited data are available to describe patterns of use among Indigenous Australians.

This thesis describes patterns and natural history of cannabis use in a five year follow-up study, and their cross-sectional association with depressive symptoms, in a community sample of adolescents and adults (aged 13–36 at baseline in 2001) in remote Indigenous communities in Arnhem Land, Northern Territory (NT, Australia). It also considers the potential of three community-driven initiatives established to address cannabis and other substance use.

Data for this thesis are drawn from two research projects. A combination of quantitative and qualitative methods were adapted to suit the study setting, to meet the needs of research conducted in small and highly mobile groups, and across considerable language and cultural barriers.

Primary data collection methods include a structured survey, semi-structured interviews, review of data routinely collected by health and other agencies, and estimations of cannabis use in the communities by local Aboriginal Health Workers and key community informants (proxy respondents). Interviews were conducted wherever possible using a combination of plain English and the local Indigenous language. Interviews were typically conducted in a private location comfortable for participants. Local Indigenous research staff assisted in interviews for the longitudinal study of cannabis use.

Persistent cannabis use and dependence symptoms were found to be commonplace in this Indigenous cohort, raising concerns for the physical, social and psychiatric burden on these vulnerable communities. High prevalence of cannabis use appears to have

persisted from baseline to five year follow-up (63%–60%; use in the previous 12 months). After five years, the majority reported continuing cannabis use, with continuing users aged thirty years (median). Past petrol sniffing among baseline cannabis users is also a key predictor of heavy cannabis use (≥ 6 cones, daily) at follow-up. Regular heavy cannabis use was found in almost 90% of users, and around 90% of the Indigenous users report symptoms of cannabis dependence (DSM-IVR).

Regular and heavy patterns of cannabis use that are predominant in these study communities also occur alongside poor mental health and severe disadvantage. In a cross-sectional study, heavy cannabis users were found to be four times more likely than the remainder of the sample to report moderate–severe depressive symptoms (on a modified Patient Health Questionnaire-9) after adjusting for age, sex and other substance use.

What might be done to address the substantial health and social burdens related to cannabis misuse in these remote Indigenous communities? Broad community-wide preventive measures and programs that provide youth diversion from court and prison offer enhanced youth resilience and connectedness in remote Aboriginal communities, and alternatives to substance use.

Treatment programs for chronic cannabis users are urgently needed, along with locally-developed preventive programs to raise community awareness of the harms associated with cannabis and other substance use. Such programs would need to incorporate local Indigenous language and cultural concepts, build capacity of local Indigenous professionals, be guided by Indigenous residents, and be founded on strong partnerships between a range of Indigenous and non-Indigenous stakeholders.

A holistic approach is needed to address substance misuse instead of tackling each substance separately, and to address mental illness and the social determinants of poor health. Potential programs need to draw on community ideas and understanding of the problems being faced. Solutions imposed without reference to local context have little chance of success or longevity. The one-size-fits-all approach assumes homogeneity, but what works for one community is unlikely to be suitable for mass rollout. Ultimately tackling cannabis and other forms of substance misuse in remote settings will depend on working with communities to create opportunities for social development, and continuing education, training and employment in adolescents and young adults.

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¹ Surnames have been omitted to preserve the anonymity of the study communities.

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List of publications included as part of this thesis

* Publication that has been submitted

1. Lee KSK, Conigrave KM, Patton GC, Clough AR. Cannabis: endemic yet neglected in remote Indigenous Australia (editorial) *Med J Aust*, 2008;190:228-9.
2. Lee KSK, Clough AR, Conigrave KM. High levels of cannabis use persist in Aboriginal communities in Arnhem Land, Northern Territory (letter). *Med J Aust*, 2007;187:594-5.
3. Lee KSK, Conigrave KM, Clough AR, Dobbins TA, Jaragba MJ, Patton GC. Five year longitudinal study of cannabis users in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2009 (in press).
4. Lee KSK, Conigrave KM, Patton GC, Clough AR. Does cannabis use contribute to depression in Indigenous Australians? *Transcult Psychiatry*, 2008 (submitted, revision requested).*
5. Lee KSK, Clough AR, Jaragba MJ, Conigrave KM, Patton GC. Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia. *Med J Aust*, 2008;188:605-8.
6. Lee KSK, Conigrave KM, Clough AR, Wallace C, Silins E, Rawles J. Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:75-82.
7. Clough AR, Lee KSK, Conigrave KM. Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:433-8.
8. Lee KSK, Jaragba MJ, Clough AR, Conigrave KM. *Wa! Ningeningma arakba akina da!*: (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use, Arnhem Land, Northern Territory. *Med J Aust*, 2008;188:113-6.

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Statement of contributions by student

Kim San Kylie Lee was the primary person responsible for the following thesis components:

- study coordination for the longitudinal study of cannabis use (2005–2006), including data collection, recruitment and support of Indigenous research staff, liaison with key local stakeholders, financial management and progress updates to ethics committees, funding agencies and study communities
- led the development of the community feedback model with the Indigenous research staff described in Publication # 8, including key liaison role, and production of feedback resources
- study coordination of the youth program evaluation, including collection of routine data from health, education and police departments, liaison with key local stakeholders (preventive and diversion components), financial management, and progress updates to ethics committees, funding agencies and study communities
- write-up including literature searches for Publications # 1–6 and # 8
- analysis of study results for Publications # 1–6 and # 8
- submission of publications and corresponding author responsible for liaison with journals for Publications # 1–6 and # 8
- contributed to survey design for the longitudinal study of cannabis use (2005–2006)
- contributed to conceptual planning and manuscript drafts, and designed Figure 1 for Publication # 7.

Conflict of interest

Kim San Kylie Lee was employed by the Youth Development Unit which was the subject of the study described in Chapter 5, Publication # 6. However, she was not involved in collection or analysis of qualitative data or review of identifiable material.

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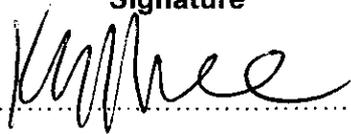
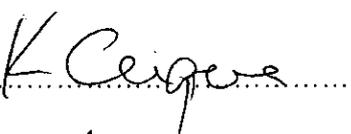
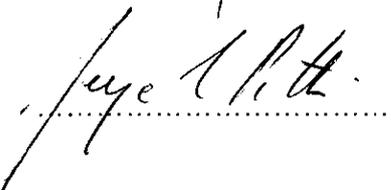
Statement of contributions by co-authors

- Kim San Kylie Lee: Refer to main statement of contributions.
- Alan R Clough: Chief Investigator for the longitudinal study of cannabis use, responsible for study design, funding applications, ethical approvals and data collection (2001, 2004). Contributed to survey design for the longitudinal study of cannabis use (2005–2006), and assisted in community feedback workshops. Write-up and data analysis for Publication # 7, including review of literature, and was corresponding author responsible for liaison with the journal. Editing assistance and final approval of Publications # 1–6 and # 8. Provided statistical support for Publication # 5. Provided support to Kim San Kylie Lee during data collection for the longitudinal study of cannabis use. Conducted interviews for the youth program evaluation (preventive and diversion components).
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- George C Patton: Contributed to survey design for the longitudinal study of cannabis use (2005–2006). Provided statistical support

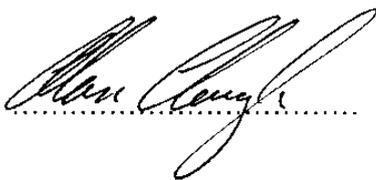
for Publications # 3 and # 5. Editing assistance and final approval of Publications # 1 and # 3–5.

- Muriel J Jaragba: Contributed to survey design, data collection, liaison with study communities and key local stakeholders, and participated in conference presentations in relation to the longitudinal study of cannabis use (2001 and 2005–2006). Contributed to conceptual planning and interpretation of results for Publications # 3, # 5 and # 8.
- Timothy A Dobbins: Provided statistical support, editing assistance and final approval for Publication # 3.
- Cate Wallace: Study coordination, data analysis and collection of routine data from health, police and education departments for the youth program evaluation (preventive and diversion components).
- Edmund Silins: Study coordination and collection of routine data from health, police and education departments for the youth program evaluation (preventive and diversion components).
- Jackie Rawles: Conducted interviews for the youth program evaluation (preventive and diversion components) and contributed to data analysis for Publication # 6.

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Glossary

* Word from the Indigenous language spoken in the study communities

Term	Definition
amarda*, ganja or gunja ²	cannabis
amungdungwa*	true
angbilyuwa amarda-langwa*	cannabis sickness
anija*	alcohol
awerrikbarrngwarrnga*	describes a feeling or emotion and comes from the words <i>awerrik</i> (inside the chest) and <i>barrngwarrnga</i> (a very heavy and deep intense sadness)
bucket bong	water pipe often made from plastic soft drink containers used to create a vacuum in which to smoke cannabis, giving the user a rapid and intense dose with little smoke lost
dambakwa*	tobacco
heads	dried flowering top of the cannabis sativa plant
joint	cannabis usually blended with tobacco and rolled into a cigarette
kava	beverage produced from the roots of the kava plant (<i>piper methysticum</i>); originally from the western Pacific region
oil	made by extracting the primary psychoactive constituent of the cannabis sativa plant using an organic solvent [4]
resin	made primarily from the glandular trichomes collected from the cannabis sativa plant
skunk	potent strain of cannabis usually grown through selective breeding and hydroponics
Top End	northern region of the Northern Territory (Australia) that extends south to include the Roper and Daly regions
warnumamalya*	Aboriginal people

² These spellings (*ganja* and *gunja*) are used interchangeably in the literature and in different publications presented in this thesis.

warningkwarba*

wurradidiyara*

wurranjarrngalyilya*

wurridarringka*

men

female teenagers

male teenagers

women

Abbreviations

Aboriginal	Aboriginal people in Australia; or Indigenous people in the study communities
AC	Alan R Clough
CDEP	Community Development Employment Projects, an Australian Government funded initiative for unemployed Aboriginal and Torres Strait Islander Australians
CI	confidence interval
CW	Cate Wallace
DSM-IVR	Diagnostic and Statistical Manual of Mental Disorders, 4 th Ed. Text revision
Indigenous	Aboriginal and Torres Strait Islander; or Indigenous people in the study communities
IQ	intelligence quotient
KC	Katherine M Conigrave
KL	K S Kylie Lee
km	kilometre
KSKL	K S Kylie Lee
JDU	Juvenile Diversion Unit
JR	Jackie Rawles
MJJ	Muriel J Jaragba
ND	data not available
NSW	New South Wales
NT	Northern Territory
OR	odds ratio
PHQ-9, modified	Patient Health Questionnaire-9, depression module, modified using local Indigenous language and concepts
SD	standard deviation
UC	unable to compute
VSM	volatile substance misuse
WA	Western Australia
VOC	Victim Offender Conference
YDU	Youth Development Unit

1. INTRODUCTION

1.1 Overview of thesis

In this thesis I present findings about cannabis use in a group of remote Indigenous communities in Arnhem Land, Northern Territory (NT, Australia). The thesis is comprised of two main components. The first investigates patterns and natural history of cannabis use, and their cross-sectional association with depressive symptoms. The second considers the potential of three community-driven efforts implemented in the same study communities to address cannabis and other substance misuse.

1.2 Cannabis use around the world

Cannabis is the most commonly used illicit drug worldwide with just under 160 million users in 2005, equivalent to 3.8% of the world's population (aged 15–64) [1]. The highest prevalence was reported in the Oceania region (15.8%), which includes Papua New Guinea (29.5%; 1995 data), Micronesia (29.1%; 1995 data), New Zealand (13.4%; 2001 data) and Australia (13.3%³; 2004 data); followed by North America (10.7%), including Canada, (16.8%; 2004 data) and the United States of America (12.6%; 2005 data); with the lowest prevalence reported in Asia (1.9%) [1]. Overall, trends indicate a stabilisation and decrease in cannabis use in Oceania, Western Europe and East and South East Asia, with increases in Africa, most South American countries, Eastern Europe and South, West and Central Asia [1].

1.3 Cannabis use in Australia

Recently in Australia, there has been a decline in cannabis use between 2004 and 2007 (in the previous 12 months; in those aged ≥ 14) from 11.3% to 9.1%, with 11.6% of males and 6.6% of females currently reporting use in 2007 [2] [3]. Cannabis remains the most commonly used illicit drug ahead of other substances including ecstasy (3.5%), meth/amphetamines (2.3%), cocaine (1.6%) and heroin (0.2%) [2] [3].

Of recent cannabis users (aged ≥ 14), Australian males are more likely than females to use daily (18.2% versus 13.4%); and females are more likely than males to use only once or twice a year (35.6% versus 28.4%) [2]. Those aged 14–39 more often report using cannabis, with current use (in the previous 12 months) most common among

³ World Health Organization data from the 2007 World Drug Report reports cannabis use prevalence in 2004 (in those aged 15–64) as 13.3%. However, similar household data from the Australian Institute of Health and Welfare from 2004 reports cannabis use prevalence (in those aged ≥ 14) as 11.3%.

those aged 20–29 (20.8%), followed by those aged 14–19 (12.9%), and those aged 39–39 (12.1%) [3].

Cannabis ‘heads’ (76.2%) are most commonly smoked, followed by cannabis leaf (43.7%), ‘skunk’ (19.3%), ‘resin’ (13.4%) and ‘oil’ (5.1%; Glossary). The most common methods of use were smoking by ‘joint’ or from a water or ‘bucket’ bong (Glossary) [2]. The average daily quantity reported by recent users in the general Australian population (aged ≥ 14) was 3.2 cones [2].

1.4 Overview of complications

A number of concerns have been expressed about the potential complications of cannabis use; however, many of these are still under investigation. Studies have shown that adverse social and health consequences of misuse are more likely in frequent and heavier cannabis users, compared with those who use recreationally or intermittently [4] [5] [6] [7]. This brief overview will describe some acute effects (desired and adverse) from cannabis intoxication. It will also consider complications related to longer-term use.

1.4.1 Cannabis intoxication

Acute effects from cannabis use include [4]:

- changes in mood, characterised by feelings of relaxation and euphoria
- intense sensory experiences during ordinary activities such as eating, watching films and listening to music
- impairments to cognitive function such as short-term memory, problem solving, attention and concentration
- decreased motor skills and reaction times, including impaired driving skills, increased risk of accidents while driving, and impaired ability to operate machinery [8]
- anxiety
- panic attacks
- nausea
- increased heart rate
- changes in blood pressure.

1.4.2 Physical

Regular cannabis use may result in chronic bronchitis including symptoms of chronic cough, wheeze and sputum production, and an increased risk of aerodigestive tract cancers [4]. Cannabis use during pregnancy may result in babies of lower birth weight or shorter height [6]. Some studies have shown risks for users with pre-existing cardiovascular disease [5]. However, there appears to be no problems in users with healthy cardiovascular systems [5]. No clear evidence has been demonstrated of birth defects, or decreased immune response with cannabis use [4]. It is common for users to smoke cannabis mixed with tobacco, so physical harms associated with tobacco use may co-exist [4].

1.4.3 Psychiatric

Cannabis dependence

There is now recognition of a cannabis dependence syndrome characterised by symptoms including difficulties controlling use and continued use despite adverse consequences [9] [10]. Increased risk of cannabis dependence is likely in chronic cannabis users [11], and increases with frequency of use. The risk of dependence is one in ten for those with any past experience of cannabis use; one in five, to one in three for those who have used cannabis more than a few times; and one in two for daily users [4].

In Australia, 1.5% of the general population, and 21% of current cannabis users from national household surveys, are cannabis dependent (DSM-IVR; aged ≥ 18) [11]. Physiological symptoms of withdrawal occur in three in ten (29.7%) dependent users (DSM-IV; aged ≥ 18) [12], and are characterised by symptoms such as irritability, anxiety, decreased appetite or weight loss, sleep difficulties and restlessness [13].

Cannabis and psychosis

There is good evidence of an association between cannabis use and psychosis with increased risk of symptom occurrence, worsening or relapse in individuals who may be vulnerable to, or have pre-existing psychotic disorder [5] [7] [14]. A recent meta-analysis by Moore and colleagues found that these effects remained after adjusting for potential confounding factors, and are distinct from effects related to cannabis intoxication, and more likely with increased frequency of cannabis use [14].

Cannabis and depression

Depressive disorders appear to occur more frequently among heavier cannabis users (14% of dependent users) compared with non-users (6%) in representative population surveys of adults (aged ≥ 18) [15], and adolescents (14% male users versus 6% male non-users, 18% of female users versus 6% of female non-users; aged 13–17) [16]. Some longitudinal studies demonstrate links between cannabis use and subsequent depression, particularly in those with weekly or more frequent cannabis use [17] [18] [19]. However, disentangling cause and effect is difficult. It is not clear whether cannabis use leads to depression, or if the association can be explained by common risk factors such as other substance use [14] [17]. There appears to be little support for a ‘self-medication’ hypothesis [17]. However, a recent meta-analysis suggests that more studies are needed to examine this ‘reverse causation’ [14].

Cannabis and low motivation

There is little evidence to support an amotivational syndrome characterised by symptoms such as apathy, poor concentration and attention, and difficulties making long-term plans [5]. Some authors suggest that low motivation may better be described as part of intoxication experienced by users who are cannabis dependent [4].

1.4.4 Cognitive functioning

Regular or chronic cannabis users compared with non-users may experience decreased cognitive function distinct from the acute effects related to cannabis intoxication. Symptoms of decreased function include short-term memory loss, decreased reaction time, difficulties with problem solving or concentration, and a global decline in IQ [5]. However, these appear to discontinue with cannabis cessation [5].

1.4.5 Social

A range of adverse social consequences appear to be associated with cannabis misuse, including low educational attainment, job instability, negative impact on relationships and anti-social behaviour [5], particularly during adolescence [20] [21] [22]. As with other substance use, financial burdens may also be experienced by users with money spent to purchase cannabis [5].

1.5 Overview of natural history of cannabis use

In non-Indigenous populations, cannabis use typically begins during mid-adolescence and ceases in early adulthood with the heaviest use found in those aged 19–22 [23].

Only a small group uses cannabis regularly over years in the general Australian population [4]. Risk of progression to dependence increases with frequency of use [4] [24]. Among young people, weekly or more frequent cannabis use is a predictor of both continued later use [25] and dependence [26]. In some studies younger males were more likely than females to exhibit continued adolescent use [27], and to become dependent [26] [27]. Daily tobacco smoking predicts later adolescent cannabis use [25], as does drinking five or more standard drinks a day among females [25]. Peer consumption of cannabis was a strong predictor of later adolescent use among adolescents [25] [27] and adults [28].

In Indigenous populations around the world, few longitudinal studies are available to describe the natural history of cannabis use. One three year follow-up study of Native American school students (aged 14–18 at baseline) from three cultural groups in different communities found that cannabis use decreased at age eighteen for males and females, and again at age twenty. Little difference was found at age fourteen in cannabis use according to gender; however, by age twenty, more males than females reported cannabis use [29]. This study was limited in its exclusion of non-school attending young people, and data did not permit investigation of cannabis use beyond twenty years.

1.6 Substance misuse in Indigenous Australians

This section features a brief overview of substance misuse among Aboriginal and Torres Strait Islander (Indigenous) Australians with a focus on cannabis.

1.6.1 Tobacco

Tobacco use (in the previous 12 months) is more than twice as likely among Indigenous Australians (aged ≥ 18) compared with other Australians (aged ≥ 14 ; 50.0% versus 19.4%) [3] [30].

1.6.2 Alcohol

While Indigenous Australians (aged ≥ 18) are more likely than their non-Indigenous counterparts to abstain from using alcohol (50.2% versus 16.4%; aged ≥ 14), if they do drink they are twice as likely to do so at a high risk level (16.4% versus 8.3%; > 6 standard drinks daily for men and > 4 standard drinks daily for women) [2] [30].

1.6.3 Any illicit drug use

Indigenous Australians (aged ≥ 15) are twice as likely as their non-Indigenous counterparts (aged ≥ 14) to report any illicit drug use in the previous 12 months (28.0% versus 13.4%; includes petrol sniffing) [3] [30]. After cannabis, amphetamines/speed is the most frequently reported substance among Indigenous Australians (7% in the previous 12 months; in those aged ≥ 15) [30].

1.6.4 Volatile substance misuse

Limited data are available to describe prevalence of volatile substance misuse (VSM) among Indigenous and non-Indigenous Australians. Some authors attribute poor data quality to limited mechanisms being available for data collection, with VSM not a criminal offence and many users aged below the minimum age of national drug surveys [31]. One in two-hundred and fifty Australians (0.4%; aged ≥ 14) from household surveys report current inhalant use (in the previous 12 months; includes solvents, glue, aerosols and petrol) [2]. Among Indigenous Australians, data were only available for seventy-four remote communities in the Northern Territory, Western Australia, South Australia and Queensland, and one in twenty (5%; aged 5–40) report current petrol sniffing (data collected across Australia between 2005 and early 2007) [31].

1.6.5 Cannabis

Indigenous Australians (aged ≥ 15) are more than twice as likely as other Australians (aged ≥ 14) to use cannabis (in the previous 12 months; 23% versus 9.1%) [3] [30]. Contrary to declining trends observed in the general population in recent years (11.3% in 2004 to 9.1% in 2007, in those aged ≥ 14) [2] [3], current cannabis use increased among Indigenous Australians between 2002 and 2004–2005 from 19%–23% (in those aged ≥ 15) [30] [32]. No other household data are available to describe patterns of cannabis use among this group (e.g. frequency of use or amount smoked per session according to age or sex) [5].

Community surveys of cannabis use among Indigenous Australians

Few published community surveys describe cannabis use among Indigenous Australians [5]. However, the available data suggest that, similar to household surveys, cannabis use prevalence appears higher among Indigenous Australians than other Australians.

In Albany, Western Australia (WA), cannabis use by Aboriginal young people (aged 14–19) was nearly twice as common as for the same age group nationally (29.5% versus 17.9%) [33]. A survey of secondary students (aged 12–17) from 143 schools in New South Wales found that weekly cannabis use was higher among Indigenous students than their non-Indigenous counterparts (24% versus 10%) [34]. However, a state-wide survey of WA Aboriginal young people (aged 12–17) demonstrated only a very weak trend of higher cannabis use (in the past week) compared to students (aged 12–17) nationally (11.9% versus 9.0%) [35].

In a study of 112 clinic attendees (aged > 14) randomly selected from an urban Aboriginal health service in the state of Victoria (Australia), nearly one in two (46%) reported current cannabis use [36].

In ‘Top End’ remote Indigenous communities (NT), a survey of substance misuse conducted in the mid-1980s did not detect cannabis use (in those aged ≥ 15) [37]. However, by the late 1990s, three in ten (31%) males and nearly one in ten females (8%; aged ≥ 15) in eastern Arnhem Land (a region in the ‘Top End’, NT) used cannabis (AC, unpublished data). Community surveys conducted in 2000 in the same region illustrate further increases in cannabis use with up to four in ten males (39%) and one in five females (20%) in one community reporting cannabis use (in the previous month; in those aged ≥ 15) [38].

By 2001, very high prevalence of cannabis use was documented in some Arnhem Land communities (72% of males, 23% of females; aged 13–36), with most users reporting weekly or more frequent use [39]. For males, this was equivalent to almost four times the national prevalence in similar age groups [39]. Most users report weekly or more frequent cannabis use (75%, in those aged 13–36) [39]. In these communities cannabis is typically consumed blended with tobacco using a locally-fashioned ‘bucket bong’ that gives the user a rapid and intense dose with little smoke lost [39]. Current cannabis users were also more likely than non-users to report using alcohol and tobacco, and have a history of petrol sniffing, but less likely to use ‘kava’ (Glossary) [39].

Natural history of cannabis use among Indigenous Australians

Just one published longitudinal study describes changes in cannabis use in an Indigenous Australian population [40]. This study by Clough and colleagues of three remote communities in Arnhem Land (aged 13–36 at baseline, 2001) reports a modest

reduction in prevalence of cannabis use at three year follow-up (2004) from 63%–54%, most evident in females ($P=0.008$) and males aged ≥ 16 at baseline ($P=0.009$) [40].

Reductions in use were attributed to the introduction of local supply control initiatives, the implementation of a program to address substance misuse and provide positive opportunities for adolescents, a re-structure of the key Indigenous governing organisation, and improved Indigenous workforce practices and recruitment by the local mining company [40].

In this study, both at baseline and three years later, cannabis users were at greater risk than non-users of imprisonment ($P=0.009$), auditory hallucinations ($P=0.041$) and suicidal ideation ($P=0.039$) [40]. However, follow-up was made difficult due to high population mobility, and only 49% of those who were interviewed at baseline were located for re-interview [40].

Social and health consequences from cannabis use among Indigenous Australians

Many communities across northern Australia report major social disruption linked to cannabis misuse [41] [42] [43] [44] [45]. In a study of adolescents and adults from Arnhem Land (aged 13–36), cannabis users were less likely than non-users to participate in education or training after adjusting for age [39]. Significant financial impacts have been documented with large amounts of money spent on purchasing cannabis [39] [44]. Cannabis is typically sold in some Arnhem Land communities for an estimated price of more than 12 times (\$A300 per gram) the price elsewhere in the NT (\$A25 per gram) [39]. In one study by Clough and colleagues, 6–10% of the community's total income was spent on cannabis, or 31%–62% of a user's median weekly income [39]. Violence by users to people or property is also common when cannabis supplies or money to purchase cannabis are limited [39] [44]. Restrictions placed on alcohol access in some Arnhem Land communities have been linked with an increased demand for cannabis [39] [44].

Adverse mental health consequences have been documented among adolescents and adults (aged 13–36) in Arnhem Land who use cannabis weekly or more often [39] [40]. Auditory hallucinations, symptoms of dependence, evacuations to regional centres for psychosis, family difficulties, and trouble with the police have been reported in relation to misuse [40].

In the same Arnhem Land study, interview respondents who used five or more cones per week were 15 times more likely than those who used one cone per week to report symptoms from an 'anxiety-dependency' cluster, including indecision, tolerance and difficulties controlling use, after adjusting for age, sex, current alcohol use and history of petrol sniffing ($P=0.020$) [46]. An association was also found between the number of cones smoked per week and a cluster of 'mood-vegetative' symptoms including irritability and disturbances to eating and sleeping ($P=0.014$). However, this association was modified by interactions with petrol sniffing ($P=0.116$) and alcohol use ($P=0.276$) [46].

Social and environmental factors that are relatively common among Indigenous Australians are also likely risk factors for substance misuse, such as crowded housing of poor quality, recurrent experiences of grief and loss related to high mortality, morbidity and incarceration, and fewer employment and educational opportunities [30] [47] [48].

Addressing cannabis misuse among Indigenous Australians

Among non-Indigenous and Indigenous populations, little research has evaluated interventions to address cannabis-related problems such as psychological interventions (cognitive behaviour therapy or motivational interviewing), pharmacological interventions for cannabis withdrawal and cravings, peer support and environmental approaches [49]. It is generally agreed that culturally relevant treatment services or preventive programs are needed to target cannabis misuse among Indigenous Australians, and to divert young Indigenous people away from the justice system [50]. However, there are limited data to show what programs succeed in remote Indigenous communities [51] [52].

Community involvement in program implementation, delivery and research has been suggested by some authors as an important component in programs seeking to address substance misuse among Indigenous Australians [48] [53] [54] [55]. Addressing the social determinants of poor health, such as housing conditions, fewer employment or educational opportunities, and experiences of trauma or violence, are also important elements [48] [55]. One example from a remote Arnhem Land community combined development programs with employment and training opportunities and fuel alternatives to successfully address petrol sniffing [56].

The importance of local Indigenous language and cultural concepts in preventive and treatment programs has been identified [57]; for example, bush hunting programs have been used as a vehicle to discuss harms related to substance misuse with adolescents [58]. The relationship between study communities and researchers is also seen as important in creating a foundation upon which potential preventive programs, interventions and research can be built [55] [58] [59] [60].

Building the capacity of local Indigenous staff, such as health and mental health workers [55] [60], and partnerships with local services, are important elements in addressing 'lifestyle health problems' [61]. One project from Gapuwiyak (Arnhem Land, NT), for example, identified local Indigenous expertise and community ideas as important factors in the implementation of a preventive program targeting poor child growth [62].

Cannabis: endemic yet neglected in remote Indigenous Australia

Cannabis is the most commonly used illicit drug in Australia [3]. Numerous studies examine the health and social consequences of cannabis misuse in non-Indigenous populations [4] [5]. However, despite significant concerns about cannabis misuse in remote Indigenous Australia [39] [40] [41] [42] [43] [44] [45], patchy evidence is available to describe patterns of use and associated harms [5]. Published evaluations of community-driven programs to address cannabis and other substance misuse among this disadvantaged group are also severely lacking.

This literature review section concludes with an editorial summarising the health and social problems linked to cannabis misuse in remote Indigenous Australia. This publication also considers reasons for uptake and persistence of use, and responses to address this major problem (Publication # 1).

1.7 Publication # 1: Cannabis: endemic yet neglected in remote Indigenous Australia (editorial)

Lee KSK, Conigrave KM, Patton GC, Clough AR. Cannabis: endemic yet neglected in remote Indigenous Australia (editorial) *Med J Aust*, 2008;190:228-9.

The published version of this manuscript is included as Appendix C.1 of this thesis. It differs from the work presented in this chapter in that:

- The references for this chapter have been integrated into the main reference list of the thesis.

Publication # 1: Cannabis: endemic yet neglected in remote Indigenous Australia (editorial)

Substance misuse in Indigenous people has long been recognised as one devastating consequence of contact with western culture. Misuse of tobacco, alcohol and petrol among Indigenous Australians has received much attention. Cannabis, by contrast, has not been viewed as a major problem. But since the 1990s it has become apparent that cannabis use is common in remote Indigenous communities [63]. The associated health and social burdens are now being recognised [63] [42].

Indigenous Australians, whether living in urban or rural settings are more likely than other Australians to report cannabis use [5]. Recent reports suggest the cannabis use is also relatively high among Indigenous populations in New Zealand [64], Canada [65] and North America [66]. Limited data are available to describe the patterns of cannabis use among Indigenous Australians [5]. However, a recent five year study of adolescents and young adults in three remote communities in Arnhem Land in the Northern Territory has found that not only is cannabis use common in remote Indigenous settings, but its effects on health and social adjustment are profound [39] [40].

These three isolated communities are close to one another but very isolated, being over 550 kilometres from the nearest city. There is one local Indigenous language, and English a secondary language. Tobacco use was found to be the norm in these communities, with over 90% of adolescents and young adults smoking [67]. Because of restricted access to alcohol, problem drinking was uncommon [67]. In contrast cannabis use was endemic, with over 70% of males and 20% of females being current users [39]. Cannabis was typically consumed mixed with tobacco and smoked using a locally-fashioned 'bucket bong' that gives the user a rapid and intense dose with little smoke lost [39]. Regular heavy use (≥ 6 cones, daily) was found in almost 90% of users [67]. This is around twice the consumption of regular cannabis users elsewhere in Australia [63]. Furthermore, around 90% of the Indigenous users reported symptoms of cannabis dependence [63]. This compares with around 20% of users aged 18 or over in the general Australian population [5]. Of even greater concern was a suggestion that, for most Indigenous users, cannabis was not a passing adolescent phase. After five years of follow-up, the great majority reported continuing heavy use (KL/AC, unpublished data).

Cannabis use was linked to substantial health and social burdens in these communities which are already disadvantaged by isolation and poverty [42] [39] [45]. Up to 10% of the communities' total income and from 31%–62% of a user's median weekly income was spent on cannabis [39]. Cannabis users were less likely than non-users to participate in education or training [39] and more likely to report auditory hallucinations, suicidal ideation [40], symptoms of depression [67], and having been imprisoned [40]. Community violence increased when cannabis supplies were scarce [63] [42]. The effects on traditional life were described by one NT Indigenous mental health clinician in the following way:

Too many of my people are chained to [cannabis]. They don't go out hunting or spend time by the river with their family. They just sit and smoke [cannabis], then look for money to buy more [cannabis] and get into fights when they can't get any.

What accounts for these unusual patterns of cannabis misuse in these remote Indigenous communities? There is little evidence that cannabis is grown locally [43], but much anecdotal evidence that market networks supplied by dealers based in urban or regional centres are extensive and resilient, making cannabis readily available (AC, unpublished observation). Alcohol restrictions have been effective in reducing problem drinking within communities, but may have had the undesirable consequence of encouraging an increase in cannabis use where it could be easily obtained [39]. As with risks for other forms of substance misuse in these communities, the social context is important. Limited employment and education opportunities; crowded, poor quality housing; community wide feelings of disempowerment; and grief and loss related to high mortality, morbidity and incarceration rates are all likely risk factors for substance misuse. Cannabis misuse is likely to be both a consequence of this type of social disadvantage and a perpetuating influence.

Cannabis misuse in remote Indigenous communities has been overlooked for too long. It is now clear that it is yet another major problem for these already disadvantaged communities, with evidence of cannabis misuse across a broad area of northern Australia [63] [42] [45] [43]. As well as in the NT, concerns about the level of cannabis use have recently been noted in Cape York [45] and anecdotally in other parts of remote and regional Australia. Further research is needed to investigate the impact of cannabis use on urban Aboriginal and Torres Strait Islander Australians.

Effective responses will not be easy. Controls on supply by state- or territory-based police are one of the few available measures [40]. In order to be effective, policy-makers and service providers would need to work collaboratively with local communities to tie in local prevention and treatment initiatives with existing supply control initiatives. Such programs would need to use Indigenous language and cultural frameworks, build capacity of local Indigenous professionals, and improve understanding of the harms associated with cannabis misuse [68]. Ultimately, tackling the misuse of cannabis and other substances in remote settings will depend on creating opportunities for social development and for continuing education, training and employment of adolescents and young adults.

1.8 Global aim

Significant concerns have so far been described in this thesis about cannabis misuse and associated harms in remote Indigenous Australia. However, limited published data are available to describe patterns and natural history of cannabis use, their association with depressive symptoms, and community-driven interventions to address this major problem within Indigenous communities.

Therefore, this thesis examines patterns and natural history of cannabis use, and psychiatric comorbidity in three remote Indigenous communities in Arnhem Land (NT; aged 13–36 at baseline, 2001). It also considers the potential of community-driven initiatives to address cannabis and other substance misuse.

1.9 Specific aims

1. To describe cannabis use at five year follow-up, including prevalence, frequency of use, amount consumed per occasion, and symptoms of cannabis dependence (DSM-IVR [9]).
2. To investigate influences on the natural history of cannabis use at five year follow-up among baseline users.
3. To investigate the extent to which moderate–severe depressive symptoms (modified Patient Health Questionnaire-9 [69], PHQ9) are associated with heavy cannabis use (≥ 6 cones, daily) in a cross-sectional analysis.
4. To evaluate the potential of three community-driven initiatives to address cannabis and other substance misuse:
 - a) a preventive youth program (for those aged ≤ 25) established to address substance misuse, crime and a lack of respect for older people and culture
 - b) a program established to divert young offenders (aged ≤ 18) away from the justice system and into local recreational, training and healthy living activities
 - c) an approach led by Indigenous cannabis research staff to feedback research findings on cannabis use and related harms to study communities using local Indigenous language and concepts.

1.10 Outline of study methods

A combination of quantitative and qualitative methods was used to address the aims outlined above. Methods were adapted to suit the study setting, with research conducted in small and highly mobile groups, and across considerable language and cultural barriers.

Primary data collection methods include a structured survey, semi-structured interviews, review of data routinely collected by health and other agencies, and estimations of cannabis use in the communities by local Aboriginal health workers (proxy respondents). Interviews were conducted wherever possible using a combination of plain English and the local Indigenous language. Interviews were typically conducted in a private location comfortable for participants. Local Indigenous research staff assisted in interviews for the longitudinal study of cannabis use.

Study methods were established prior to the student's candidature as part of pre-existing studies. Details of methods used are presented in the next chapter, and specified in each publication throughout the thesis.

1.11 Thesis outline

The thesis features a series of reports for publication along with linking commentary. Six of these publications are already in print, one is in press and one is under review at the time of submission. A thesis by publication format, such as this thesis, brings some unavoidable duplication of material; for example, repeated descriptions of study methods and study setting. Changes to the final format of each publication were made to integrate each publication's references, tables and figures into the overall table of contents and lists of figures and tables. Introductory notes provided before each publication give details of changes made. The student's contribution to each publication is presented in Appendix A. Publications and presentations supporting this thesis are featured in Appendix B. An offprint version of each publication is included in Appendix C. The thesis includes the following chapters and publications.

Chapter 1: Introduction

The present introductory chapter gives an overview of the literature pertaining to prevalence of cannabis use on a global scale and within Australia, a summary of some complications from cannabis misuse, and the natural history of cannabis use in non-Indigenous populations. Literature specific to cannabis use in Indigenous Australians is then described, including prevalence, natural history, social and health consequences, and interventions to address misuse. This overview of literature concludes with the first publication of the thesis, an editorial that summarises the health and social problems linked with cannabis misuse in remote Indigenous Australia.

- Publication # 1: Cannabis: endemic yet neglected in remote Indigenous Australia (editorial) *Med J Aust*, 2008;190:228-9.

A statement of the global and specific aims and outline of study methods is then presented. This chapter concludes with an outline of this thesis.

Chapter 2: Overview of study methods

This chapter provides an overview of the study methods used in this thesis, including a description of data sources (sampling, data collection and analysis), the study setting, previous efforts made by the study communities to address substance misuse, and key elements that underpinned the collection of survey data. This chapter concludes with some reflections from the student who previously lived and worked in the study communities.

Chapter 3: Patterns of cannabis use

High levels of cannabis use have been documented in the study communities (2001, 2004) [70] [39] [46] [40]. Building on this earlier work, this chapter examines patterns and natural history of cannabis use at five years in the same remote Arnhem Land communities by drawing together two publications.

The first publication compares characteristics and perceptions of cannabis use in the study communities with available national data.

- Publication # 2: High levels of cannabis use persist in Indigenous communities in Arnhem Land, Northern Territory (letter) *Med J Aust*, 2007;187:594-5.

There is only one published longitudinal study of cannabis use in an Indigenous Australian sample [40]. This study describes changes in prevalence and symptoms of misuse over three years [40]. No other published study examines factors predicting subsequent cannabis use among Indigenous Australians.

To address this gap in the literature, the final publication in this chapter uses logistic regression analyses to investigate the predictors of continuing cannabis use, symptoms of cannabis dependence and cessation among baseline cannabis users over five years.

- Publication # 3: Five year longitudinal study of cannabis use in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia *Drug Alcohol Rev*, 2009 (in press).

Chapter 4: Cannabis use and depressive symptoms

In the preceding chapter, patterns of cannabis use in the study communities were described. Regular and heavy cannabis use was found to be predominant, and raises concerns for potential psychiatric comorbidity [46] [71] [72] [18].

Despite growing links between cannabis use and mental disorders in non-Indigenous populations, including psychotic illness [14] and depression [14] [17], its contribution to mental disorders in Indigenous populations has been little studied [67] [73].

This chapter considers the extent to which cannabis use is associated with depressive symptoms by drawing together two publications. The first publication in this chapter

focuses on Indigenous Australians to consider the potential contribution of cannabis to depression, and the implications of this for research, service planning and policy.

- Publication # 4: Does cannabis use contribute to depression in Indigenous Australians? *Transcult Psychiatry*, 2008 (submitted, revisions requested).

Some but not all longitudinal studies of non-Indigenous populations have demonstrated links between cannabis use and subsequent depression [17] [14]. However, no published studies of Indigenous populations could be located. The next publication presents cross-sectional findings using logistic regression analyses to investigate the association between heavy cannabis use (≥ 6 cones, daily) and moderate–severe depressive symptoms (raw score of ≥ 6 out of a possible 18, modified PHQ-9 [69]).

- Publication # 5: Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia *Med J Aust*, 2008;188:605-8.

Chapter 5: Potential for community-driven interventions

In the previous chapters, evidence of the patterns of cannabis misuse in these remote Indigenous Arnhem Land communities, and its association with depressive symptoms, has been presented. Given the extent of the health and social burdens linked to cannabis misuse in these already disadvantaged communities, this chapter considers the utility of three community-driven initiatives implemented between 2003–2006 to address these significant issues.

Firstly, a prospective evaluation is presented to examine the potential of a preventive youth program (for those aged ≤ 25) established in 2003 to address youth substance misuse, crime, and lack of respect for older people and culture.

- Publication # 6: Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia *Drug Alcohol Rev*, 2008;27:75-82.

The next publication considers the processes and outcomes of a community-based program established in 2003 to divert young offenders (aged ≤ 18) away from the justice system and into local recreational, training and healthy living activities.

- Publication # 7: Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia *Drug Alcohol Rev*, 2008;27:433-8.

The final publication describes an approach taken by Indigenous and non-Indigenous research staff in 2006 to communicate findings from studies of cannabis use to study communities using local Indigenous language and concepts. Elements used to build community understanding about these findings, and to create momentum for change through a community feedback process, are discussed.

- Publication # 8: *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use in Arnhem Land, Northern Territory *Med J Aust*, 2008;188:113-6.

Resources developed as part of the community feedback project are not included in the thesis as they feature identifying material that would conflict with confidentiality agreements made with the study communities.

Chapter 6: Discussion and conclusions

This chapter provides a discussion of the findings presented in the preceding chapters, and considers the strengths and limitations of this research.

Chapter 7: Recommendations for further research, policy and practice

This chapter considers the prospects for further research and implications for policy and practice.

2. OVERVIEW OF STUDY METHODS

2.1 Data sources

Data for this thesis are drawn from two research projects that were conducted in the same communities during similar time periods: a five year longitudinal study of cannabis use (October 2001–June 2006), and an evaluation of a community-driven youth program (preventive component: June 2003–June 2005, and diversion component: September 2003–July 2006).

2.2 Ethical approvals

Approvals were granted from the Human Research Ethics Committees of the NT Health Department and Menzies School of Health Research. Subsequent to the student's enrolment, ethical approval for both projects was also sought and granted from James Cook University (Appendix F). From 2005, progress reports related to these approvals were prepared annually by the student.

2.3 Longitudinal study of cannabis use

A three year longitudinal study of cannabis use had been conducted in 2001 to examine patterns of cannabis and other substance use (tobacco, alcohol, kava, petrol sniffing), and related harms in three remote Indigenous communities in Arnhem Land (aged 13–36 at baseline in 2001) [39] [40]. This thesis reports on data from the subsequent follow-up of this study conducted in the same communities in 2005–2006 to examine patterns of use, natural history, cannabis dependence and depressive symptoms.

2.3.1 Sample

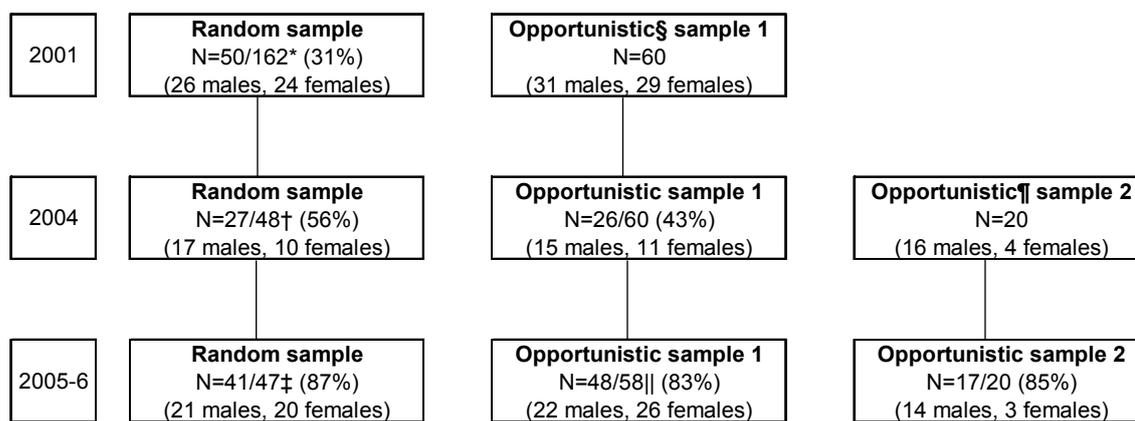
This study uses interview data from a combined opportunistically and randomly recruited cohort, plus it uses data obtained from proxy assessors on a community sample which was purely randomly recruited. The sampling procedures for both these cohorts are set out below (Figure 2.3.1a and Figure 2.3.1b).

Interview participants: combined randomly selected and opportunistically recruited sample

At baseline (2001), 162 subjects were randomly selected from patient lists compiled in the three communities' health clinics. Only 50/162 (31%) were able to be interviewed due to high population mobility. To supplement the interview group ('interview sample'

or 'interview participants'), an additional 60 respondents comprising clinic attendees and general community members were opportunistically recruited by Aboriginal health workers (total N=110). At the second wave of interviews (2004), two subjects had died and 53/108 (49%) were re-interviewed [40]. An additional 20 individuals were similarly opportunistically recruited to boost interview sample size. At third wave (2005–2006), eight baseline records were excluded due to incomplete data on variables of key interest (leaving N=102), a further two subjects had died and 106 interviews were conducted. This comprised 89/105 (85%) of respondents originally interviewed at baseline and 17/20 (85%) of those recruited in 2004, representing 12% of the communities' population aged 13–42 (Figure 2.3.1a and Figure 2.3.1b).

Figure 2.3.1a: Sampling process and participation rates of interview respondents aged 13–36 (at baseline) from a longitudinal study of cannabis use in three Aboriginal communities in Arnhem Land (NT)



* Subjects not located for interview at 2001 were not sought for interview at subsequent time points.

† Two male subjects died between 2001 and 2004, bringing the total number of possible random sample interviewees at 2004 to N=48 (N=50-2).

§ Clinic attendees and general community members were opportunistically recruited by Aboriginal health workers.

‡ One duplicate record was removed, bringing the total number of possible random sample interviewees at 2005–2006 to N=47 (N=48-1).

|| Two female subjects died between 2004 and 2005–2006, bringing the total number of possible opportunistic sample 1 interviewees to N=58 (N=60-2).

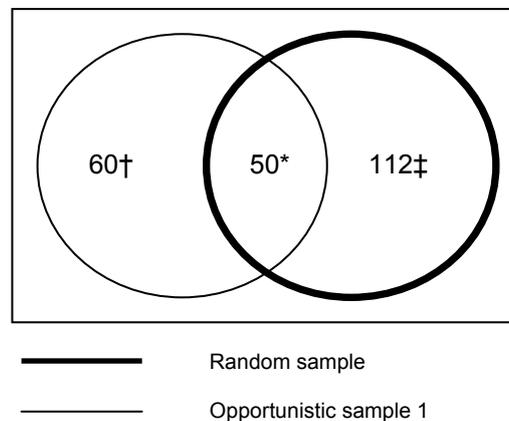
¶ Clinic attendees and general community members were opportunistically recruited by Aboriginal health workers.

Estimation of subject status by Aboriginal health workers and other key Indigenous community informants: randomly selected sample

For all randomly selected subjects, regardless of whether they were later interviewed, current and lifetime substance use status (cannabis, tobacco, alcohol, kava and petrol sniffing) was estimated by Aboriginal health workers and other key Indigenous community informants ('proxy respondents', N=162). At second wave, two subjects had died and 160 estimations were made. At wave three, 160 subjects were re-rated. A

supplementary group of randomly selected subjects (20 males, 15 females; aged 13–17 at wave 3) were recruited permitting estimates of population prevalence of cannabis use for a younger age group (13–17 years). This method of proxy assessment has been used previously where the preferred source of information was not available [74], and high population mobility makes re-interview attempts difficult [75] [76]. Proxy informants have been found to provide accurate information on substance use in the small communities with good correlation with self-report data [76].

Figure 2.3.1b: Venn diagram showing the overlap between the random sample and opportunistic sample 1 for subjects aged 13–36 (at baseline), from a longitudinal study of cannabis use in three Aboriginal communities in Arnhem Land (NT)



* Due to high population mobility, 50 out of 162 respondents from the randomly selected sample were interviewed at baseline (2001).

† A further 60 respondents were opportunistically recruited at baseline by Aboriginal health workers (sample 1) to boost interview sample size.

‡ Estimations of subject status by proxy respondents were conducted for all subjects in the random sample at each time point (2001, 2004 and 2005–2006).

2.3.2 Overview of quantitative data collection

Baseline data (2001)

- *Interview sample:* a structured survey questionnaire (Appendix D.3) was used to enquire into current employment and involvement in school or training, current and lifetime patterns of substance use (cannabis, tobacco, alcohol, kava and petrol sniffing), and adverse mental health symptoms experienced in the previous 12 months.
- *Randomly selected sample:* subjects were classified as current users or non-users drawing on the estimators' intimate knowledge and understanding of the study

communities [76] [77]. Up to five proxy respondents made their assessments separately in a private meeting room at the community health clinic or council office (Appendix D.4). Consensus classification was used to collate individual estimations as described by Clough and others [76] [77].

Five year follow-up data (2005–2006)

- *Interview sample:* interviews included the same structured survey as baseline
 - Additional questions enquired about symptoms of cannabis dependence (DSM-IVR [9]) and depression (modified Patient Health Questionnaire-9, PHQ9 [69]), and experiences when cannabis supply runs out (Appendix D.5).
 - Only respondents who report current cannabis use at 2005–2006 were asked questions about cannabis dependence, their motivations and intentions about cannabis use, and experiences when cannabis supply runs out.
 - A modified PHQ-9 [69] administered by the interviewer assessed depressive symptoms in the fortnight prior to interview [67]. Modifications for local use were made in consultation with local Aboriginal health and mental health workers. Original response categories (never, several days, more than half the days, nearly every day) were simplified (never, a little, a lot) to fit the local language and numbering system. Scores of zero, one or two were allocated to the amended response categories. Cronbach's α coefficient was used to assess internal validity of the modified questionnaire (α , 0.73; 95% CI, 0.47–0.98). Particular efforts were made to clarify whether self-reported depressive symptoms occurred outside usual daily experience (e.g. lethargy versus tiredness after physical exertion). In the original PHQ-9, raw scores of ≥ 10 (out of a possible 27) indicated moderate–severe depression [69]. This equates to ≥ 6.6 (out of a possible 18) in the modified PHQ-9. Accordingly, raw scores of ≥ 6 were used to indicate a moderate–severe threshold of depressive symptoms. Because of practical and funding constraints, no specific validation study was conducted of the modifications made to the PHQ-9. However, one recent study evaluated the utility of the Patient Health Questionnaire-9 (PHQ-9) as a depression screening tool in an urban Aboriginal medical service (NT) [78]. The PHQ-9 was found to be culturally appropriate in this setting with modifications such as the use of local Indigenous language, and having a

trusting relationship between respondent and person administering the questionnaire [78].

- Height and weight measurements were taken for all respondents.
- *Randomly-selected sample*: estimations of current and lifetime substance use status were estimated by proxy respondents as per baseline (Appendix D.4).

2.3.3 Overview of quantitative data analysis

Descriptive statistics were used to calculate patterns of cannabis use at 2005–2006 (Chapter 3, Publication # 2). Logistic regression analyses including multivariable models were used to investigate the natural history of cannabis use (Chapter 3, Publication # 3), and the cross-sectional association between cannabis use and depressive symptoms (Chapter 4, Publication # 5). Subject numbers for statistical analyses may vary between publications due to study inclusion criteria which are selected based on the purpose of each publication. For example, sub-samples of the whole population are used for certain publications.

2.4 Community feedback of studies on cannabis use and evaluation of this feedback initiative

An approach was developed by Indigenous and non-Indigenous research staff to disseminate findings on cannabis use to the study communities. Instead of literal translations, prevalence estimates were translated using local concepts of life stages, numbers and quantities. Responses to the feedback resources (book and DVD, in the local language with English subtitles) were evaluated.

2.4.1 Overview of qualitative data collection

Semi-structured interviews were conducted with 30 Indigenous and eight non-Indigenous participants either individually or in groups. Interview purpose was to gauge community attitudes towards resources developed by local Indigenous and non-Indigenous research staff to feedback findings of cannabis studies. Interviews were conducted opportunistically across the study communities with Indigenous community members and relevant local service providers including the community health clinics, local police, community corrections program, aged care facility and schools. Interviews with Indigenous participants were conducted using the local Indigenous language and plain English by the Indigenous research staff and student (Appendix D.6).

2.4.2 Overview of qualitative data analysis

Interview data were analysed by extracting and summarising key themes.

2.5 Youth program evaluation

A community-driven youth initiative was established by the study communities in 2003 to address substance misuse, crime and a lack of respect for culture and older people. This included a general preventive arm and a component to divert young offenders from the criminal justice system. Two separate evaluations were conducted of the preventive and diversion components of this program. The utility of these initiatives to tackle cannabis and other substance misuse will be considered.

2.5.1 Overview of data collection

Preventive component

Data included community, staff and stakeholder interviews, review of management committee minutes, and observation to assess the methods of operation, community acceptability, perceived impact and likely ability to meet goals. Seventy-three interviews were conducted with 30 Indigenous and 43 non-Indigenous respondents (Appendix E.3). Local school attendance and youth apprehension rates were collected two years before and after program implementation, as well as data from local substance use surveys.

Diversion component

Client assessment records were reviewed (N=35, aged 11–18 years; Appendix E.3) and interviews conducted with case management staff (N=4, Appendix E.4) and key stakeholders (Appendix E.3) to assess program performance.

2.5.2 Overview of data analysis

Preventive component

Interview data and management committee minutes were reviewed against the program's stated goals by extracting and summarising recurrent themes. Systematic differences provided by Indigenous and non-Indigenous participants were noted. Quantitative data were compared before and after program implementation (Chapter 5, Publication # 6).

Diversion component

De-identified data from client records were compiled according to age, gender, date of referral to the diversion program, substance use at the time of offence, and the diversion programs assigned and completed by the young person. Case workers who were responsible for the management of each client's diversion program verified their completion according to de-identified case numbers. Case workers provided detailed case histories, including any information related to their history of substance use (Chapter 5, Publication # 7).

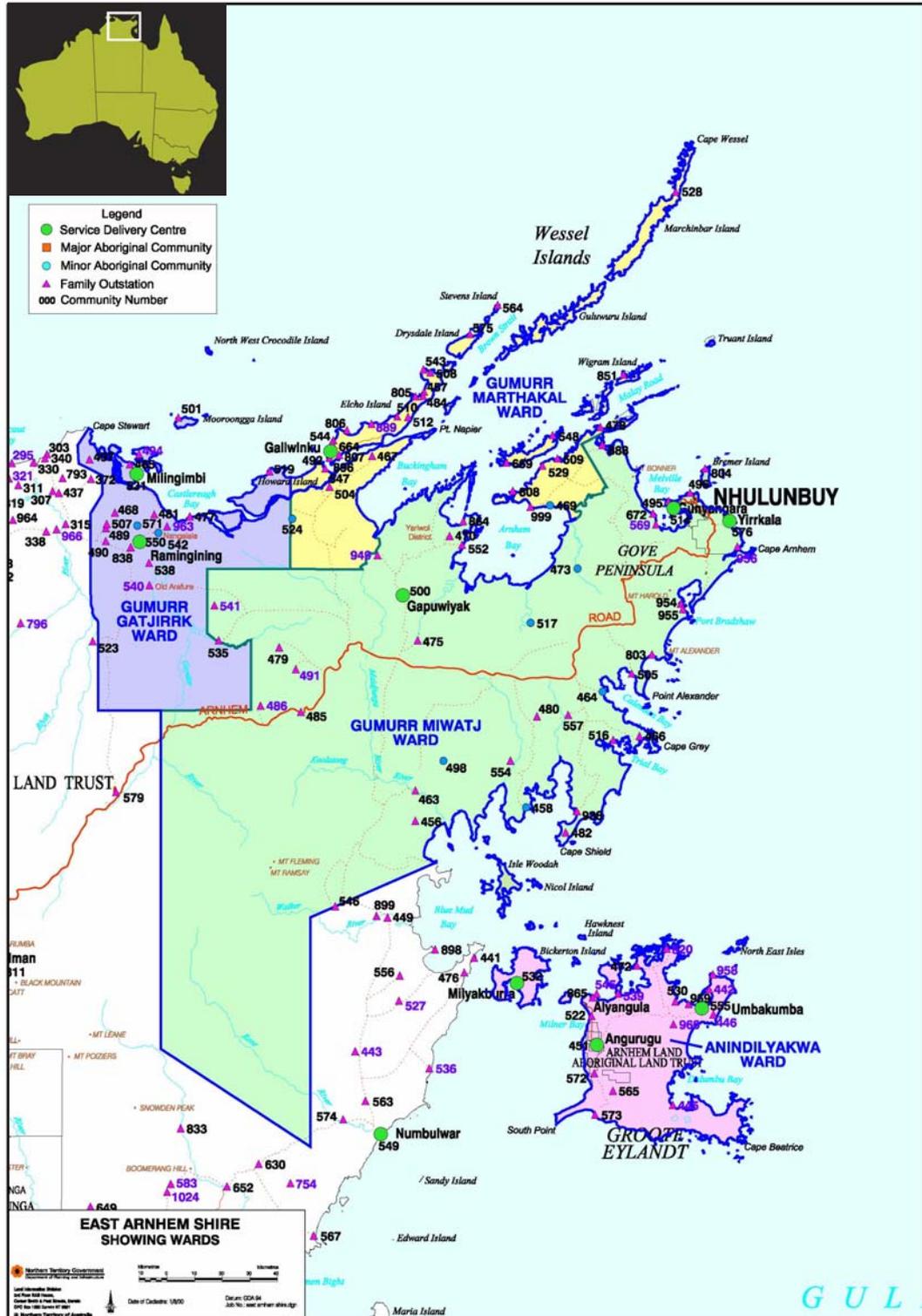
2.6 Study setting

Research for this thesis was conducted in three remote Indigenous communities, several 'single-family' outstations and a neighbouring mining town spread over 2,600 square kilometres in Arnhem Land, Northern Territory (NT, Australia; Figure 2.6). The Indigenous communities range in size from 200 to 750 people, of which 50–55% is aged 24 years or younger [79]. Situated over 550 km east of Darwin (NT), these communities are physically isolated, and socially and culturally distinct. One Indigenous language is spoken, English is a secondary language, and skills in English vary greatly. Research agreements made with key Indigenous governing organisations preserve the anonymity of the study communities.

2.6.1 Employment and education

The median weekly individual income for local Indigenous residents aged ≥ 15 was \$206 in 2006 [80], indicative of very low adult employment amongst the Indigenous population. Given the low adult employment, it can be challenging for young people to see the purpose of education, and school enrolment and attendance in these communities is low. Only 9–48% of the young people eligible for primary school enrolment was enrolled in 2001, and of those enrolled only 47–65% were attending (unpublished data, NT Education Department, 2004). Secondary school was available in two out of three communities. A small number of young people attend secondary school in Darwin or interstate.

Figure 2.6: Map of East Arnhem Shire, the region that includes the three study communities [81]



2.6.2 High prevalence of substance misuse and related harms

Substance misuse, violence and crime have been identified by the study communities as significant problems (unpublished data, management committee minutes, youth program). Use of psychoactive substances, particularly cannabis, by Indigenous people is common (72% of males, 23% of females; aged 13–36; 2001) [39].

Petrol sniffing was commonly practised in the 1980s and early 1990s [39]; however, it has greatly reduced and is practised by a minority of adolescents at any one time, with its presence fluctuating from time to time and place to place. When it occurs it may be associated with violence and vandalism (interviews with community members and key stakeholders, 2003–2005, youth program).

Alcohol was available from outlets near the study communities from the 1960s, and has previously been a cause of considerable health and social problems (unpublished data, reports from Aboriginal health workers). Access to alcohol has been restricted since the 1980s, and the study region is now governed by a locally-developed alcohol management system that was endorsed by the NT Liquor Licensing Commission in July 2005. Alcohol access now tends to be opportunistic and episodic.

These problems occur on a background of disadvantage with severely limited training and employment opportunities [80], limited recreational facilities and unrelenting challenges to traditional cultural values and controls (unpublished data, management committee minutes, youth program).

2.6.3 Community efforts to address substance misuse

The study communities have a history of implementing local solutions to address substance misuse. In the 1970s–80s, a local substance misuse program led by a senior Indigenous community leader was initiated to tackle petrol misuse. Since the late 1990s, the local health clinics have attempted to raise community awareness of the harms associated with tobacco use. Since 2000, in recognition of difficulties experienced by younger people related to substance misuse and crime, government funding was secured to establish a community-driven youth initiative to provide positive opportunities for young people, and to divert them from engaging in substance misuse and criminal activity (Chapter 5, Publications # 6–7). In July 2005 an alcohol management plan developed by the communities, local stakeholders and government over a period of four years was implemented.

2.7 Overview of challenges for data collection

The challenges of collecting face-to-face survey data in remote Indigenous communities are unique, with considerable cultural and language barriers [75] [57] [82], and research conducted in small and highly mobile groups [83] [84]. The purpose of this section is to describe some key elements that underpinned the collection of survey data in these remote Indigenous communities.

2.7.1 Involvement of Indigenous research staff

Collaborative efforts between Indigenous and non-Indigenous research staff were a crucial component of our research approach. Indigenous research staff participated in many study aspects including method and survey design, data collection and community feedback. Indigenous research staff generally became aware of the study through observation or from other community members. Prior to their involvement in the project, all were known to me (KL) and the study's Chief Investigator (AC).

Researchers were paid on a casual basis, except for the health and mental health workers who offered their time as part of their usual employment with the community health clinics, as per arrangements made with each clinic. Staff participation numbers fluctuated at various times depending on illness, family or community issues, and training or other work commitments. Prior to starting work, it was explained to me that approval to participate in the research had to be obtained from their family. This was seen as especially important in view of the study's illicit drug content.

In 2005–2006, the number of Indigenous research staff increased to include seven women and three men, all local residents of the study communities. These staff members came from a range of backgrounds including health work, mental health work, full-time care giving, substance misuse, education and land management. A key member of the Indigenous research staff was the mental health worker based at the community health clinic in the largest community. In addition to her clinical role, she assumed a senior research role, and participated in data analysis and interpretation of results, health promotion development, conference and stakeholder presentations, and publication writing.

2.7.2 Practicalities and challenges of conducting substance misuse research in this setting

Many authors describe the importance of recognising Indigenous cultural concepts and protocols when collecting data in Indigenous community settings [85] [82] [57]. We were acutely aware of being conspicuous as we sought to locate and approach respondents for interview. The sensitive nature of our survey content that enquired into personal illicit drug use and adverse mental health motivated us to identify ways to ease individual and community level comfort about our presence in their communities. Specific measures to address these challenges during data collection are described below.

Before approaching respondents for interview

Prior to locating respondents for interview, I would approach the key local agencies (e.g. key Indigenous governing organisations, community health clinics, local police and schools) to seek the relevant permission to enable data collection to occur. The Indigenous research staff advised as many community members as possible (key community leaders, family and other community members) about the purpose and progress of the study in both informal (shop, bank, post office, clinic and private homes) and formal settings (meetings and community events).

Locating and approaching respondents for interview

Attempts to locate respondents were generally made by the Indigenous research staff. I would wait at a discreet distance in a vehicle or across the road from where enquiries were being made. The location of the three study communities situated in an archipelago often resulted in several attempts being needed to locate respondents for interview.

Family or other community members would inform the Indigenous research staff of a respondent's unavailability for a range of reasons (e.g. they were sick, asleep or visiting another community or 'outstation', attending a funeral or meeting, or away in an urban centre). If the respondent was present, the Indigenous research staff would ascertain whether it was possible to conduct an interview and discussion about the study purpose would ensue. Sometimes this involved a small group of family members or a larger group including children and extended family, and would take from 2–10 minutes. Requests for interview were refused on two occasions.

If additional information was requested or the respondent was available for interview, I was asked to approach. Otherwise it was expected by the Indigenous research staff that I would refrain from being a part of these discussions or from approaching onto the veranda, knocking on the front door or entering residences where enquiries were being made. Three interviews were conducted with no involvement from the Indigenous research staff. In these cases, I was advised by the Indigenous research staff that their assistance was not required on account of being well-known to the respondent and their family.

Conducting interviews

Interviews were generally held outdoors, on the grass or dirt outside the respondent's house or on their veranda, and lasted from 10–50 minutes. Children, spouses, dogs and other family members were usually present, though a private outdoor space was typically made available. If no suitable outdoor space was available, an alternative interview space was offered, such as an air-conditioned vehicle or private meeting room at the community health clinic or council office.

Particular efforts were made to create a comfortable interview environment. Interviews were conducted using a mixture of local language and plain English. The identification of relevant words and phrases in the local language further assisted comprehension, particularly with regards to questions about 'quantity' (did you feel that way: 'none of the time', 'a little bit', 'some of the time', 'a lot of the time'), and symptoms of depression. Questions requiring a time reference (e.g. experience of a particular symptom in the last year or in the last fortnight) were framed according to commonly known local events (e.g. pay day, seasons, festivals, important meetings and funerals). Back-translation from English to the local language, and back to English between the student, respondent and Indigenous research staff was routinely used to ensure the Indigenous research staff member's confidence of the respondent understanding the questions being asked. Humour was regularly used when appropriate.

2.7.3 My involvement as a student researcher

I was known to the study communities before commencing my candidature, having previously lived and worked in the study communities. The following reflections consider some of the benefits and constraints of my role as a student researcher in these research projects, and how these shaped our research approach. From April 2004–June 2005, I was responsible for coordinating a community-driven youth initiative established to reduce substance misuse, increase respect for culture and elders, and

create positive opportunities for young people (described in Chapter 5, Publications # 6–7). This role required liaison with individual families and young people, leaders and other community members, local and regional service providers and funding bodies. As a result, strong connections were developed with the local Indigenous community residents and service sector, including important familial relationships. From these relationships every person in the study communities was able to ascertain their kinship connection with me. Three months after leaving this position, I returned to the study communities in a research capacity.

Benefits

Being already known in the study setting had many benefits. It was integral in helping to recruit an excellent team of Indigenous research staff. I was constantly grateful for their time and efforts and recognised that, without their participation, many respondents would not have been able to be located, that interviews could not have been conducted as comprehensively, and that the design and implementation of a community feedback model to describe our studies of cannabis use could not have happened. Established relationships with the local service system and community leaders assisted to keep local stakeholders informed of study progress. Familiarity with many respondents or at least their families greatly assisted in our attempts to locate and interview respondents. Working knowledge of the local language, including commonly used gestures helped me to engage more effectively with respondents.

Constraints

Being well accepted in the study communities also had constraints. Sometimes family disputes would be projected onto me. There were situations when I was advised by community leaders and other local residents to refrain from entering a community for short periods due to personal safety concerns. Key Indigenous mentors comforted me with the knowledge that I should be excluded from this type of community business. However, this logic was not always followed midway through a dispute. My goal to achieve a respectable interview response rate occurred alongside learning how to cope with the trauma related to disputes involving ‘family’ members.

Accommodating these insights into our research approach

This knowledge motivated us to shape our research approach to minimise any additional burden on the communities, local service system and in particular the community health clinics where I was based. To enable greater independence, research funds were found to provide me with a vehicle to avoid borrowing vehicles.

Student visits were also scheduled for 2–8 weeks in duration with a short break in the middle, to cater for unforeseen events that may require the attention of the Indigenous research staff, and improve our chances of being able to conduct research tasks.

Our approach aimed to be respectful of community life and cultural practices. Sometimes research activity was postponed to enable participation in various community activities; for example, to resolve a housing issue for an Indigenous research staff member, attend a community meeting on behalf of the health clinic, or to pay our respects to a deceased community member. Every opportunity was sought when appropriate to conduct research activity; for example, when a respondent or Indigenous researcher was available for interview, to liaise about local language terms with the local linguists, or to provide a project update to community leaders and other key stakeholders.

3. PATTERNS AND NATURAL HISTORY OF CANNABIS USE

In 2002, Clough and colleagues published a letter in the *Medical Journal of Australia* alerting policy-makers and clinicians to disturbing levels of cannabis use found among adolescents and adults in remote Indigenous communities in eastern Arnhem Land (NT) [70]. Very high prevalence of cannabis use (in the previous 12 months) was estimated by local Aboriginal health workers in a randomly selected sample of community members (63%; 80% of males and 46% of females, in those aged 13–36) [40]. Weekly or more frequent cannabis use was predominant (75%, in those aged 13–36) [39]. Past petrol sniffing was also common among current cannabis users (60% of males, aged 20–34), raising additional health concerns for the potential compounding of residual cognitive impairments [70].

Three years later (2004), a modest reduction in cannabis use prevalence was documented from 63%–54% (Appendix C.9) [40]. These rates still appear far higher than household surveys of other Australians in similar age groups (aged 14–19, 17.9%; aged 20–29, 26%; aged 30–39, 15.9%) [2].

This three year follow-up study provides the only longitudinal data on cannabis use among Indigenous Australians [40]. However, follow-up was made difficult due to high population mobility, and only 49% of those who were interviewed at baseline were located for re-interview [40]. This led to a subsequent follow-up being conducted one year later (2005–2006).

The purpose of this chapter is to present findings from this latest follow-up of cannabis use in three remote Indigenous communities in Arnhem Land (2005–2006; in those aged 13–36 at baseline, 2001).

The first publication is a letter that describes patterns of cannabis use at five years, and makes comparisons with available national data.

The second publication examines predictors of cannabis use at five year follow-up.

3.1 Publication # 2: High levels of cannabis use persist in Aboriginal communities in Arnhem Land, Northern Territory (letter)

Lee KSK, Clough AR, Conigrave KM. High levels of cannabis use persist in Aboriginal communities in Arnhem Land, Northern Territory *Med J Aust*, 2007;187:594-5.

The published version of this manuscript is included as Appendix C.2 of this thesis. It differs from the work presented in this chapter in that:

- The figure featured in this chapter has been integrated into the main list of figures of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

The total number of subjects in the randomly selected sample in this publication (N=164) is different to that described in the overview of study methods (N=162; Chapter 2, Figure 2.3.1). This is because analysis for this publication was the first conducted for this thesis. Subsequently two randomly selected respondents were excluded from analyses because they were discovered to be usual residents of communities outside the study region.

For this publication we limited the analysis to subjects aged 13–34 (in 2005–2006) for consistency with the age bracket used by Clough and colleagues in an earlier publication [70].

Publication # 2: High levels of cannabis use persist in Aboriginal communities in Arnhem Land, Northern Territory (letter)

TO THE EDITOR: Cannabis use is implicated in serious social disruption in many Northern Territory Aboriginal communities [41]. Rising levels of cannabis use were first reported in Aboriginal communities in Arnhem Land in 2002, along with associated concerns about escalating social impacts and mental health effects compounded by other substance use [70].

A random sample of 164 people in Arnhem Land initially interviewed and assessed in 2004 was followed up between October 2005 and June 2006. Their cannabis use was measured using health worker assessments and self-reports from interviews. Ethical approval was granted by the NT Health Department, Menzies School of Health Research and James Cook University.

Despite a modest decline in cannabis use in this population between 2002 and 2004 [40], the 2005–2006 data indicate persisting high rates, with 61% of males and 58% of females (aged 13–34 years) using cannabis at least weekly.

In a subsample of 60 cannabis users opportunistically recruited for in-depth interviews in 2005–2006 (37 male and 23 female; aged 13–42 years), 92% of males and 78% of females used cannabis daily; 88% reported cannabis dependence symptoms.

These figures appear to be far higher than national rates, although national data for similar age groups are not available [2] [11]. Research has found that, nationally, 6% of males and 3% of females (aged ≥ 14 years) reported using cannabis in the past week; 18% of males and 13% of females smoked cannabis daily [2]; and 21% of adults (aged ≥ 18) using cannabis were dependent [11].

Beyond high rates of cannabis use in Arnhem Land communities, we also found local characteristics and perceptions that illustrate the drug's distinctive context of use (Figure 3.1). Quantities of cannabis used appear to be higher than in the general population; unemployment among users is higher; and violence related to diminished supply is common. One Indigenous community leader described attitudes to cannabis use: “... *if there's a bowl of it on the table, it is smoked until gone, morning to night*”. Interestingly,

some respondents reported that using cannabis prevents them from engaging in criminal activity (Figure 3.1). While key community members may believe that cannabis is a tool for social control – “good for calming down people” – they are increasingly recognising the significant social and mental health problems it causes:

People get chained by [cannabis], they don't go hunting with family ... lots of fights when they can't get any ... [Cannabis] becomes the boss.

Continued concerns about adverse mental health consequences for Aboriginal people in Arnhem Land who use cannabis seem to be warranted. Cannabis appears to be firmly entwined in these isolated communities in a manner not seen nationally. High levels of concurrent drug use, particularly tobacco, raise additional health concerns. Resources are urgently needed for prevention programs and targeted interventions for chronic cannabis users and those with psychiatric comorbidity. If these patterns of use continue, the implications for compounding of pre-existing mental illness and the potential mental health burden are disturbing.

Figure 3.1: Characteristics and perceptions of cannabis use in Arnhem Land Aboriginal communities (57 males and 49 females, aged 13–42 years*) in 2005–2006 compared with available national data from 1997† and 2004‡

National [11] [2]	Arnhem Land*	National [11] [2]	Arnhem Land*
Number of cones smoked		Per cent unemployed current users / daily users	
3.2 (average per day) ‡	7.4 (average per occasion)	25.6%* / nd	60% / Males, 41%; females, 94%
Concurrent drug use		Motivations for use	
Alcohol (86.2%); stimulants§ (8.2%–27.9%); none (10.8%); analgesics (6.6%); antidepressants (5.7%); tranquillisers/sleeping pills (4.4%); other (3.9%)‡	Tobacco (100%); alcohol, restricted access (40%); kava (15%); petrol (5%)¶	nd	Socialisation (tempted, lonely, copying friends); mood altering (“calms me down”, “gets me going in the morning”, “makes my mind straight”); drug substitution (from alcohol or petrol); prevents criminal activity (stealing or other trouble)
Drug substitution (when cannabis unavailable)		Motivations for ceasing/moderating use	
Alcohol (60.4%); no substitution (34.2%); ecstasy/designer drugs (1.3%); painkillers/analgesics (0.8%); tranquillisers/sleeping pills (0.5%); heroin (0.3%); antidepressants (0.2%); cocaine/crack (0.1%); other (1.1%)‡	No substitution (83%); kava (7%); alcohol (5%); petrol (5%)¶	nd	Limited supply; starting a family (females); “sick of fighting when cannabis runs out”; “made me sick”; “mind not straight”; expenses and time spent looking for cannabis; employment (males)

* Self-report interview data from an opportunistically recruited sample (using age and sex quotas) of respondents, including people who had never used cannabis as well as current and former cannabis users.

† People aged ≥ 18 years [11].

‡ People aged ≥ 14 years [2].

§ Including ecstasy.

¶ There have been no reliable reports of stimulant, benzodiazepine or barbiturate use in these communities.

nd = data not available.

3.2 Publication # 3: Five year longitudinal study of cannabis users in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia.

Lee KSK, Conigrave KM, Clough AR, Dobbins TA, Jaragba MJ, Patton GC. Five year longitudinal study of cannabis users in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2009 (in press).

The published version of this manuscript is included as Appendix C.3 of this thesis. It differs from the work presented in this chapter that:

- The figure used in this chapter has been integrated into the main list of figures of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

Publication # 3: Five year longitudinal study of cannabis users in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia

Introduction and aims: to examine predictors of cannabis use at five year follow-up in an Australian Aboriginal cohort.

Design and methods: a longitudinal study consisting of two waves of data collection five years apart was conducted. Of 100 Aboriginal residents (aged 13–36) interviewed about cannabis use in 2001, 83 were re-interviewed in 2005–2006 from three remote communities in Arnhem Land, Northern Territory, Australia. Self-reported cannabis use was categorised at each time point (none; former use, quit \geq 3 months; lighter use, < 6 cones, 2–3 times weekly; daily use, \geq 6 cones, daily) and summarised as any current use, heavy use, dependence or cessation. Other substance use, employment and involvement in school or training were also compiled.

Results: most respondents who reported cannabis use at baseline again reported use at follow-up. A history of petrol sniffing predicted later heavy use ($P < 0.05$). Trends were evident for males to have persisting cannabis use, and for employment and/or engagement in school or training to be associated with cannabis cessation.

Discussion and conclusion: ongoing heavy cannabis use is commonplace in this Aboriginal cohort and raises concerns for the physical, social and psychiatric burden on these already vulnerable communities. Prevention, treatment and intervention programs developed with communities are badly needed.

Introduction

Cannabis is the most commonly used illicit drug world wide with 160 million users, equivalent to 3.8% of the world's population (aged 15–64) [1]. Indigenous people commonly have higher levels of use than their non-Indigenous counterparts. Cannabis prevalence is higher among Canada's First Nation population (aged ≥ 18) than other Canadians (aged ≥ 15 ; 26.7% versus 14.1%) [65] [86], among North America's Indigenous population than other Americans (aged ≥ 12 , 13.5% versus 10.6%) [66] and among Maori compared with non-Maori New Zealanders (aged 13–65; 20.8% versus 14.0%) [64].

In Australia, national household surveys suggest that Aboriginal and Torres Strait Islander (Indigenous) Australians (aged ≥ 15) have higher rates of cannabis use compared with the remainder of the population (aged ≥ 14 ; 23% use in past 12 months versus 9.1%) [3] [30]. Similarly in Albany, Western Australia (WA), cannabis use by Aboriginal young people (aged 14–19) was nearly twice as common as for the same age group nationally (29.5% versus 17.9%) [33]. So too a state-wide survey of secondary students (aged 12–17) from 143 schools in New South Wales found that weekly cannabis use was higher among Indigenous students than non-Indigenous (24% versus 10%) [34]. However, a state-wide survey of WA Aboriginal young people (aged 12–17) showed only a weak trend for cannabis use (in the past week) compared to Australian students (aged 12–17) in a national school survey (11.9% versus 9.0%) [35].

Among Aboriginal populations in Arnhem Land, Northern Territory (NT), Australia, very high prevalence of cannabis use has been documented (72% males, 23% females; aged 13–36) [39] [63]. In a number of NT Aboriginal communities, cannabis is viewed as a major cause of social disruption [63] [41] [42] [43] and linked with considerable financial burdens [39], acts of violence by users when cannabis supplies are scarce [63] [41] and mental disorders including depression [67].

In longitudinal studies among non-Indigenous populations, cannabis use typically begins during mid adolescence and ceases in early adulthood, with the heaviest use in those aged 19–22 [23]. Risk of progression of cannabis use to dependence is increased with frequency of use [4]. Among young people, weekly or more frequent use is a predictor of both continued use [25] and dependence [26]. Men were more likely to exhibit continued adolescent use in a New Zealand birth cohort [27] but not in an Australian cohort [25]. Younger Australian and New Zealand men were more likely than

women to become dependent [26] [27]. Among adolescent cannabis users, daily tobacco smoking predicted subsequent cannabis use [25]; drinking five or more standard drinks per day predicted subsequent cannabis use among women [25]; and peer consumption of cannabis predicted later use among men [25] [27] and among New Zealand women [27].

Our Arnhem Land studies provide the only published longitudinal data describing cannabis use among Aboriginal Australians (community sample; aged 13–36 at baseline) [40]. This current paper explores the natural history of cannabis use in this cohort examining predictors of continued use, heavy use, dependence or cessation among baseline cannabis users.

Methods

Setting

About 630 km east of Darwin (NT), three Aboriginal communities and smaller single-family 'outstation' settlements have a combined population of around 1,700. Although living near a mining town with 1,000 non-indigenous residents, these Aboriginal people generally live within their traditional cultural paradigm. One Aboriginal language is spoken. English is a secondary language and skills in English vary. Cannabis is typically consumed blended with tobacco using a 'bucket bong' [39]. Further study setting details have been provided elsewhere [39] [40].

Sample

Between October 2001 and June 2005–2006, we conducted a five year longitudinal study of cannabis use. These data form part of a larger study that includes an intervening wave of interviews (2004) [40]. The three year follow-up data (2004) were not included in these analyses as only 49% of the subjects from baseline were able to be re-interviewed. In addition, cannabis dependence was not a focus of this wave, and responses on only five out of seven criteria were sought.

Recruitment and follow-up: at baseline (2001), 162 subjects were randomly selected from patient lists compiled in the three communities' health clinics. Only 50 (31%) were interviewed because of high population mobility. To supplement this group, an additional 60 respondents comprising clinic attendees and general community members were opportunistically recruited by Aboriginal health workers (total N=110). By follow-up (2005–2006), four subjects had died and after data cleaning one duplicate record and five incomplete baseline records were removed, leaving 100 eligible records

with complete cannabis data at baseline (N=100). At follow-up, 83 interviews were conducted comprising 83% of respondents interviewed at baseline (Table 3.2.1).

One hundred and twelve respondents were not able to be recruited for interview at baseline in the random sample. There was no difference in the sex of those who were recruited and those who were not ($\chi_1^2=0.06$, $P=0.81$). However, respondents located for interview at baseline were older than those not successfully enrolled (mean age of 21 years versus 17 years; $t=-2.871$, $P=0.005$).

Assessment

In-depth interviews were conducted face-to-face using the local Aboriginal language and plain English by AC (baseline) or KL (follow-up) and assisted by MJ or other local Aboriginal research staff. A private outdoor space was usually available with interviews typically conducted within close proximity of routine family activity. Alternative interview locations included an air-conditioned vehicle or private office at the health clinic or council. Interview duration was 10–50 minutes.

Demographic factors: age was verified using clinic patient lists. Current involvement in school, training and employment were identified from self-report at both time points and combined (no involvement in education or employment versus involvement in education or employment).

Cannabis use – both time points: we enquired into current use (in the previous 12 months), lifetime status, frequency of use (never, tried once, former, monthly, 2–3 times weekly, daily), the number of cones used per session and attempts made to moderate use.

In 2005–2006, symptoms of cannabis dependence were assessed by self-report in those who reported current cannabis use. The DSM-IVR diagnostic criteria were formulated into questions [9]. A cut-off of ≥ 3 (out of a possible 7) criteria experienced in the previous 12 months indicated likely presence of dependence.

Other substance use – both time points: current (in the previous 12 months) and lifetime substance use status for tobacco, alcohol, kava and petrol sniffing were enquired into. Amounts of alcohol, kava and petrol used could not be assessed accurately since alcohol access is tightly restricted and kava and petrol availability varies, so their use tends to be opportunistic and episodic. Since further quantification

was not feasible, subjects were classified only as users or non-users. Similarly, tobacco smokers were classified as smokers or non-smokers as the norm of cigarette sharing makes quantification challenging. Lifetime petrol sniffing data at baseline were missing. The local substance misuse department and Aboriginal health workers advised that there was little change in the number of new petrol sniffers between baseline and follow-up. Accordingly, self-reported history of ever sniffing petrol at follow-up was used as proxy for baseline.

Derived variables, analysis and ethical approvals

Smoking six or more cones per session was defined as the threshold for high level cannabis use based on perceptions of local community leaders. Subjects were also classified as heavy users if they were high level cannabis users and reported: being up all night smoking, spending a lot of time looking for either more cannabis or money to purchase it, compulsion to use in the morning and difficulties stopping use. Four cannabis use categories were defined: lifetime abstainers; ex-users (quit ≥ 3 months); lighter users (< 6 cones, 2–3 times weekly); and heavy users (≥ 6 cones, daily). No daily users reported smoking < 6 cones per session and of those who smoked two to three times weekly, none reported six or more cones per session.

Logistic regression was used to assess factors among baseline cannabis users (N=49) which predicted the binary outcomes of current cannabis use, heavy cannabis use, cannabis dependence or cessation at follow-up. Initial multivariable analyses controlled for the influence of age (baseline) and sex with one additional potential confounder (baseline factors: current tobacco use, current alcohol use, past petrol sniffing, involvement in education or employment). In addition, the associations between cannabis use behaviour at follow-up and other follow-up variables of interest were assessed using similar analyses. Further multivariable analyses controlled for age, sex, other substance use and involvement in education or employment. Numbers for whom complete data are available changes according to the analyses conducted. For example, cannabis dependence questions at 2005–2006 were only available for those who reported current cannabis use (N=34).

Analyses were performed with Stata 9.2 (Stata Corporation, College Station, TX, USA). Ethical approvals were granted from the Human Research Ethics Committee of the NT Health Department, Menzies School of Health Research and James Cook University.

Results

Sample characteristics

Of the 100 subjects who were interviewed at baseline, 83% were successfully re-interviewed at 2005–2006, and comprised of 47% of men and a median age of twenty-eight years. Those lost to follow-up (17%) were predominantly male (59%) and younger (median age of 24 years). Given the small numbers of those not followed up, almost all comparisons with those who were re-interviewed showed non-significant differences, such as in the prevalence of cannabis use (53% of those who were lost to follow-up versus 64% of those re-interviewed; $\chi_1^2=0.71$, $P=0.40$). For the whole cohort, at baseline, 62% (63% males and 61% females) were cannabis users.

Baseline non-users

Of the 83 respondents at baseline for whom follow-up data were available, 30 (36% males, 36% females) were non-users. By follow-up, 36 (43% males, 44% females) of the baseline non-users had initiated cannabis use. Compared with those who remained non-users at follow-up, respondents who initiated cannabis use were more likely at baseline to report using tobacco (100% of cannabis users versus 65% of non-cannabis users; $\chi_1^2=5.74$, $P=0.02$) and alcohol (31% versus 29% respectively; $\chi_1^2<0.01$, $P=0.94$) and to have a history of petrol sniffing (38% versus 24%; $\chi_1^2=0.78$, $P=0.38$). There was a non-significant trend for them to be less likely to be involved in education or employment at baseline (31% versus 53%; $\chi_1^2=1.47$, $P=0.23$). Low numbers did not permit regression analyses.

Baseline users

Further analyses were restricted to those subjects who were cannabis users at baseline and for whom follow-up data was available (Table 3.2.2 and Table 3.2.3). Small sample size prohibited some models from being computed.

Any cannabis use at follow-up: of the 49 cannabis users at baseline, 31 (76% males, 54% females) remained users at follow-up. Neither age nor sex was significant predictor of any cannabis use at follow-up in univariate analyses ($P=0.56$ and $P=0.10$, respectively). When examining the effect of age, sex and one additional possible confounder, only past petrol sniffing posed a borderline significant risk of continued cannabis use, with past sniffers more likely than non-sniffers to report later cannabis use ($P=0.05$). This association remained after adjusting for all possible confounders ($P=0.04$).

Heavy cannabis use at follow-up: nearly three in five (57%, N=30; 57% males, 57% females) baseline cannabis users and 55% (N=27, 67% males, 46% females) of cannabis users at follow-up reported heavy use (≥ 6 cones, daily). Neither age nor sex was significant predictor of heavy use at follow-up in univariate analyses ($P=0.83$ and $P=0.17$, respectively). When examining the effect of age, sex and one additional possible confounder, only past sniffing posed a significant risk with past sniffers more likely than non-sniffers to report heavy use at follow-up ($P=0.02$). This association remained after adjusting for all possible confounders ($P=0.02$).

Cannabis dependence at follow-up: of the 49 cannabis users at baseline who reported cannabis use at follow-up, 34 had full data available for all predictors of interest. Of these, nearly nine in ten (88%; 76% males, 54% females) reported three or more dependence symptoms. The most commonly reported symptoms were persistent desire or unsuccessful efforts to control use (82%, 28/34) and withdrawal (79%, 27/34), considerable time spent obtaining cannabis or recovering from its effects, tolerance and difficulties controlling use (each 71%, 24/34), neglecting other activities (62%, 21/34) and continued use despite adverse consequences (12%, 4/34).

Neither age nor sex was significant predictor of three or more dependence symptoms at follow-up in univariate analyses ($P=0.40$ and $P=0.47$, respectively). When examining the effect of age, sex and one additional possible confounder, no factors predicted the likelihood of dependence.

Cannabis cessation by follow-up: of the 43 cannabis users at baseline for whom data for all predictors of interest were available, 28% (16% males, 38% females) had ceased use by follow-up. Neither age nor sex was significant predictor of cessation at follow-up in univariate analyses ($P=0.39$ and $P=0.11$, respectively). When examining the effect of age, sex and one additional possible confounder, no baseline factors predicted the likelihood of cessation at follow-up. There was a non-significant trend for respondents who reported cessation at follow-up to be more likely than continuing users to also be involved in education or employment at follow-up ($P=0.21$).

One former user highlighted the positive influence of employment on achieving abstinence:

Before I was smoking a lot of cannabis all day, staying at home and doing nothing, ...I gave up cannabis six months ago after I got a job, now I am

working instead of smoking cannabis...and feel good about myself. (Female, follow-up)

Of the continuing users at follow-up (N=31) for whom data were available at baseline, more than seven in ten (77%; 69% males; 87% females) reported an intention to moderate their cannabis use.

Discussion

This is the first published study describing influences on the natural history of cannabis use in an Australian Aboriginal cohort. One previous study demonstrated persisting high cannabis use prevalence in these same study communities over three years [40]. In the current five year follow-up study, most of those who reported cannabis use at baseline again reported current use at follow-up, with past petrol sniffing a key predictor of heavy use at 2005–2006. There was a small sample size, but a consistent trend emerged for males to have persisting cannabis use. Among cannabis users at follow-up, a high proportion were cannabis dependent.

In non-Indigenous populations cannabis use typically ceases by late twenties [23]. In this study, respondents who reported cessation were more often older (aged ≥ 25) than younger (13–24); however, fewer users reported cessation. The average age of heavy users at follow-up was thirty years. Men tended to be at increased risk of later cannabis use, consistent with longitudinal studies of general populations [27]. The association between petrol sniffing and subsequent cannabis use in baseline cannabis users has not been previously reported.

We did not examine the role of peer consumption as a risk factor for continued cannabis use [25] [27]. However, with the high prevalence of cannabis use in these communities [40], many respondents would have peers who use cannabis and one described difficulties in moderating their use because of constant ‘cue exposure’:

I have thought about quitting, I want to, but don't know how and it's hard when other people use it around me and I get that smell all the time pulling me back [to cannabis]. (Male, follow-up)

The proportion of users who reported three or more dependence symptoms appears much higher than for other Australians (88%, aged 13–42 versus 21% [DSM-IVR], aged ≥ 18) [11]. The high prevalence of dependence symptoms is consistent with the

high frequency and quantity of cannabis use in these remote communities [63] [4]. There are no comparable studies investigating cannabis dependence among Indigenous Australians. This high prevalence of heavy and dependent use may have parallels with studies of alcohol use among Indigenous Australians which demonstrate a polarisation of drinking, with most drinkers being either heavy drinkers or abstainers and there being few moderate drinkers [87] [88].

Several limitations of this study need acknowledging. A combined sampling strategy was necessary in these remote communities where populations are small and highly mobile. Hence, only part of the interview sample was randomly selected with the remainder opportunistically recruited. However, age and sex quotas were used to recruit additional interviewees, and at follow-up 12% of the population in the targeted age groups were interviewed. Cannabis use was measured as a snapshot at each time point, so we are unable to determine what happened between interviews. However, the consistency of high cannabis use prevalence [12] [40] suggests that subject to supply availability, it is likely that use was maintained between interviews. Small sample sizes may have contributed to a majority of findings being non-significant.

It is important to consider in these remote communities why only a quarter of users from baseline had ceased cannabis use by follow-up. In non-Indigenous populations, it is common to see cannabis cessation with life transitions such as starting a family and employment [22]. In addition to frequent social exposure to cannabis, other social factors likely to perpetuate cannabis use include the lack of education or employment opportunities [22]; social disadvantage (median weekly individual income \$160–199 [79]); high prevalence of mental health problems [67] and recurrent experience of grief and loss associated with high rates of mortality, morbidity and imprisonment [57]. Many of these confounders were not able to be measured, as well as others such as stress, violence and cultural discontinuity. These are relatively common in Australian Aboriginal populations and may contribute to continued cannabis and other substance misuse [30] [89].

Our findings show that past petrol sniffers are more likely than non-sniffers to report ongoing cannabis use; however, we cannot comment on the direction of this association. For example both petrol sniffing and later cannabis use may have been secondary to the same cluster of underlying mental health concerns and social stressors [48]. Alternatively, there may be residual cognitive impairment or other effects from past sniffing. This finding has important policy and service delivery implications.

Unless the social determinants of substance use and poor mental health are addressed, users may simply substitute one drug for another [48] [56].

Persistent cannabis use and dependence symptoms are commonplace in this Aboriginal cohort and raise concerns for the physical, social and psychiatric burden on these vulnerable communities [41] [42] [67]. Further longitudinal studies will improve our understanding of the natural history of cannabis use in Indigenous populations and assist to develop targeted prevention and treatment programs. Such interventions need to be community-driven using local Indigenous language and concepts [57] [68], and incorporate training and employment components to support positive lifestyle changes [56] [90].

A considered and 'ground-up' approach that nurtures local professional skills [91] should accompany any initiative seeking to tackle substance misuse in remote Australia [48] [63]. Investments in locally-developed models to improve health literacy [92] and specifically to acquaint young people with harms related to cannabis misuse are important [93] [94] [95]. Policies need to promote cannabis cessation and prevent uptake including continued supply reduction measures [96] [43], while also more broadly promote community and individual wellbeing.

Table 3.2.1: Demographic characteristics of interview participants at baseline (N=100), and wave 3 (N=83) in three Aboriginal communities in Arnhem Land, Northern Territory, Australia

Characteristic	2001		2005–2006	
	N	Percent	N	Percent
Male	51	50%	44	47%
Age groups (years):				
13–19	36	36%	14	17%
20–24	21	21%	24	29%
25–29	18	18%	20	24%
≥ 30	25	25%	25	30%
Employment:				
Full-time*	16	16%	23	28%
Part-time†	23	23%	10	12%
Unemployed	61	61%	50	60%
Having income support‡	36	36%	49	59%
Attending school or training	25	25%	13	17%

* Including full-time involvement in Community Development Employment Projects (an Australian Government funded initiative for unemployed Indigenous Australians).

† Involvement in regular Community Development Employment Projects.

‡ Pension, unemployment benefits, youth allowance.

Table 3.2.2: Predictors of cannabis use at follow-up among those who reported current cannabis use at baseline, in three Aboriginal communities in Arnhem Land, Northern Territory

Cannabis use status at follow-up:	Characteristics at baseline: [OR (95%CI) P-value]					
	Age*	Sex*	Current tobacco use**	Current alcohol use**	History of petrol sniffing**	Current employment or involvement in school or training**
Any cannabis use ¹	0.7 (0.20–2.37) P=0.56	2.9 (0.81–10.16) P=0.10	0.56 (0.08–3.82) P=0.56	1.2 (0.15–9.36) P=0.89	3.9 (1.02–15.62) P=0.05‡	0.7 (0.16–3.01) P=0.62
Heavy† cannabis use ²	1.1 (0.36–3.64) P=0.83	2.3 (0.70–7.40) P=0.17	1.0 (0.17–5.92) P=0.99	1.0 (0.16–6.20) P=0.99	4.4 (1.21–15.80) P=0.02‡	0.7 (0.18–3.00) P=0.67
Dependence ³ §	0.4 (0.03–3.93) P=0.40	0.4 (0.04–4.59) P=0.47	UC	UC	1.1 (0.13–9.46) P=0.92	UC
Cessation ⁴	1.9 (0.45–8.10) P=0.39	0.3 (0.06–1.31) P=0.11	UC	0.6 (0.04–7.76) P=0.67	0.4 (0.10–1.88) P=0.27	1.2 (0.23–6.61) P=0.80

* Unadjusted odds ratios for age (at baseline; reference category: age = 13–24, comparison group: age ≥ 25) and sex (reference category: female).

** Adjusted odds ratios adjusting for age and sex.

† ≥ 6 cones, daily.

‡ P-value < 0.05.

§ ≥ 3 dependence symptoms (DSM-IVR).

UC Unable to compute, due to small sample sizes.

¹ In this analysis, N=49.

² In this analysis, N=49.

³ In this analysis, N=34.

⁴ In this analysis, N=43.

Table 3.2.3: Cannabis use status and its association* with involvement in employment or education at follow-up among those who reported cannabis use at baseline, in three Aboriginal communities in Arnhem Land, Northern Territory

Cannabis use status at follow-up:	Current employment or involvement in school or training at follow-up
Any cannabis use ¹	0.4 (0.09–2.04) P=0.29
Heavy† cannabis use ²	0.7 (0.18–2.99) P=0.67
Dependence ^{3‡}	UC
Cessation ⁴	3.4 (0.51–22.27) P=0.21

* Adjusted odds ratio adjusting for age (at baseline; reference category: age = 13–24, comparison group: age ≥ 25) and sex (reference category: female).

† ≥ 6 cones, daily.

‡ ≥ 3 dependence symptoms (DSM-IVR).

UC = unable to compute; other substance misuse models were unable to be computed due to small sample sizes.

¹ In this analysis, N=49.

² In this analysis, N=49.

³ In this analysis, N=34.

⁴ In this analysis, N=43.

4. CANNABIS USE AND DEPRESSIVE SYMPTOMS

In the previous chapter, results were presented about patterns and natural history of cannabis use in three remote Indigenous communities in Arnhem Land. The principal finding was that problematic cannabis use observed at baseline (2001) appears to have maintained at five years (2005–2006) [63] [97]. Cannabis use prevalence is high (61% of males and 58% of females, aged 13–34; in the previous 12 months), daily cannabis use is predominant (92% of males and 78% of females; aged 13–42), and just under nine in ten current users (88%; aged 13–42) report symptoms of cannabis dependence (≥ 3 symptoms, DSM-IVR) [63].

After five years of follow-up, a majority of users from baseline report continued cannabis use (76% of males, 54% of females; aged 13–36 at baseline) [97]. Past petrol sniffing among baseline cannabis users is also a key predictor of heavy cannabis use (≥ 6 cones, daily) at follow-up [97].

Patterns of heavy cannabis use raise concerns for psychiatric comorbidity [17] [4]. However, no studies were able to be located that examine the association between cannabis use and depression in any Indigenous population worldwide. This chapter will investigate this association by drawing together two publications.

The first publication focuses on Indigenous Australians to consider the potential contribution of cannabis to depression, and the implications of this for research, service planning and policy.

Secondly, cross-sectional findings are presented to investigate the association between heavy cannabis use (≥ 6 cones, daily) and moderate–severe depressive symptoms⁴ (as measured on a modified PHQ-9 scale [69]). These findings were disseminated to the study communities in the form of a short film on cannabis and mental health by the Aboriginal Mental Health program and local Indigenous film students (Appendix G).

⁴ *Awerrikbarrngwarrnga* means depression in the Indigenous language spoken in the study communities. It describes a feeling or emotion and comes from the words *awerrik* (inside the chest) and *barrngwarrnga* (a very heavy and deep intense sadness). This concept is not naturally occurring. Extensive community discussion led by the Aboriginal Mental Health program was conducted to identify an equivalent word in the local language.

4.1 Publication # 4: Does cannabis use contribute to depression in Indigenous Australians?

Lee KSK, Conigrave KM, Patton GC, Clough AR. Does cannabis use contribute to depression in Indigenous Australians? *Transcult Psychiatry*, 2008 (submitted, revisions requested).

The submitted version of this manuscript is included as Appendix C.4 of this thesis. It differs from the work presented in this chapter in that:

- The references for this chapter have been integrated into the main reference list of the thesis.

Publication # 4: Does cannabis use contribute to depression in Indigenous Australians?

Objective: this paper focuses on Indigenous Australians to consider the potential contribution of cannabis to depression, and the implications for research, service planning and policy.

Method: leading electronic databases were used to source studies of the association between cannabis use and depression among Indigenous populations worldwide. Studies among Indigenous peoples from New Zealand, Canada and North America were included, and key longitudinal studies and review papers on non-Indigenous populations from Australia, New Zealand, Canada, North America, Europe and the United Kingdom. In addition, relevant monographs, technical reports and other literature on Indigenous Australians were accessed including policy documents on cannabis use, depression, co-morbid substance use and mental disorders, and on social and emotional wellbeing.

Results: high levels of cannabis use and poor mental health are evident among Indigenous Australians. However, the available data describing prevalence of cannabis use and depressive disorders, and the association between cannabis and depression in this population, are limited. Patterns of heavy cannabis use observed in other First Nation populations also raise concerns for psychiatric comorbidity.

Conclusions: studies of interventions including strategies to prevent use, to promote cannabis cessation, and address mental disorders are urgently needed, along with improved data on the prevalence, nature and course of cannabis use and mental disorders among Indigenous Australians and other Indigenous populations. Current mental health and substance misuse services for Indigenous Australians are often grossly under-resourced. Policies need to allow for better integration of these services, and to develop frameworks to build capacity of local Indigenous staff.

Introduction

Aboriginal and Torres Strait Islander (Indigenous) Australians are 4–5 times more likely than other Australians to be hospitalised for mental or behavioural disorders due to psychoactive substance use [98]. Rates of hospitalisation for mental and behavioural disorder are 22 per 1,000 for Indigenous Australians, compared with 13 per 1,000 for their non-Indigenous counterparts [98]. High levels of cannabis use are linked to significant social disruption in remote Indigenous Australia [43] [41] [42] [44] [63] [45]. Considerable financial burdens have been described by users and their families with large amounts of money used to purchase cannabis [41] [42] [39], and violence towards people or property by users when cannabis supplies are scarce [41] [42] [44] [63].

Mental disorder and depression in Indigenous Australians

Mental health problems are common in Indigenous Australians [99] [30] [41]. Suicide rates for Indigenous females (aged 0–24) are five times higher than their non-Indigenous counterparts, and for Indigenous males, three times higher [30]. High levels of violence, incarceration and physical illness in Indigenous Australians are also common and may contribute to poor mental health [99] [30] [100]. Marginalisation, loss of control and challenges to cultural continuity seen in Indigenous populations [57] [89] are further social factors believed to contribute to mental disorders [89] [101] and substance misuse [101].

One cross-sectional study of remote Indigenous communities in Arnhem Land, Northern Territory (NT, Australia) found high levels of moderate–severe depressive symptoms, with nearly one third of females (31%) and one in six males (18%), in those aged 13–42, reporting symptoms in the previous fortnight (Patient Health Questionnaire-9, PHQ-9; modified using local Indigenous language and concepts) [67].

Cannabis misuse in Indigenous people

Few data are available to describe prevalence and patterns of cannabis use among Indigenous Australians [5] and this is the case in other similarly-situated Indigenous populations. Cannabis use is higher among Indigenous Australians (aged ≥ 15) compared with other Australians in national household surveys (aged ≥ 14 ; 23% versus 9.1%; for use in the previous 12 months) [3] [30]. Similar contrasts are evident in First Nation populations in Canada compared with other Canadians (aged ≥ 15 ; 26.7% versus 14.1%) [65], North America's Indigenous population compared with other

Americans (aged ≥ 12 , 13.5% versus 10.6%) [66], and Maori compared with non-Maori New Zealanders (aged 13–65; 20.8% versus 14.0%) [64].

Community, state and territory-wide surveys also demonstrate higher levels of cannabis use among Indigenous Australians. In a regional town in Western Australia (WA), Aboriginal young people (aged 14–19) were nearly twice as likely to report cannabis use than non-Indigenous young people in the rest of Australia (29.5% versus 17.9%; aged 14–19) [33]. A survey of students (aged 12–17) from 143 schools in New South Wales found weekly cannabis use more common among Indigenous students than their non-Indigenous counterparts (24% versus 10%) [34]. However, a state-wide survey of WA Aboriginal young people (aged 12–17) found that use (in the past week) was similar to other students (aged 12–17) nationally (11.9% versus 9.0%) [35].

From 2001, in remote Arnhem Land communities (NT), very high cannabis use prevalence has been documented (72% of males, 23% of females; aged 13–36 in 2001) [39]. Regular heavy daily use (≥ 6 cones, daily) is reported by nearly 90% of users [67]. This is around twice the consumption of regular cannabis use in the general population [2]. In keeping with this, nearly nine in ten users report symptoms of cannabis dependence (DSM-IVR) [63]. In other Australians, around 20% of recent users are cannabis dependent (aged ≥ 18) [11]. Furthermore, in these remote communities it appears that cannabis use is not a passing adolescent phase. More than six in ten respondents reported continuing heavy use at five year follow-up and the median age of continuing users was 30 years [97].

Cannabis use and mental disorders in non-Indigenous populations

A growing number of studies have investigated links between problematic cannabis use and mental disorders in non-Indigenous populations, including psychotic illness [14] and depression [14] [17]. Depressive disorders appear to occur more frequently among problematic cannabis users compared with non-users in large representative population surveys of adults (aged ≥ 18 ; 14% of dependent users versus 6% of non-users) [15], and adolescents (aged 13–17; 14% male users versus 6% male non-users, 18% of female users versus 6% of female non-users) [16]. Some longitudinal studies are demonstrating links between cannabis use and subsequent depression, particularly in those with weekly or more frequent cannabis use [17] [18] [19]. However, disentangling cause and effect is difficult. It is not clear whether cannabis use leads to depression, or if the association can be explained by common risk factors such as other substance use [14] [17]. There appears to be little support for a 'self-medication'

hypothesis [17], although a recent meta-analysis suggested that more studies need to examine this 'reverse causation' [14]. Few comparable studies have been conducted in Indigenous populations worldwide.

Does cannabis have a role in depression in Indigenous Australians?

Considerable mental health burdens are linked to cannabis misuse in some remote communities as described by one Indigenous mental health clinician in the NT:

I see this every day in my clients and family members and other community people. Our people are being gripped by that [cannabis] and it makes them [depressed], sad and heavy. That [cannabis] has chained them up.

Yet, studies of the association between cannabis use and depressive disorders among Indigenous populations are rare [67] [46]. In one Arnhem Land (NT) study, heavy cannabis users (≥ 6 cones, daily) were four times more likely than never, former and lighter users to report moderate–severe depressive symptoms after controlling for age, sex and other substance use [67]. Analyses differentiated depressive symptoms from those of cannabis intoxication. However, only cross-sectional associations between depression and cannabis use were examined.

Although the contribution of cannabis use to the overall number of depression cases in the general population may be modest [17], an association is most likely observed in those with problematic cannabis use [17]. What accounts for the strong association between cannabis use and depression in Indigenous Australians? Heavy and weekly or more regular cannabis use is the predominant pattern, consistent with the dose-response relationship between cannabis and depression observed in longitudinal studies of non-Indigenous populations [14] [17]. Alcohol restrictions that have been effective in some NT communities in reducing problem drinking may have also increased demand for cannabis use [39] [44]. Other factors that are relatively common in Indigenous Australian populations may impact on the severity of depressive symptoms [35] [99] [47] [89] [102] [103] and propensity to use cannabis [30] [47] [48], such as trauma, violence, grief and loss related to high mortality, morbidity and incarceration, limited employment and educational opportunities, and crowded housing of poor quality. Both cannabis use and mental disorders are likely to be consequences of this context as well as a perpetuating influence.

Policy implications

There is a dearth of published studies and few available data describing the association between cannabis use and depression among Indigenous populations worldwide. The high levels of cannabis use and its associations with poor mental health that are highly visible in an Australian context [67] [41] [42], along with heavy patterns of cannabis use reported in Indigenous populations elsewhere [65] [66] [64], raises concerns for psychiatric comorbidity [73], and suggests a need for further research in this area. Intervention studies are needed to progress the Australian Indigenous research agenda which has been dominated by descriptive studies [104]. Studies would need to incorporate community-driven prevention and treatment components with local Indigenous language and concepts [68], and target both cannabis use [48] and mental health [99] [105] [106]. Measurement of mental disorders needs to incorporate local Indigenous concepts [107] [57] [108].

Mental health and substance misuse services for Indigenous Australians are currently grossly under-resourced. In the communities where the studies by Lee and colleagues were conducted [67], three remote Indigenous communities with a population of 1700 were serviced by just one mental health worker and a small substance misuse team. This team was primarily staffed by workers with no prior training and 'employed' on the Community Development Employment Project (CDEP) or 'work for the dole' scheme. No on-site or easily-accessible psychiatrist, psychologist or addiction medicine specialists are available. Local agencies provide an excellent service in extremely difficult circumstances. Improved access to staff training and support are needed to nurture local Indigenous staff in these and other communities [57] [53]. Resources are needed to allow for integration of substance misuse and mental health services, and to support communities to work alongside local service providers and government to address the broader social determinants of health [105] [71] [48].

Investments in locally-developed models to improve the health literacy of communities [108] [92] of the harms associated with cannabis misuse are important especially for young people [93] [94] [95]. Cannabis use studies from remote Indigenous Australia (NT) [70] [38] [39] [46] have informed policing strategies targeting cannabis supply in remote NT communities [43]. However, demand reduction policies are also needed to compliment existing supply control initiatives [43], and to promote cannabis cessation and prevent uptake.

The implications of our findings for Aboriginal and Torres Strait Islander Australians and for First Nation populations elsewhere are i) high rates of problematic cannabis use are possible ii) high levels of psychiatric comorbidity are likely if high rates are evident, iii) policy makers need to encourage the necessary research and develop suitable intervention strategies.

4.2 Publication # 5: Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia

Lee KSK, Clough AR, Jaragba MJ, Conigrave KM, Patton GC. Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia *Med J Aust*, 2008;188:605-8.

The published version of this manuscript is included as Appendix C.5 of this thesis. It differs from the work presented in this chapter in that:

- The tables featured in this chapter have been integrated into the main list of tables of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

Publication # 5: Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia

Objective: to determine the extent to which depressive symptoms are associated with heavy cannabis use in an Aboriginal population in Arnhem Land, Northern Territory (NT).

Design, participants and setting: cross-sectional study involving interviews with 106 Indigenous participants (57 males, 49 females) aged 13–42 in three remote Aboriginal communities in Arnhem Land, NT, Australia.

Main outcome measures: measures of depressive symptoms (a raw score of ≥ 6 out of a possible 18 on a modified version of the Patient Health Questionnaire-9) and self-reported heavy cannabis use (≥ 6 cones, daily).

Results: after adjusting for other substance use (tobacco, alcohol and lifetime petrol sniffing), age and sex, heavy cannabis users were four times more likely than the remainder of the sample to report moderate–severe depressive symptoms (OR=4.1; 95% CI=1.3–13.4).

Conclusions: given its high prevalence in Indigenous populations, the development of clinical and prevention strategies for cannabis misuse are warranted.

Introduction

Mental health problems appear to be common in Australia's Indigenous population [99] [32] [41]. Compared with their non-Indigenous counterparts, suicide rates among Indigenous people aged up to 24 years are five times higher for females and three times higher for males [99]. High levels of violence, incarceration and physical illness may be contributors to poor mental health and suicide in Indigenous Australians [99] [32] [100]. In 2002, nearly a quarter (24%) of Indigenous people aged 15 years or more reported being victims of actual or threatened violence in the previous 12 months [32]. Moreover, marginalisation, loss of control and challenges to cultural continuity are also likely to play a role [101].

Heavy substance misuse is a further potentially modifiable contributor to high levels of mental disorder in Indigenous populations [99] [35]. Indigenous people are 4–5 times more likely than other Australians to be hospitalised for mental or behavioural disorders as a result of psychoactive substance misuse [98]. Despite growing links between cannabis and mental disorders, including psychotic illness [109] and depression [17] [4], its contribution to mental disorders in Indigenous people has until now been little studied.

A small proportion of the general Australian population use cannabis regularly for extended periods [4]. However, in the Arnhem Land Aboriginal communities that are the subject of this study, a high prevalence of cannabis use has persisted from 2001, with 61% of males and 58% of females aged 13–36 years in a random sample of 162 people reporting using cannabis at least weekly in 2005–2006 [63]. In comparison, of current Australian cannabis users, only 24% of males and 21% of females aged 14 years or older used cannabis weekly or more frequently [2]. In this study we explored the association between depressive symptoms and heavy cannabis use among Aboriginal people in Arnhem Land.

Methods

We studied three Aboriginal communities and smaller single-family 'outstation' settlements with a combined population of around 1700 in a location about 630 km east of Darwin. Although near a mining town with 1000 non-Indigenous residents, these Aboriginal people generally live within their traditional cultural paradigm with cultural concepts largely intact. A single Indigenous language is spoken across these communities. English is a second language and the people's skills in English vary.

This study was part of the third wave of a five year longitudinal study outlined below:

- In 2001, 162 people were randomly selected from patient lists compiled in the three communities' health clinics. Only 50 (31%) were interviewed in the study because of high population mobility. To supplement the interview group, an additional 60 respondents, comprising clinic attendees and general community members, were opportunistically recruited by Aboriginal health workers. All 60 were interviewed, bringing the total number of participants to 110.
- In 2004, 27 participants from the original random sample and 26 from the opportunistic sample were interviewed. An additional 20 people were opportunistically recruited, all of whom were interviewed [40].
- Data for this study were collected from 17 October 2005 to 30 June 2006, by which time four of the original 110 participants had died and one duplicate record had been removed (leaving 105 possible participants from 2001 and another 20 from 2004). There were 106 participants interviewed in total. They comprised 89 of the 105 possible participants from 2001 (85%; 43 males, 46 females) and 17 of the additional 20 recruits from 2004 (85%; 14 males, 3 females).

The 106 participants in this study were aged 13–42 years and represented 12% of the population in that age group in the three communities. The mean age of the 57 males was 27.0 years (SD, 7.5 years) and of the 49 females was 25.6 years (SD, 6.5 years). Characteristics of the study participants are shown in Table 4.2.1.

Ethical approval was granted by the Human Research Ethics Committees of Menzies School of Health Research, the NT Health Department and James Cook University.

Interviews

Interviews in the local Indigenous language and plain English were conducted by KSKL, MJJ and other local Indigenous research staff. A private outdoor space was usually available with interviews typically conducted in close proximity to routine family activity. Alternatively, interview locations such as an air-conditioned vehicle or health clinic consulting room were used. The duration of interviews was 15–50 minutes.

Cannabis use

We assessed the self-reported frequency and quantity of cannabis use in interviews. Smoking six or more cones per day was defined as heavy use, a level corresponding to local community leaders' perceptions of 'heavy' use. Participants were also classified as heavy users if they reported: being up all night smoking, spending a lot of time either looking for more cannabis or money to purchase it, compulsion to use in the morning and difficulties stopping use.

Four cannabis use categories were defined: lifetime abstainers; former users (quit 3 or more months prior); lighter users (less than six cones 2–3 times weekly); and heavy users (six or more cones daily). To compare the occurrence of depressive symptoms in the heaviest cannabis users with that in other respondents, a dichotomous measure distinguished those with the highest levels of cannabis use (six or more cones daily) from the remainder of the sample who were never, former and lighter users. We made this comparison because of literature linking heavy use with psychopathological disorder [17].

Other substance use and demographic factors

Self-reported current and lifetime substance use status (tobacco, alcohol, kava and petrol) were assessed and data for demographic characteristics including involvement in school or training and current employment status were compiled. Age was verified using clinic patient lists. Amounts of alcohol, kava and petrol used could not be assessed accurately since alcohol access is tightly restricted and kava and petrol availability varies, so their use tends to be opportunistic and episodic. As further quantification was not feasible, participants were classified as users or non-users. Tobacco smokers were classified as smokers or non-smokers because the common behaviour of cigarette sharing makes quantification challenging.

Depressive symptoms

A modified Patient Health Questionnaire-9 (PHQ-9) [69] was administered by the interviewer to assess depressive symptoms in the fortnight prior to interview. Modifications for local use were made in consultation with local Aboriginal health and mental health workers. Original response categories (never, several days, more than half the days, nearly every day) were simplified (never, a little, a lot). Scores of zero, one or two were allocated to the amended response categories. Cronbach's α coefficient was used to assess internal validity of the modified questionnaire ($\alpha=0.73$; 95% CI=0.47–0.98). Particular efforts were made to clarify whether self-reported depressive symptoms

occurred outside usual daily experience (e.g. lethargy versus tiredness after physical exertion). In the original PHQ-9, raw scores of ≥ 10 (out of a possible 27) indicated moderate–severe depression [69]. This equates to ≥ 6.6 (out of a possible 18) in the modified PHQ-9 we used. Accordingly, raw scores of ≥ 6 were used to indicate a moderate–severe threshold of depressive symptoms.

Statistical analysis

The association between moderate–severe depressive symptoms and heavy cannabis use was estimated by logistic regression, controlling for influence of confounding factors (age, sex and other substance use).

Results

Baseline comparisons of the randomly selected and opportunistically recruited interview samples showed no differences in sex, age, or heavy cannabis use (each $P > 0.1$). A greater proportion of males were lost to follow-up interview in 2005–2006 than females ($P = 0.02$), but there were no differences in baseline prevalence of heavy cannabis use ($P = 0.77$) or age ($P = 0.21$).

Concurrent substance use was common among heavy cannabis users who reported moderate–severe depressive symptoms, with 100% smoking tobacco, 47% (8/17) current alcohol drinkers and 6% (1/17) sniffing petrol. Among respondents without moderate–severe symptoms, concurrent substance use was also common, with 88% (71/81) smoking tobacco and a third (33%, 27/81) drinking alcohol.

Cannabis and depression

Just under a quarter of the sample (24%, 25/106; 31% of females, 15/49; and 18% of males 10/57) reported symptoms indicative of moderate–severe depression (raw score on the modified PHQ-9 of ≥ 6).

One in seven (15%, 8/54) of the never, former and lighter users reported moderate–severe symptoms, compared with one in three heavy users (33%, 17/52).

Table 4.2.2 shows that heavy cannabis users were nearly three times more likely to report moderate–severe depressive symptoms than the remainder of the sample (OR=2.8; 95% CI=1.1–7.2; Table 4.2.2). The association was similar in females (OR=4.9; 95% CI=1.3–17.9) and males (OR=4.2; 95% CI=0.8–21.7). After controlling for potential confounders (age, sex, current alcohol and tobacco use and lifetime petrol sniffing), the

association strengthened (OR=4.1; 95% CI=1.3–13.4). No significant interactions were found with sex or other substance use.

Restricting the analysis to symptoms that are associated with depression, but unlikely to be associated with cannabis intoxication (i.e. anhedonia, depression, worthlessness and suicidal ideation), mean total scores for heavy users were significantly higher than those of the never, former and lighter users (P=0.02).

Discussion

We found a strong association between heavy cannabis use and moderate–severe depressive symptoms in this Indigenous Arnhem Land community sample. Rates of depression were high, with nearly a third of females and one in six males reporting moderate–severe symptoms. There are no similar data published reporting the prevalence of depressive symptoms and their associations with cannabis use in any Indigenous sample worldwide. Consistent with studies in non-Indigenous populations, the association between cannabis and depressive symptoms was clearest in heavy cannabis users [18] [15] and remained after controlling for potential confounders including other substance use.

Several limitations of this study should be noted. A combined sampling strategy was necessary in these remote Indigenous communities where populations are small and highly mobile. Although those interviewed comprised 12% of all males and females in the 13–42 years age group, only part of the sample was randomly selected with the remainder being opportunistically recruited. It is therefore possible that the presence of depressive symptoms may have influenced participant recruitment in some way. We adapted the PHQ-9 (a widely validated measure of depressive symptoms) [69] with the assistance of local Aboriginal health and mental health workers to ensure the instrument's suitability in the local context and across age groups. A specific validation study was not undertaken after modifications were made, although the internal consistency of the instrument suggests reliability. It nevertheless remains possible that the construct assessed does not fully correspond with the Western concept of depression warranting further investigation.

We cannot exclude the influence of confounding factors not measured, such as stress, violence and trauma that are widespread in Australian Aboriginal populations [32] [35]. In a study context such as this, where research conducted across language and cultural barriers faces considerable challenges, lengthy interviews with detailed examination of

concurrent mental disorders, physical health, trauma, health service contact and other factors that may impact on the severity of depressive symptoms were not possible. For most individuals, a 25-minute interview was the maximum feasible. Depression might theoretically cause the levels of cannabis use we found through a process of self-medication. However, to date there has been little support for a 'self-medication' hypothesis [17] [15] [19].

The possibility that heavy cannabis use caused the depressive symptoms observed deserves consideration. The relationship observed elsewhere between daily use of cannabis and a higher frequency of diagnoses of depression [18] [15] is consistent with this view, but longitudinal studies in Indigenous samples would be needed to test this further.

The damaging effects of alcohol on Australian Indigenous communities are well-recognised, and have led to community-driven policies restricting supply [41]. These policies have been successful in reducing some social and health burdens associated with alcohol misuse. The high prevalence of cannabis use and emerging evidence of an association with mental disorders suggests a need for clinical interventions and preventive programs aimed at cannabis misuse in Indigenous communities, along with continued support for measures to reduce supply [96] [43].

Table 4.2.1: Characteristics of 106 study participants from three remote Aboriginal communities, Arnhem Land, Northern Territory

Characteristic	Number	Percent
Male	57	54%
Female	49	46%
Age groups (years):		
13–19	23	22%
20–29	53	50%
30–42	30	28%
Employment:		
Full-time*	33	31%
Part-time†	12	11%
Unemployed	61	58%
Having income support‡	60	57%
Currently attending school or training	18	17%
Substance use:		
Heavy cannabis use§	52	49%
Tobacco use¶	95	90%
Petrol sniffing¶	3	3%
Alcohol use¶	22	21%
Kava use¶	10	9%

* Including full-time involvement in Community Development Employment Projects.

† Involvement in regular Community Development Employment Projects.

‡ Pension, unemployment benefits, Youth Allowance.

§ ≥ 6 cones, daily.

¶ Current user at the time of interview (2005–2006).

Table 4.2.2: Association between patterns of cannabis use and moderate–severe depressive symptoms* in 106 participants aged 13–42 from three remote Aboriginal communities in Arnhem Land, Northern Territory

Variable	Number of participants	Unadjusted odds ratio (95% CI)	Adjusted odds ratio† (95% CI)
Male	57	0.5 (0.2–1.2)	0.3 (0.1–0.9)
Age	106	1.0 (0.9–1.0)	0.9 (0.9–1.0)
Cannabis use:			
Never, former and lighter users	54	1.0	1.0
Heavy users	52	2.8 (1.1–7.2)	4.1 (1.3–13.4)
Current alcohol use	35	0.4 (0.1–1.7)	1.3 (0.4–4.1)
Current tobacco use	95	3.4 (0.4–27.8)	2.2 (0.2–21.2)
Lifetime petrol use	45	1.3 (0.5–3.3)	1.0 (0.3–2.8)

* Raw score of ≥ 6 out of a possible 18 on the modified Patient Health Questionnaire-9 (PHQ-9) [69].

† Independent variables were age, sex, cannabis use, current tobacco and alcohol use and lifetime petrol use. The contribution of each in predicting depressive symptoms is shown, controlling for the effects of the others.

5. POTENTIAL FOR COMMUNITY-DRIVEN INTERVENTIONS

In the preceding chapter, results were presented about the association between heavy cannabis use and symptoms of depression in three remote Indigenous communities in Arnhem Land. The principal finding was that heavy cannabis users (≥ 6 cones, daily) are four times more likely than the remainder of the sample to report moderate–severe depressive symptoms (raw score of ≥ 6 out of a possible 18, modified PHQ-9) after adjusting for age, sex and other substance use [67]. Furthermore, regular and heavy patterns of cannabis use that are predominant in these study communities appear to occur alongside poor mental health and severe disadvantage, and are linked to substantial health and social burdens.

What might be done to address problems from cannabis misuse in these remote Indigenous communities? Few studies consider the utility of community-driven interventions to address cannabis and other substance use among Indigenous Australians. This chapter will investigate this by drawing together three publications. Each describes a community-driven initiative implemented in the study periods between 2003–2006.

Firstly, a prospective evaluation considers the potential of a preventive youth program (for those aged ≤ 25) established to reduce the risk of substance misuse and increase resilience and connectedness. No evaluations were located of similar initiatives conducted with young Indigenous Australians.

The next publication considers the efficacy of a program established to divert young offenders (aged ≤ 18) away from the justice system and into local recreational, training and healthy living activities. No evaluations of similar programs have been published previously in Australia.

The final publication presents results of an approach developed by Indigenous and non-Indigenous research staff to disseminate findings on cannabis use to the study communities. Instead of literal translations, prevalence estimates were translated using local concepts of life stages, numbers and quantities. This approach builds upon earlier efforts to feedback study findings to Indigenous Australians [110] [111] [112] [113].

5.1 Publication # 6: Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia

Lee KSK, Conigrave KM, Clough AR, Wallace C, Silins E, Rawles J. Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia *Drug Alcohol Rev*, 2008;27:75-82.

The published version of this manuscript is included as Appendix C.6 of this thesis. It differs from the work presented in this chapter in that:

- The tables featured in this chapter have been integrated into the main list of tables of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

Declaration of interest: one of the authors (KL) was employed by the Youth Development Unit, which was the subject of this study. However, this author was not involved in collection or analysis of qualitative data or review of identifiable material.

Publication # 6: Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia

Introduction and aims: we evaluated a community-driven initiative established to prevent substance misuse and increase respect for culture and their elders among young people in a group of remote Aboriginal communities in Arnhem Land, Northern Territory (NT), Australia. The Youth Development Unit provided a range of training, recreational and cultural activities within a community development framework to all young people in the community.

Design and methods: methods of operation, community acceptability, perceived impact and likely ability to meet goals were assessed. Data included community, staff and stakeholder interviews and observation. School attendance, youth apprehension rates and information on levels of substance use were compared two years before and after the initiative was implemented.

Results: interviewees reported increased youth training and recreational opportunities, increased communication between local agencies, overall satisfaction with programme delivery and optimism that it could achieve its goals. Suggested improvements included even more training, cultural programmes and other activities and employment of more community-based Indigenous staff. The importance of key staff, involvement of a respected Indigenous staff member and community engagement were noted as probable contributors to its success.

Discussion and conclusions: Indigenous young people in Australia remain one of the most disadvantaged and vulnerable groups. Community-driven preventive initiatives offer enhanced youth resilience and connectedness in remote Aboriginal communities and alternatives to substance use.

Introduction

Substance misuse is a concern to many Indigenous communities in Australia. Although substance use typically commences in adolescence, few data are available to describe preventive substance misuse interventions for Indigenous youth. Indigenous Australians 14 years and older are twice as likely as other Australians to be recent users of illicit drugs (26.9% versus 15.0%) [2]. Similarly, in Albany (Western Australia) current cannabis use by Indigenous youth aged 14–19 was twice as common as the same age group nationally (29.5% versus 17.9%) [33]. In Indigenous populations in Arnhem Land (NT), very high cannabis prevalence (72% of males, 23% of females, aged 13–36) has been reported [40].

While substance misuse and poor mental health remains a national priority for all Australian youth [114] [115] [116], Indigenous youth have particular needs. While just 3.8% of Australians aged 10–19 are Indigenous [117] [118], in 2002–03 Indigenous youth comprised nearly half (48%) of those in juvenile detention (aged 10–17) [32]. Indigenous youth (aged 15–24) experience the highest rate of physical violence of any Indigenous Australians [32]. Suicide rates for Indigenous females (aged 0–24) are five times greater than their non-Indigenous counterparts and for Indigenous males are three times greater [32].

Effectiveness of youth substance misuse preventive programs

‘Cultural discontinuity’ or lack of connectedness is believed to be a risk factor for poor mental health, suicide, violence and substance misuse among Indigenous youth [101]. However, the effectiveness of initiatives to enhance connectedness, to rebuild cultural continuity and reduce the incidence and prevalence of these serious problems in Indigenous communities has not been assessed.

In adolescent populations generally, family and school connectedness are protective factors against substance misuse, violence and mental health problems [119]. Furthermore, interventions that engage whole communities to increase youth resilience and connectedness and promote a ‘collaborative culture’ in schools [120] and communities [121] are associated with improved mental health.

In remote Aboriginal communities where a minority of youth attends school, interventions targeting those inside and outside school are needed. Activities, such as sport and recreation programs are valued by community members and by service providers [51]. Such programmes provide opportunities to engage youth with family,

school and the community generally, and for informal health promotion. However, Trudgen cautions that organised sporting activities, typically coordinated by non-Indigenous adults, could erode respect for Aboriginal culture and elders [57]. Such concerns have not been studied systematically. Limited data are available on programme outcomes and the elements which help programmes succeed [51] [57] [52].

In one remote NT community, local development initiatives combined with supply control successfully addressed petrol sniffing, although these activities were not youth focused [56]. In another remote NT community recreational activities were used in a successful intervention to reduce youth petrol sniffing [122].

Community-driven activities including cultural programs have been employed in north American Indigenous communities, to increase understanding of substance misuse, again not youth specific [123]. We could find no published evaluations of community development activities targeting Indigenous youth specifically to reduce substance misuse and improve mental health and wellbeing.

This paper examines the role, methods and probable effectiveness of a community-driven youth preventive initiative, the Youth Development Unit ('the Unit') in reducing the risk of substance misuse and increasing resilience and connectedness in a group of Indigenous communities in Arnhem Land (NT).

Background

Three Aboriginal communities, several single-family outstations and a mining town are located in an area covering 2600 km² [79] in Arnhem Land (NT). Aboriginal community populations range from 200 to 750, of whom 50–55% are aged 24 or younger [79]. One Aboriginal language is spoken; English is a secondary language. These communities are isolated and socially and culturally distinct. Substance misuse, violence and crime have been identified by the communities as significant problems for many years. In 2002, over 600 offences were reported to police, equivalent to one offence per every four people. School enrolment and attendance is low. Only 9–48% of those eligible for primary school were enrolled in 2001 and only 47–65% of these attended (unpublished data, NT Education Department, 2004). These problems sit on a background of disadvantage with severely limited youth training and employment opportunities [79] and recreational facilities, and with unrelenting challenges to traditional cultural values.

Community response

Indigenous community members and local service providers established a preventive youth initiative with NT Government funding in June 2003 to address concerns about youth substance misuse, crime and a perceived lack of respect for elders and culture. The Unit's management committee has Indigenous and non-Indigenous representatives from communities, key agencies and the local mining company. Three staff (a co-ordinator, case worker and Indigenous youth worker) were funded initially to deliver programmes, liaise with communities and agencies and obtain further funding.

In the Unit's formative stages, community representatives described their vision for wide-ranging preventive youth activities developed in close consultation with communities, that strengthened local authority and culture, improved integration between the two cultures and provided alternatives to substance misuse and criminal activity. Skill development that capitalised on both Indigenous and Western cultures was a priority.

The Unit offers programs to all young people and also provides case management for juvenile diversion. The management committee invited one of the authors (KC) to evaluate the Unit in its early stages. This investigator was introduced to the communities in 2000 by a colleague providing professional development in local schools.

In this report, we describe acceptability and perceived effectiveness of the general preventive activities and report on early quantitative outcomes. The Unit's juvenile diversion activities will be reported separately.

Methods

Qualitative and quantitative measures were used to assess acceptability and effectiveness in the initiative's first two years of operation (June 2003–June 2005).

Observation

Routine activities were observed and recorded during nine visits by three authors (KC, AC, JR) in the process of conducting interviews. Impressions noted of interactions between staff and youth, families, service providers and the broader community were compared.

Interviews

Seventy-three interviews were conducted, 30 with Indigenous (11 males, 19 females) and 43 with non-Indigenous respondents (26 males, 17 females). A matrix summarising key stakeholder roles from each community guided recruitment of adults for interview.

Interviews were conducted with two to three representatives from each Aboriginal community council and the Land Council, including where possible, the presiding chair, an elder and a balanced gender mix. Indigenous and non-Indigenous personnel from other key agencies were also interviewed. Interviews, 15–60 minutes long, were generally conducted privately in a location comfortable for the participant, often outdoors, or occasionally at a designated meeting room in the community. Some participants preferred to be interviewed jointly with another participant.

Secondary students (year 7–10) were also interviewed in three communities. Primary students (year 1–6) were interviewed in the community with no secondary schooling available. School Principals assembled student groups. Interview format (small or large group) was adapted to suit the students.

Interviews were conducted by three authors (KC, AC, JR) who had no direct association with Unit. Interviews with Indigenous participants were conducted in plain English. Interviews were semi-structured and included questions about perceived ability to meet goals, satisfaction with youth activities, extent and nature of youth and community participation and suggested improvements. Programme organisers were asked additional questions about challenges in implementation and decision making methods.

Retrospective weekly diary of the Unit's co-ordinator

Time allocation across various activities was documented during weekly phone interviews with one of the Unit's co-ordinators (KL) a year after its formation, by one author (KC) over a seven week period.

Corporate documents

Management committee meeting minutes (June 2003–June 2005) were reviewed.

Early quantitative outcome measures

Data routinely collected by the NT Education Department and Police described school attendance and youth apprehensions in the study communities two years before and after the Unit's formation. Data from a concurrent study of substance use in the area were reviewed [40] [39].

Analysis

Interview data and management committee meeting minutes were reviewed against the Unit's stated goals. Interviews were analysed by extracting and summarising recurrent themes by one investigator (CW). Where uncertainty arose, interviews were re-analysed by a second investigator (KC). Any systematic differences between Indigenous and non-Indigenous participants' responses were noted. School attendance, youth apprehensions and substance use were compared before and after the Unit's formation.

Feedback and ethical approval

Feedback was provided to the management committee and staff, communities, service providers and NT Police throughout the evaluation and on its conclusion by two authors (KC, AC). Ethics approval was provided by the Human Research Ethics Committee of Menzies School of Health Research and NT Health Department.

Results

Acceptability of the initiative to the community

Participants spoke positively of the Unit's activities. Generally, they were enthusiastic about the increased training and recreation, consultation and liaison between the Unit, communities and local agencies and implementation of community-inspired programs (Table 5.1.1). Suggested improvements included more community-based Indigenous staff, even more inter-agency and community liaison, more regular youth training and activities and further inclusion of Indigenous culture in programmes (Table 5.1.2). School students were enthusiastic about all activities encountered. Activities catered for groups of from 10–20 and up to around 100 youth assembled from different communities. The overwhelming majority commented positively about the sporting programmes. Numerous diverse activities were suggested including discos, shell collection and jewellery making.

Community engagement

Of the forty-seven participants who provided comment about the approach taken by the Unit to achieve its objectives, most (41) felt it was becoming increasingly effective. Early in the Unit's operations, concerns were expressed about decisions being made without community consultation. At the time, one non-Indigenous participant feared that the Unit was seen as:

... a non-Indigenous solution so there is little ownership of it by Indigenous people. (non-Indigenous)

Community consultation was enhanced over time, with more programs developed from community ideas and delivered with Indigenous people at the forefront:

Plenty of [Indigenous] people involved with limited [non-Indigenous] input. (Indigenous)

Evaluators observed that towards the second year of evaluation, staff actively encouraged community involvement and guidance. This was achieved by staff being flexible, engaging in regular formal meetings and informal discussion. Indigenous committee participation was encouraged by translating key proceedings into local language and providing opportunities for unfettered discussion in their language by Indigenous members.

Perceived ability to meet its goals

There was generally optimism about the Unit's potential contribution to youth wellbeing:

Helps out heaps with kids [in communities]. Improving... good standard, workers, programs, communications, working with sport and rec, police, health people and educators, land council... all supporting the [Unit]. (Indigenous)

Thirty-nine participants thought the Unit could potentially reduce youth problems including cannabis misuse and related violence, with thirteen of these believing it had already made an impact. This view was shared between Indigenous and non-Indigenous participants.

Participants emphasised that youth behaviour is influenced by a combination of factors including cannabis supply controls, other agencies' initiatives and wider community efforts, alongside the Unit's independent effects:

Yes, there have been changes and the [Unit] has helped, but... the Police have been more active, the supply and flow of gunja has decreased and people have changed their substance misuse behaviours. Family members are embarrassed by the substance misuse by some members of their family and have asserted 'family control' taking responsibility for them. (Indigenous)

The Unit attempted to deliver activities combining cultural and educational elements with immediate youth appeal, e.g. bush hunting excursions and using computers to record traditional music. Of the thirteen Indigenous participants who responded about the capacity to improve respect for elders and culture, 10 believed it had already contributed, with three believing that an impact was likely. Non-Indigenous participants shared this view in similar proportions. One elder described how organised sport resulted in adults gathering to watch and how this, in turn, led to increased interaction between young spectators and adults and between young adults and elders. The participant emphasised that this interaction reinstated understanding and respect between generations.

Staff roles

Twenty-eight participants mentioned the importance of the Indigenous senior youth worker, with nineteen of these stressing his crucial importance. He is a respected community member with a close collaborative working relationship with non-Indigenous staff. Thirty-six participants commented on the co-ordinator's role and a majority (20) stated that this role was pivotal to the initiative's success.

Evident in reviewing the co-ordinator's diary was the volume and variety of demands on this position. These ranged from logistical tasks including improvising equipment and resources and driving people to training to more complex tasks, including preparing submissions, community consultation and staff management. In an average working day of around 12 hours, the co-ordinator spent most time on programme delivery, followed by travel, programme preparation and meetings. Support and training from the primary funding agency (via phone and off-site meetings) was not provided to the co-ordinator until mid-2004.

At the time of writing, a series of four co-ordinators and five case workers had been employed during 45 months. Additional employees included three Indigenous youth workers, a non-Indigenous youth worker and a research officer. Staff turnover impacted significantly on program continuity and workloads. Forty-two participants commented that more staff were needed, with 24 suggesting additional Indigenous staff:

They need more local workers as back up when someone is ill or unavailable and to help collect materials, bush tucker, organise events and people.

(Indigenous)

Early outcome measures

Comparing the two years before and after the Unit's implementation, there were no significant changes in school attendance (55.9% versus 51.3%) or youth apprehensions (68 versus 75).

A longitudinal study of cannabis use in males and females (aged 13–36) in the same communities showed that cannabis use declined somewhat between 2001 (80%) and 2004 (74%) [40]. This decline in cannabis use was statistically significant in females aged 13–36 and in older males (≥ 16 years) [40]. From June 2004 to June 2005, there were further anecdotal reports of reduced cannabis use. However, some of these changes were attributed to a shortage of cannabis. Anecdotally petrol sniffing was practiced by a relatively small and discrete group before the Unit's formation with no change afterwards. Alcohol access is restricted in the region and youth alcohol related problems were rare.

Discussion

This is one of the first published evaluations of a community-driven preventive initiative established to reduce substance use and promote resilience among the total youth population in a remote Indigenous Australian community. Participants reported an increase in recreation and training opportunities, skill development and improved connectedness following the formation of a Youth Development Unit. Perceived achievements included promoting skills of Indigenous community members, enhanced inter-agency communication and an increased range of youth activities. Community members felt the Unit had the potential to reduce youth problems, including substance misuse and to increase respect for elders and culture.

Staff characteristics, personality and commitment were pivotal to success. In its most successful periods, the Unit was led by an energetic and versatile co-ordinator with strong interpersonal and organisational skills and a capacity to develop skills and confidence of staff, youth and communities. The senior youth worker was also seen as key in building the Unit's profile within each community and encouraging involvement from concept generation to programme delivery. He used his status and knowledge as a respected older Indigenous male to encourage regular youth participation and broader community engagement.

The need for systems to address staff turnover and to prevent staff 'burn-out' is critical. External funding agencies need to recognise the importance of community consultation and skills transfer and allow time for this vital investment.

Deriving ideas based on community interests and priorities has been noted as an important factor in community development [124] [62]. Similarly, equal partnership with Indigenous communities in addressing substance misuse has been identified as a key component of preventive programmes [48]. Furthermore, a 'collaborative culture' [125] can focus efforts to support young people, reinforce health messages and nurture a sense of belonging. In this setting where violence and risk factors for substance misuse and poor mental health are common, cooperative links may also ease the burden felt by youth, families and agencies.

Participants were optimistic about the potential of the Unit to reduce substance misuse and related violence, bridge the inter-generational gap and ultimately strengthen young people's connection with their culture and community. In establishing the Unit, community members emphasised the need to foster young people's sense of purpose, pride and belonging within the community and wider world:

Young people say 'you don't understand this new world' it is our new world. How does the ... community secure the area from gunja, how can programs and activities work for youth? ... You must 'look at mind and heart' – if you only have half it won't work. (Indigenous elder)

'Culturally congruent' substance misuse interventions among Maori in New Zealand have been suggested as important in strengthening health and wellbeing and protecting against substance misuse [126]. In the current study, programmes which

combined cultural elements with appealing youth activities such as music or film-making were well received by youth and adults alike.

In mainstream populations, increasing young people's sense of connection in schools has been associated with reduced substance misuse [119]. Participation in youth-focused community activities has also been identified as a way of building youth resilience and protecting against substance misuse [127]. The current study was an early evaluation, but it seems probable that by increasing young people's connection to the Unit, agencies, community and culture, youth resilience is likely to increase. Also, provision of increased youth activities provided alternatives to drug use in a setting with limited recreational options.

Limitations

Indigenous adults interviewed may have been more informed about the Unit than other community members as many were engaged with key agencies. Feedback from youth not attending school was not possible due to practical constraints in accessing this group. The numbers of youth attending activities could not be routinely collated. Available cannabis use data described persons aged 13–36, and was not youth specific.

While it was impossible to separate the Unit's beneficial impact from other initiatives, anecdotal reports and some supporting evidence [40] indicated that youth behaviour and substance misuse levels changed in a positive way. Other community initiatives likely to have contributed to this improvement included rewards linked to school attendance, establishment of a preschool and improved supply control of psychoactive substances.

Conclusion

A collaborative community-driven approach appears to have potential in increasing connectedness and in addressing youth problem behaviours in Indigenous communities. Appealing programs that combine youth training and employment preparedness with recreation and culture and are accepted by communities, provide alternatives to substance misuse and have potential to enhance youth resilience. Study designs such as staged implementation in similar but separate communities with sufficient follow-up may allow more comprehensive delineation of benefits. Further research is also needed to clarify optimal features of community-based preventive

youth initiatives and the longer-term impact in reducing substance misuse and mental health disorders.

Table 5.1.1: Positive achievements of the [Youth Development] Unit, reported by community and local agencies, May 2004–June 2005

Achievements	Examples given
Provides more training opportunities	Technical studies; film-making; drivers' licence programme; marine debris clean-up programme; youth leadership opportunities; recruitment, support and training for new employees in local youth recreational sector
Increased recreational and other activities provided in partnership with local and regional agencies and community-based volunteers	Youth and community festivals, mural painting programme, sporting carnivals, cultural knowledge programme, discos, film-making
Consultation and liaison with community in programme development	Active measures taken to build relationships with each community and invite community involvement in programme development and delivery
Increased inter-agency approach	Programs with involvement from local agencies, e.g. health, education, police, councils
Programs developed from community ideas	Mural programme, mental health promotion poster programme, health promotion activities

Table 5.1.2: Suggested improvements [to the Youth Development Unit], reported by community and local agencies, May 2004–June 2005

Suggested improvements	Examples given
Further increase in inter-agency collaboration and community discussion	Even more liaison with elders, community members and young people; increased communication and opportunities for collaboration with local agencies
More cultural knowledge activities	Learning about bush foods, music programmes that encourage young people to record traditional songs, inviting older people to observe and participate
More community-based Indigenous staff	Indigenous staff (youth worker positions) in each community, to enable consistent community-based presence
More training that leads to jobs	For example, training that provides recognised certificates
Access to four-wheel drive vehicle	To conduct programmes in off-road conditions, e.g. camping and hunting
Need for more regular activities	

5.2 Publication # 7: Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia

Clough AR, Lee KSK, Conigrave KM. Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia *Drug Alcohol Rev*, 2008;27:433-8.

The published version of this manuscript is included as Appendix C.7 of this thesis. It differs from the work presented in this chapter in that:

- The figures featured in this chapter have been integrated into the main list of figures of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

The student is the second author for this publication and contributed to conceptual planning, interpretation of results and manuscript drafts, and designed Figure 1 (Appendix A).

Publication # 7: Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia

Introduction and aims: diversion from court and prison has been recommended for Indigenous Australian youth who commit offences. Since no evaluations of such programs have been published, we describe processes and early outcomes of a diversion program in the Northern Territory.

Design and methods: from 2003–2006, amongst 1700 remote Indigenous community residents, 35 young people (aged 11–18 years, median = 15 years) committed offences. They were diverted from criminal justice and referred to a community-based diversion initiative. Client assessment records and staff interviews furnished data to examine clients' diversion pathways and early program results.

Results: eighteen clients were reportedly using a substance at the time of their offence: cannabis (N=9), petrol (N=5), alcohol (N=4). The remaining 17 had histories of using one or more of these. Two clients could not complete local diversion programs because they moved to other regions; one case was not pursued for legal reasons, leaving 32 clients exposed to the local program. By July 2006, four clients were continuing in their programs, three had breached them, but 25 had completed them in periods ranging from 2–60 weeks (median = 26 weeks); a completion rate of 89% (25/28). Just one client re-offended after completing diversion.

Discussion and conclusions: a high completion rate was achieved despite a dearth of locally-available drug and alcohol treatment services and diversion options; shifts in police approaches; heavy administrative burdens to meet legal requirements; and difficulties communicating across cultural barriers.

Introduction and aims

Indigenous people in Australia generally remain over-represented in the criminal justice system [128]. The rate of incarceration for Indigenous youth (aged 10–17) declined between 1994 and 2001 (from 414 to 284 per 100,000) [50], but by 2005 it had risen again to 312 per 100,000, a level that is 23 times higher than for their non-Indigenous counterparts [129].

Generally, juveniles within the justice system suffer a high prevalence of co-morbid substance use and mental health problems [130] [131]. They have a much higher death rate than other young people, with early detention, multiple detention and drug-related offences indicators of a high mortality risk [132]. Almost one in four young people who commit offences may report a prior suicide attempt, with lifetime substance use most predictive of the number of attempts [133]. For Indigenous youth, substance use and offending behaviour also appear to involve common multiple risk factors [50].

It has been recommended that more options should be made available to divert young Indigenous people who commit offences away from the criminal justice system and into treatment services designed to be culturally relevant, along with action to address multiple risk factors within broader social justice programs [50].

An example of one such program comes from remote Indigenous communities in Australia's Northern Territory (NT) where a diversion scheme for youth who committed offences was developed as part of a multiple-component, preventive youth initiative with NT and Commonwealth government support [134]. In this brief report we describe its early performance and results.

Design and methods

The 1700 Indigenous people in the communities studied comprise a discrete cultural and language group, living in one of the most isolated parts of the NT, approximately 550 km east of the capital, Darwin. Data were available from de-identified records held by the NT Juvenile Diversion Unit (JDU) in Darwin and from interviews with local case workers (N=4) employed by the communities' youth development unit (YDU). Data compiled included age, gender, date of referral to diversion programs, substance use at the time of the offence, the diversion programs assigned and completed by the young person. Case workers, responsible for oversight of diversion programs and for verifying their completion, could identify clients from case numbers in a database provided by JDU to the research team. Case workers were asked (by KC) to provide

information on the history and progress of individual diversion clients together with any history of their substance misuse.

Ethics approval was provided by the Human Research Ethics Committee of the Menzies School of Health Research and the NT Department of Health and Community Services.

Results

The required diversion steps and processes are summarised in Figure 5.2.1 [135]. Figure 5.2.2 traces the progress of 35 young people, aged 11–18 years (median = 15 years), who were assigned to diversion programs between September 2003 and July 2006, an observation period of 153 weeks. Case managers could provide information about these 35 diversion clients for periods of from 2–60 weeks (median = 22 weeks) during this observation period. Aggregated JDU data (for cases, not individuals) indicate that there were, in total, 103 youth apprehension cases in the study communities during the same period suggesting that around one-third of youth who committed offences were diverted to the local program. The decision to refer youth who commit offences for diversion from criminal justice processes is made by police following criteria and procedures stipulated in the *Youth Justice Act* (NT) [135]. Once referred by police, diversion program components, summarised in Figures 5.2.1 and 5.2.2, were all provided locally with formal case management provided by the YDU case manager. Lines in Figure 5.2.2, depicting the progress of diversion clients of different ages who committed offences, are shaded to represent the use of cannabis, alcohol, petrol or no substance at the time of the offence, together with an indication of their exposure to different diversion program components.

The majority of diversion clients suffered substance misuse problems, three also had mental health disorders, and in at least four cases, major family disruption was recorded, including violence and substance misuse. Eighteen diversion clients were using a substance at the time of their offence. Cannabis use (N=9) or petrol sniffing (N=5) were reported primarily in the 14–16 year old clients (Figure 5.2.2). Alcohol use at time of the offence (N=4 clients) was not a major concern in the client group since alcohol availability, a serious issue for the study communities for many years, became subject to increasingly tighter restrictions during the observation period.

Fourteen clients were not under the influence of a substance at the time of their offence while for three there was no such information. However, in all seventeen of these, a

history of substance use was evident including; cannabis (N=6), petrol sniffing (N=6), both cannabis and petrol sniffing (N=4), and alcohol (N=1).

Three clients cases did not proceed to diversion: one because the client and his family moved to another community where no diversion services or infrastructure were available, and so police issued a formal warning instead; another was transferred to be managed from Darwin since the client and his family moved there; and a third case could not proceed for legal reasons. By July 2006, four clients were continuing in diversion but 25 clients had completed their diversion programs in periods ranging from 2–60 weeks (median=26 weeks). Just three clients breached their assigned programs. This implies a completion rate for the program of 89% (25/28).

Further follow-up data for these 28 clients were not available since local case managers' records and responsibilities for clients were concluded once the client had completed diversion. However, from their informal knowledge as community members, local case workers could indicate positive outcomes at the end of diversion programs for some clients including eight clients employed or returned to school. Just one of the 28 clients re-offended before July 2006. This young person was reportedly sniffing petrol at the time of the new offence, as in his preceding offence. He offended yet again shortly after re-entering diversion; his case was recalled by police.

Discussion and conclusions

The difficulties of implementing and sustaining much-needed youth diversion programs in remote Indigenous communities are considerable. Evidence that the prevention arm of the community-driven initiative in the communities studied is showing early signs of success in reducing youth crime [91], indicates that these challenges can be met. We are further encouraged that the diversion component of the initiative appears to be achieving parallel successes.

Further follow-up studies in the client group would be required to assess the sustainability of successes achieved. Elements of good practice are, nonetheless, indicated in these early results. For instance, it has been recommended that diversion responses should be commensurate with the offence with increasingly coercive and treatment-focused diversion strategies used for those with more advanced criminal careers or drug problems [50]. This was evidenced by the tendency for increased diversion program intensity in diversion clients who were under the influence of a substance at the time of their offence (see Figure 5.2.2). The informally-graduated

sanctions framework used in the community-based program was supported by local systems collaboration and by case management, another recommended element of good practice [50].

Already-recognised challenges for diversion of Indigenous youth were echoed in our study including a lack of adequately-resourced diversion options and the need to involve Indigenous communities comprehensively in planning and implementing diversionary systems [50]. Our observations indicate the following further challenges.

- Evidentiary requirements and ongoing reporting in case management and juvenile diversion are demanding requiring considerable expertise not generally available in remote Indigenous communities.
- Meeting the challenges of lack of suitable diversion options in the communities and the high mobility of the client population requires creativity in designing programs. Seemingly insurmountable challenges were presented, for example, in one client who needing detoxification from petrol sniffing with no local detoxification services available.
- Across cultural and language barriers, miscommunication and partial understanding among diversion clients and their families regarding the purpose and intent of diversion is exacerbated by time lags between the offence being committed and a formal referral to diversion. These time lags are subject to many variables pertaining to investigation and procedural matters.
- Care-givers easily become exhausted because of other community issues and the often difficult behaviour of young people in their care who commit offences. Diversion staff provided relief and support within limited resources available [91].
- Integrating diversion clients with other local youth, an important element of the strategy used here, was often difficult to achieve.
- Cannabis use and petrol sniffing are difficult to control in this setting and users switch from one to the other depending upon availability. Non-sniffable petrol is not yet available locally. Access to alcohol is now tightly restricted for all.

- Shifts in police practice occur with change in personnel. An officer making the decision about prosecution or diversion may be reassigned, so interpreting and applying diversion criteria set down in the *Youth Justice Act (NT)* [135] may vary between clients.
- Cultural and language complexities add to these challenges.

Despite formidable difficulties, results of this community-based diversion initiative are promising with an 89% completion rate and reports of sound re-engagement of young people into community life.

Figure 5.2.1: Summary of diversion steps and processes in a local youth justice diversion initiative in remote communities in the Northern Territory (NT, Australia) including a summary of the diversion programs used by the community-based Youth Development Unit (YDU)

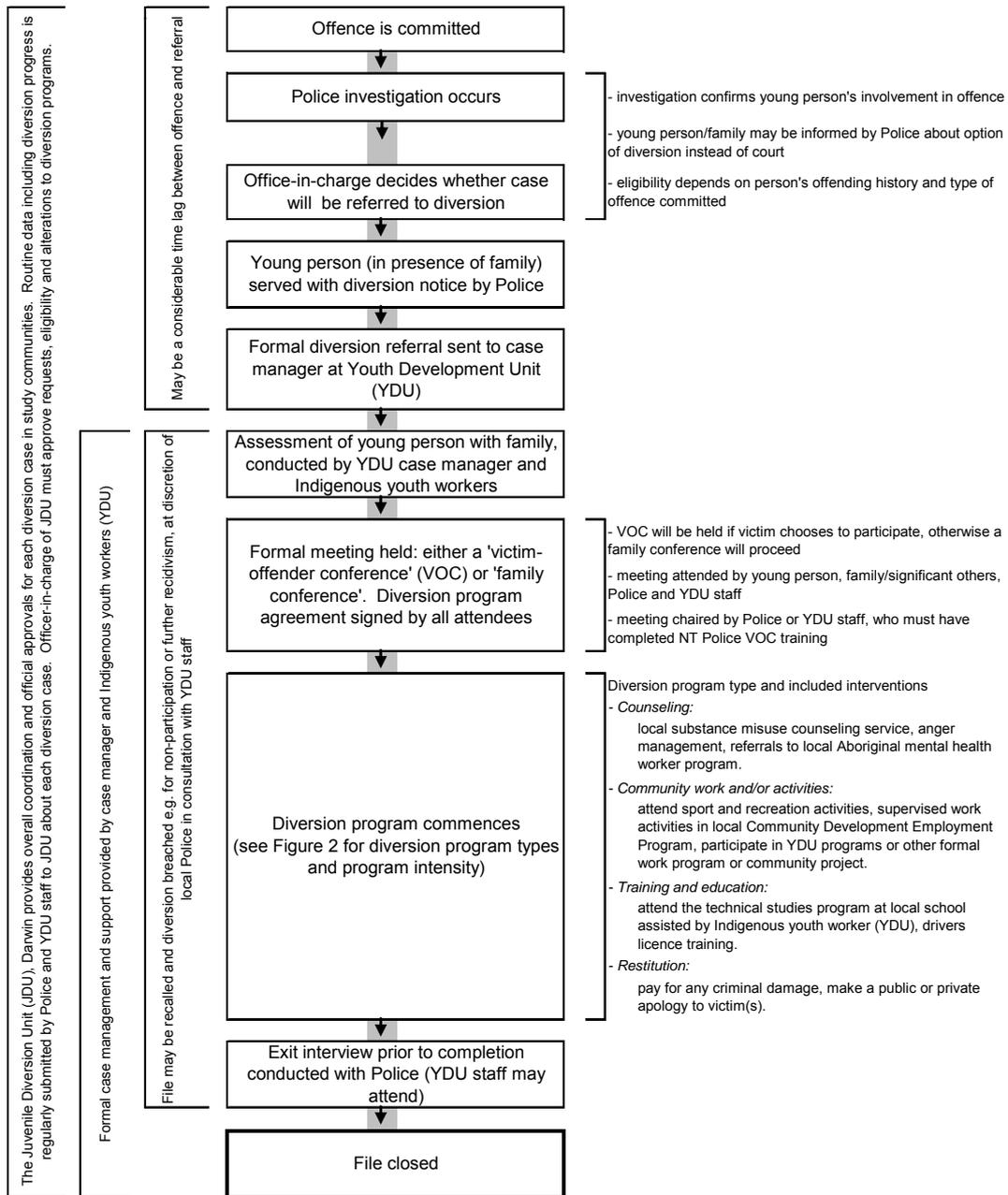
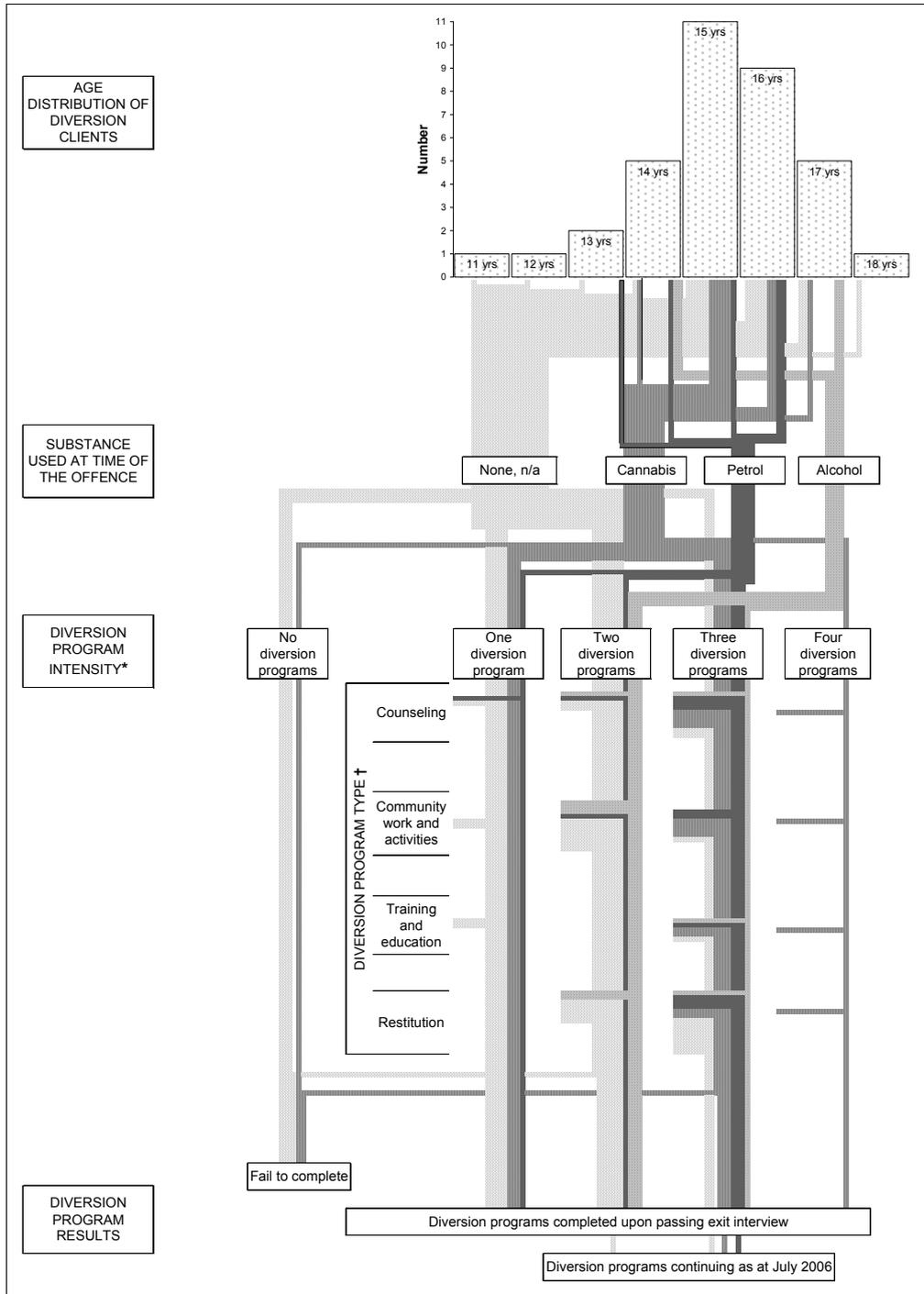


Figure 5.2.2: The pathways and progress of 35 Indigenous clients through a community-based youth justice diversion initiative in remote communities in the Northern Territory (NT, Australia)



* Diversion program intensity is the number of diversion programs to which a client was assigned.

† Each client could be assigned to one or more diversion programs categorised into four groups. The interventions comprising each group are listed in Figure 5.2.1.

5.3 Publication # 8: *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use in Arnhem Land, Northern Territory

Lee KSK, Jaragba MJ, Clough AR, Conigrave KM. *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use in Arnhem Land, Northern Territory *Med J Aust*, 2008;188:113-6.

The published version of this manuscript is included as Appendix C.8 of this thesis. It differs from the work presented in this chapter in that:

- The figures featured in this chapter have been integrated into the main list of figures of the thesis.
- The references for this chapter have been integrated into the main reference list of the thesis.

Publication # 8: *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use in Arnhem Land, Northern Territory

Objective: to disseminate research results about the very high rates of cannabis use in three remote Aboriginal communities in Arnhem Land (Northern Territory) to the study populations.

Method: to achieve this we translated prevalence estimates, using local concepts of life stages, numbers and quantities.

Results: the reaction of the local community to results presented in this way was characterised by the phrase used when understanding something for the first time: *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!).

Conclusions: to successfully disseminate research findings in these communities, it is critical to undertake comprehensive community liaison, to find common conceptual understandings and to build the skills of local Indigenous researchers.

Our people have told us a lot about gunja [cannabis] and how they feel mental health way. Now we need to find a way to give this back, to tell all three communities what we have found... Jackie Amagula (Indigenous educator and researcher), February 2006

Introduction

We recently reported persistently high rates of cannabis use in three Indigenous communities in Arnhem Land in the Northern Territory; in our longitudinal studies [70] [39] [40], 72% of males and 23% of females aged 13–36 years were current users at baseline (2001) [39]. We also found that the prevalence of symptoms of anxiety and cannabis dependence increased with more frequent cannabis use and we documented a heavy burden on community finances and health services [39] [46].

These reports informed changes in policies featuring policing strategies targeted at cannabis supply and associated problems in remote NT communities generally [43]. However, the Indigenous communities we studied were not engaged in or aware of these wider strategic shifts. Indigenous researchers became alarmed at respondents' reports of cannabis-related harms during interviews in 2005–2006 and expressed a desire to disseminate the research findings and describe their insights to the respondents, their families and the wider community. They envisaged that, through such a feedback process, their communities would become better informed about cannabis use and its consequences and so would be able to make more informed choices about cannabis. Here, we report the approach we developed to providing feedback on research, the processes involved, and the implications.

Relevant literature

There is widespread endorsement for disseminating research results back to study communities [85] [136] and for the importance of correcting power imbalances in research involving vulnerable populations such as Indigenous Australians [137]. In the past 30 years, approaches to conveying research results to the Indigenous groups studied have progressed from no feedback (pre-1970s), to findings being used as an impetus for change (mid 1990s) [59]. Diverse methods for doing this have been described for a wide range of audiences [85] [138]. However, few studies provide specific practical guidelines, especially where language and cultural differences compound the difficulties faced. One NT study used locally understood concepts of 'land, body and spirit' to disseminate adult mortality data [112]. Another survey, of Aboriginal health workers in the NT and South Australia, identified preferences for pictorial representations

of survey information [111]. Pictorial representations of program outcomes were also used to convey findings about infant birth weight in three Aboriginal communities in the NT [113]. However, there is a lack of detailed examination of the processes used to communicate epidemiological data in remote Indigenous Australia.

Setting

The three study communities in Arnhem Land have been described in detail elsewhere [39]. A single Indigenous language is spoken in these communities, and cultural concepts are generally intact. English is a second language; English language skills vary greatly, as does literacy in younger people [91]. Our continuing studies of cannabis use [40] are collaborative efforts between non-Indigenous and local Indigenous researchers. Commitment by Indigenous researchers to address cannabis-related harms in their communities since the late 1990s has been pivotal to achieving these research outcomes.

Our research feedback approach

Over 3 months in 2006, workshops were held with the Indigenous and non-Indigenous researchers. These aimed to develop a shared understanding about the levels of cannabis use and to design feedback resources suitable for community-wide dissemination. Indigenous researchers translated the research findings into their own cultural concepts and language.

Challenges emerged in translating concepts of numbers, quantities and the ages of participants. The local numbering system has specific terms only for numbers from 1 to 10, so we used a denominator of 10 individuals to pictorially and verbally describe prevalence of cannabis use. We also learned that adjectives used to describe quantities of countable things (e.g. *a lot* of houses) were always different from those used to describe quantities of uncountable things (e.g. *a lot* of wind) and that the terms were not interchangeable. Appropriate words were identified to qualitatively describe levels of cannabis use.

To represent the age groups of the population sample, the Indigenous researchers chose to use locally recognised descriptors of the life stages for males and females. These descriptors are not fixed according to calendar age and the definition of each may vary from one individual to another depending on cultural considerations and individual characteristics. A local Indigenous artist was commissioned to draw relevant images. The Indigenous researchers chose to depict cannabis users as faded figures, as they

considered users to be weakened by their drug use (Figure 5.3.1).

In addition to these pictorial presentations of prevalence data, the mental health harms, financial impacts and information about cannabis and NT law (provided by the local police) were described in plain English and the local language. Phrasings were translated into the local language and then back to English and concepts were re-explained by the Indigenous researchers to KSKL after consultation across the study communities. Three resources – a book, a poster and a DVD (in the local language with English subtitles) – were developed and endorsed by community leaders for dissemination to community residents and local service providers.

Response to the feedback

Dissemination of the resources began in May 2007. Initial responses to the materials were gauged from semi-structured interviews with 30 Indigenous and eight non-Indigenous participants, interviewed either individually or in groups. The main questions were about attitudes towards the materials and their appropriateness for local Indigenous people. Interviews of 15–60 minutes were conducted opportunistically across the three study communities with community members, health centre personnel, linguists, representatives of governing Indigenous organisations, police and staff of correctional services, the aged care service and schools. Interviews with Indigenous participants were conducted by MJJ and KSKL, using plain English and the local language. Most participants commented positively about the locally drawn pictures used to describe prevalence of cannabis use. Many also remarked about the importance of providing communities with this kind of information using “*our ways of describing things*”. Negative comments were few. Suggestions for improvements were offered, such as adding more local language words to describe cannabis use and more clearly differentiating between the local language and English (Figure 5.3.2).

Advantages and limitations of the approach

Rather than providing literal translations, our efforts focused on identifying common concepts, to widen the community understanding of our studies of cannabis use. Early indications are that comprehension of the research findings was considerably enhanced among Indigenous researchers and community members. The approach also appears to be flexible enough to convey information effectively to people of different ages and with different levels of English comprehension and reading ability, a positive first step in improving community-wide literacy about frequent cannabis use and related harms, including mental health impacts [92]. As explained by one community leader:

It makes good sense . . . with our pictures and words everyone can understand this one even the young ones. For the first time we can see how many people are using gunja and how gunja is affecting our communities.

Indigenous researchers' capacity was strengthened. They took on the challenging task of seeking community review of the feedback resources and disseminating the resources to all study communities and local service providers. They were delegated by community leaders to present their work at a national drug and alcohol conference [139]. Their enhanced understanding of prevalence of cannabis use and its consequences in their communities enabled them to secure funding for a project to assist a closely affiliated community that was also experiencing high levels of cannabis use.

We are unable to comment on the transferability of the approach to other communities where cultural and language concepts may be different. Time is needed to assess the uptake and utility of these resources across the study communities. However, early reports are promising:

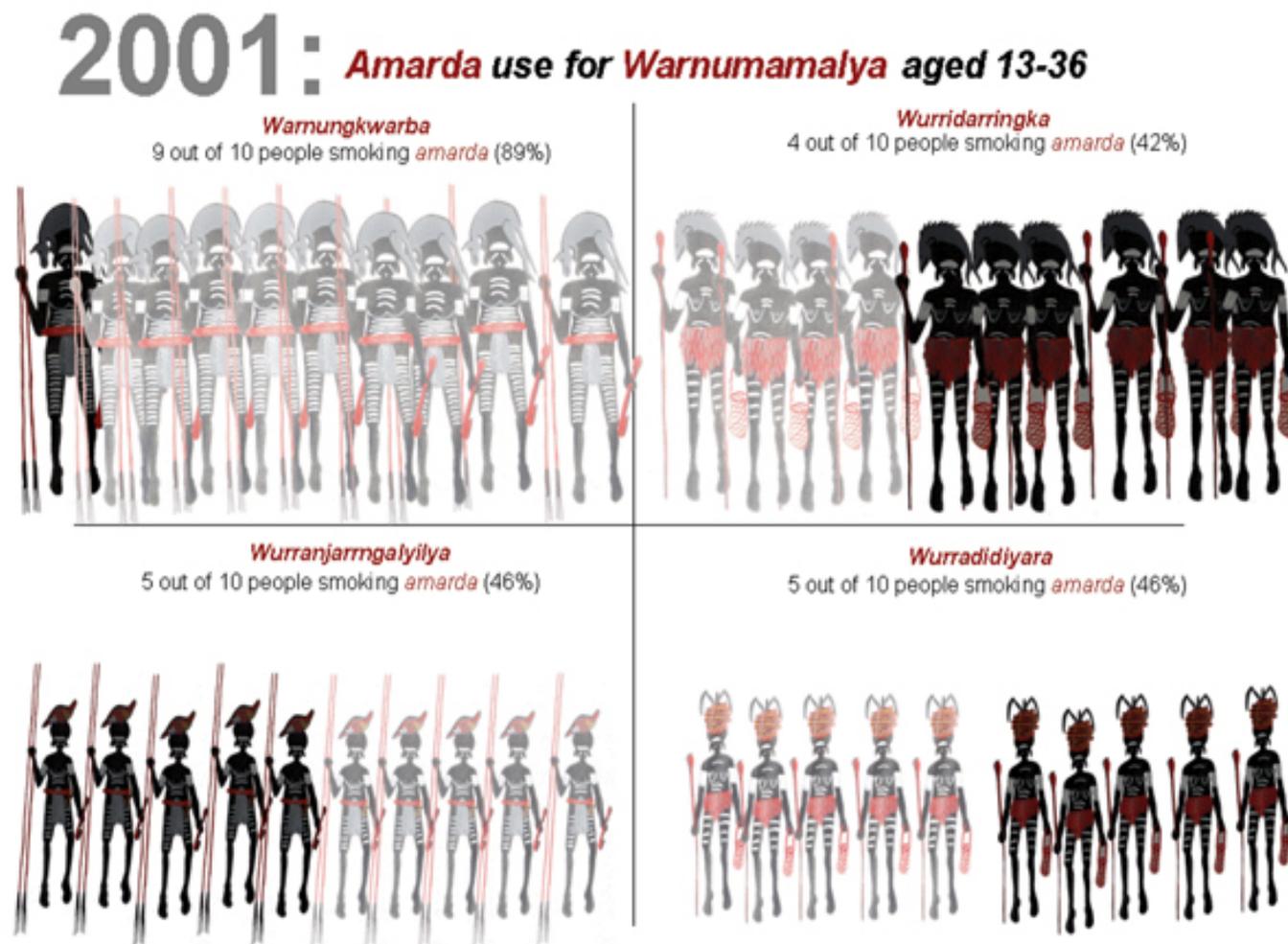
Already families have come to see me asking questions about the poster and book. We are being shown information from research about our communities that has never been given back to us in this way, using our ways of looking at the world. Now we can start to tell our people about how many people get chained to that gunja and about the sickness and worry from using too much, so they have this knowledge. (MJJ)

Conclusion

Building community understanding and momentum for change through a community-feedback process is important for research and health promotion efforts, whether these are in a remote Indigenous community or an urban multicultural setting. We have shown that it is possible to convey health information using this simple and strategically important approach. Some key factors made this possible. Sound relationships between the Indigenous and non-Indigenous researchers, the study communities and the service providers created a basis of trust on which to conduct the research. The role of the Indigenous researchers was pivotal. Their participation combined pragmatic, moral, interventionist and epistemological rationales for involving Indigenous people in research, consistent with best practice [60]. Their capacity for comprehensive community liaison, considered guidance and willingness to share their ways of

understanding the research stimulated participation from other community members. They also continually challenged the non-Indigenous researchers to seek their own insights and to consider alternative approaches that would enable their own communities to better understand the research conducted in these disadvantaged and vulnerable groups.

Figure 5.3.1: Presentation of prevalence estimates of cannabis use among 262 people aged 13–36 years at baseline (2001)



Glossary: Amarda = cannabis. Warnumamalya = Aboriginal people. Warnungkwarba = men (20–36 years). Wurridarringka = women (20–36 years). Wurranjarrngalyilya = male teenagers (13–19 years). Wurradidiyara = female teenagers (13–19 years).

Figure 5.3.2: Comments about the resources (book and DVD) from community members and local service providers*

Use of locally-drawn pictures

- **“Pictures work well; I can see how much gunja people in our communities use”**
- **“The faded ones are the ones that use that gunja; the darker ones have a healthy lifestyle”**
- **“There are a lot of people with gunja sickness in these pictures, lots of men smoking then, lots of women smoking now”**
- **“When I took the book home to show my family, the pictures were good, even for my grandchildren. We could see how many people using gunja across all three communities”**
- **“Work’s well with the four groups to show who we talked to (men, women, boys and girls)”**

Health promotion tool

- **“We have never seen pictures like these before. The book and DVD will help people see the whole picture about how many people use gunja in our communities and what sickness they might get from it.”**
- **“We all sat there as a family listening to the DVD”**
- **“Law information is good because there are a lot of court cases now about possession of cannabis” (non-Indigenous)**
- **A good resource to show students**

Suggestions

- **Make a poster about gunja and [depression]**
 - **Use a different word for ‘some’ (in describing the levels of cannabis use)**
 - **Italicise the local language words (non-Indigenous)**
 - **Make the book (A4 size) a little smaller (A5 size) so it is easier to carry around and show people**
-

* Participants comprised 30 Indigenous and eight non-Indigenous community residents.

6. DISCUSSION AND CONCLUSIONS

For the first time in an Indigenous Australian context, this research describes patterns and natural history of cannabis use in a five year follow-up study, and the cross-sectional association of cannabis use with depressive symptoms. Regular and heavy cannabis use in the study communities occurs alongside severe disadvantage with prominent risk factors for substance misuse and mental health disorders.

This thesis extends the cannabis use literature in the following important ways.

6.1 High prevalence and frequency of cannabis use

This is the longest period a cohort of cannabis users has been followed in Indigenous Australia. High prevalence of cannabis use appears to have persisted with only slight variation from 63% at baseline [40], 54% at three years (aged 13–36) [40], to 60% at five year follow-up (aged 13–34) [63]. Despite this overall consistency, the prevalence of use for males appears to have dropped substantially from 80% at baseline to 61% at follow-up [63]. Reductions in use among men may be attributed to improved workforce initiatives within the key Indigenous governing organisation and local mining company, the latter of which has strict drug testing for all staff. In contrast, female use appears to have increased from 47% at baseline to 58% at follow-up. High birth rates may contribute to women being less likely to apply for work. However, no specific data are available on the effect of pregnancy and employment on continued cannabis use in these communities. The pattern of weekly or more frequent use that was common at baseline has also persisted, with frequent heavy use found in almost 90% of users at follow-up (≥ 6 cones, daily; in those aged 13–42) [67]. One Indigenous community leader described attitudes to cannabis use: “... *if there’s a bowl of it on the table, it is smoked until gone, morning to night*”.

Some reasons for these particularly hazardous patterns of cannabis misuse include strong market networks that make cannabis readily available; alcohol restrictions that may have increased demand for cannabis; and social factors such as limited employment and education opportunities, poor housing, and recurrent experiences of grief and loss related to high mortality, morbidity and incarceration. Cannabis misuse is likely to be both a consequence of this context and a perpetuating influence.

This study provides the only detailed data on patterns of cannabis use and psychiatric comorbidity among Indigenous Australians. Patterns of heavy cannabis use have also been documented among First Nation populations in Canada [73] and in New Zealand [64], raising concern for the associated harms among these already vulnerable groups.

6.2 Symptoms of cannabis dependence

Nearly nine in ten cannabis users in this study report symptoms of dependence (88%, of users aged 13–42; ≥ 3 symptoms, DSM-IVR [9]) [63]. This proportion appears much higher than for other Australians (21%, of users aged ≥ 18 ; DSM-IVR) [11], and is consistent with the high frequency and quantity of use documented in these remote communities [97]. Some effects from cannabis dependence were described by the local Aboriginal mental health clinician:

Too many of my people are chained to [cannabis]. They don't go out hunting or spend time by the river with their family. They just sit and smoke [cannabis], then look for money to buy more [cannabis] and get into fights when they can't get any.

This finding supports earlier work from the same study communities that demonstrated an association between the number of cones consumed and a cluster of 'anxiety-dependency' symptoms [46]. No other comparable studies investigate cannabis dependence among Indigenous Australians.

6.3 Past petrol sniffing a predictor of heavy cannabis use

Past petrol sniffing among baseline cannabis users was found to be a key predictor of heavy cannabis use (≥ 6 cones, daily) at follow-up [97]. The association between petrol sniffing and the natural history of cannabis use has not previously been explored among Indigenous Australians. Given the high prevalence of cannabis use and petrol sniffing in some remote Indigenous communities, this finding has important policy and service delivery implications. If individual substances are targeted as they arise, users may simply substitute one drug for another. Efforts need to tackle psychiatric comorbidity and social determinants of substance use.

6.4 Fewer users reporting cannabis cessation

In addition to heavy and regular cannabis use, there is a suggestion that cannabis is not a passing adolescent phase in the study communities [97]. After five years of

follow-up the majority of users from baseline report continuing heavy use (76% of males, 54% of females; aged 13–36 at baseline), with continuing users aged thirty years (median) [97]. In non-Indigenous populations cannabis cessation is typically observed by late twenties [23], and with life transitions such as starting a family and employment [22]. Factors likely to have perpetuated cannabis and other substance use in these communities include constant cue exposure, high prevalence of mental health problems, fewer employment opportunities and high prevalence of other social determinants of poor health.

6.5 Cannabis use and depressive symptoms

High levels of cannabis use and poor mental health are evident among Indigenous Australians [41] [42] [67]. However, the available data describing prevalence of cannabis use and of depressive disorders and the association between cannabis and depression in this population are severely limited. In a cross-sectional study, a strong independent association was found between heavy cannabis use (≥ 6 cones, daily) and moderate–severe depressive symptoms (on the modified PHQ-9) [67]. While we are unable to comment on the direction of this association, considerable mental health burdens are linked to cannabis misuse in the study communities:

I see this every day in my clients and family members and other community people. Our people are being gripped by that [cannabis] and it makes them [depressed], sad and heavy. (Aboriginal mental health clinician)

6.6 Potential of community-driven programs established to withstand the risk of substance use and related problems

Involvement of key Indigenous and non-Indigenous staff, and effective community engagement, are likely contributors to successful community-driven programs [91]. The youth program evaluation described in Chapter 5 (Publication # 6) demonstrates one example of Indigenous people understanding the severity of their problems, and identifying underlying causes, and how these should best be addressed. Participation of community members, both adult and young people, in this preventive program increased over time. Participation included design and development of activities and implementation of these. High levels of ill-health and mortality in these communities adds to the heavy load already placed on Indigenous staff members, and flexibility is crucial in program implementation and delivery. Effective partnerships with local service providers, government and other relevant agencies [48] [53] [55], specific

initiatives to nurture and support the Indigenous workforce [140], and recurrent funding are also necessary elements [55].

This is one of the first published evaluations of a community-driven preventive initiative established to reduce substance use and promote resilience among the total youth population in a remote Indigenous Australian community. Key previous studies describe programs targeting individuals already engaged in substance use activity [56] [122]. In adolescent populations generally, family, community and school connectedness are protective factors against substance misuse, violence and mental health problems [120] [48] [141]. In these vulnerable communities, just targeting users is not enough. Broad community-wide measures are needed to build resilience and protect against substance misuse.

6.7 Elements needed to disseminate study findings to Indigenous Australians

Few studies provide specific practical guidelines about how to disseminate study findings especially where language and cultural differences compound the communication difficulties faced [68]. In the study communities, a flexible community feedback approach was used to convey information to people of different ages and with different levels of English comprehension and reading ability [68]. Local language and concepts of life stages, numbers and quantities, comprehensive community liaison and involvement of local Indigenous research staff were critical elements. The reaction of the study communities to results presented in this way was characterised by the phrase used when understanding something for the first time: *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!). As explained by one community leader, the feedback approach is a positive first step to improve community-wide literacy about cannabis misuse and related harms:

It makes good sense... with our pictures and words everyone can understand this one, even the younger ones. For the first time we can see how many people are using gunja and how gunja is affecting our communities.

6.8 Strengths and limitations of this research

In this section the strengths and weaknesses of each study will be listed.

6.8.1 Strengths of the longitudinal study of cannabis use

- Local Indigenous research staff assisted during overall study design, development of the survey questionnaire, including modifications of the depression instrument to ensure its suitability, and the development of recruitment, follow-up and interview methods appropriate to the study context.
- Local Indigenous research staff located respondents for follow-up and fostered comfort of respondents during interviews. These efforts resulted in an 85% follow-up interview rate in a highly mobile population despite considerable cultural and language barriers.
- Strong relationships between non-Indigenous researchers (KL and AC) and study communities contributed to comprehensive involvement and interest in the study from local Indigenous research staff, key local service providers and community members.
- Identification of local Indigenous language and cultural concepts and their use in the survey questionnaire and community feedback approach may have increased understanding of the study among Indigenous respondents and community members.

6.8.2 Limitations of the longitudinal study of cannabis use

- A combined sampling strategy was necessary in these remote communities where populations are small and highly mobile. Only part of the interview sample was randomly selected with the remainder opportunistically recruited. However, age and sex quotas were used to recruit additional interviewees, and at follow-up 12% of the population in the targeted age group were interviewed.
- Prevalence estimates were based on estimations by local Aboriginal health workers and key community informants of substance use status of individuals from a randomly selected sample. These proxy respondents have an intimate understanding of community levels of cannabis and other substance use.
- Cannabis use was measured as a snapshot at each time point, so we are unable to determine what happened between interviews. However, the consistency of high

cannabis use prevalence suggests that, subject to supply availability, it is likely that use was maintained between interviews.

- Possible shame factors may have led to an underestimation of cannabis use, particularly given that the student and Indigenous research staff were well-known to interview respondents.
- In the interview sample, small sample sizes may have contributed to a majority of non-significant findings (Chapter 3, Publication # 3).
- In the interview sample, measures of depressive symptoms were conducted using the PhQ-9, which was modified with assistance from Aboriginal health and mental health workers to ensure suitability in the local context and across age groups. No specific validation study was undertaken of the modifications made, although internal consistency of the instrument suggests reliability. Nonetheless it remains possible that the construct assessed does not fully correspond with the Western concept of depression.
- Data on the association between cannabis use and depressive symptoms was cross-sectional and causation cannot be established.
- The association between cannabis use and depressive symptoms may have been influenced by potential confounding factors not measured, such as stress, experience of violence and trauma, cultural discontinuity, fewer employment and educational opportunities, and other social determinants of poor health that are widespread in the study communities. These factors may contribute to continued cannabis and other substance use, and also to the occurrence of depressive symptoms.

6.8.3 Strengths of the youth program evaluation (preventive and diversion components)

- Both the youth program and intention to evaluate it were initiatives developed by the study communities, with one of the authors (KC) invited to perform the evaluation in the program's early stages.

- Efforts were made to create a comfortable interview environment for all respondents; for example, the use of plain English and interview format (small or large group or individual, indoor or outdoor, gender-matched interviewer for young people) adapted to suit students and other community members.

6.8.4 Limitations of the youth program evaluation (preventive and diversion components)

- Feedback was not possible from young offenders who were referred to the diversion program due to practical constraints.
- Feedback about the preventive component was not possible from young people not attending school due to practical constraints.
- It is likely that adults interviewed about the preventive component were more informed about the program than other community members, as many interviewees were engaged with key local service providers.
- It is impossible to separate the preventive program's beneficial impact on youth behaviour and substance misuse from other local initiatives.
- Both preventive and diversion components were evaluated during the early stages of being established, just 2–3 years after implementation.

6.9 Conclusion

Persistent cannabis use and dependence symptoms are commonplace in this Indigenous cohort and raises concerns for the physical, social and psychiatric burden on these vulnerable communities [97]. Local community survey data appears to be particularly important in providing information for community education in this setting where English is a secondary language and traditional cultural practices are generally intact. The Indigenous cannabis researchers describe how the study communities are more likely to 'believe' findings from this local data rather than national household data, because they were familiar with the research staff, knew where the data came from, and had observed the research activity occurring in their community [68]. Building community understanding and momentum for change through a community feedback process that is based on locally relevant data was also important for research and health promotion efforts [68].

A holistic approach is needed to address substance misuse instead of tackling each substance separately [48] [55]. One service provider cannot solve these problems alone. Programs guided by Indigenous residents that are founded on strong partnerships between a range of Indigenous and non-Indigenous stakeholders, and which also address mental illness and the social determinants of poor health are vital [48].

Treatment programs that incorporate local Indigenous language and cultural concepts [57] are urgently needed for chronic cannabis users and their families. Locally-developed preventive programs are also required to raise community awareness of the harms associated with cannabis and other substance use [93] [94] [95], including tobacco.

Potential programs need to draw on community ideas and understanding of the problems being faced [62] [91] [124]. Solutions that are imposed without reference to local context have little chance of success or longevity. The one-size-fits-all approach assumes homogeneity, but what works for one community is unlikely to be suitable for mass rollout.

To address cannabis and other substance use, one community leader from the study communities described their preferred approach to look at the whole person and foster young people's sense of purpose, pride and belonging within the community and wider world:

Young people say 'you don't understand this new world' it is our new world. How does the ... community secure the area from gunja, how can programs and activities work for youth? ...You must 'look at mind and heart' – if you only have half it won't work. (Indigenous elder)

7. RECOMMENDATIONS FOR FURTHER RESEARCH, POLICY AND PRACTICE

7.1 Further research

- Intervention studies that incorporate community-driven prevention and treatment components with local Indigenous language and concepts, and target both cannabis use and mental health.
- Further data on the prevalence, nature and course of cannabis use and mental disorders among Indigenous Australians, particularly community specific data that could be used to inform local programs and policy.
- Further exploration of local Indigenous concepts of depression and substance use, and how these relate to Western constructs.

7.2 Policy

- Demand reduction policies that complement existing supply control initiatives to prevent uptake and promote cannabis cessation, while also broadly promoting community and individual wellbeing.
- Policies that do not view drugs separately, but take a holistic view to address problems related to substance misuse, mental illness and the social determinants of health.
- Resource allocation that allows for the integration of substance misuse and mental health services, improved access to mental health and substance misuse specialists, and development and delivery of locally-developed health promotion programs, and diversion programs.

7.3 Practice

- Collaboration on a local level between communities, service providers and government to address substance misuse and poor mental health that acknowledges differences in culture, language and history, and the challenges and strengths facing individual communities.

- Consideration of psychiatric and substance use comorbidity including targeted interventions for chronic cannabis users and their families.
- A framework to build the capacity of local Indigenous professionals including health promotion specialists, and enables programs to be developed from community ideas using local Indigenous language and cultural concepts.
- Locally-developed models to improve health literacy of communities on the harms associated with cannabis misuse including psychiatric comorbidity, and physical harms from combined tobacco and cannabis use.

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Appendix A: Outline of candidate's contribution to the publications featured in this thesis

Chapter	Contribution	Co-Investigators	Design
1.7	Write-up including literature review, conceptual planning, manuscript drafts and submission of publications and corresponding author responsible for liaison with journal.	Publication # 1: Katherine M Conigrave, George C Patton, Alan R Clough	Editorial paper.
3.1	Participated in survey design, including coordination of liaison with local linguists about local Indigenous language and concepts used in survey questionnaire. Coordinated and conducted data collection, including recruitment and support for Indigenous research staff. Data analysis with statistical advice. Write-up, including literature review. Key liaison role with study communities.	Publication # 2: Alan R Clough, Katherine M Conigrave	Mixed methods: structured survey into cannabis, other substance use and mental health (N=106; aged 13–42); estimations of Indigenous community members about cannabis use by local Indigenous health workers and other key community informants (N=162; aged 13–36 at baseline in 2001; proxy respondents).

Chapter	Contribution	Co-Investigators	Design
3.2	Participated in survey design, including coordination of liaison with local linguists about local Indigenous language and concepts used in survey questionnaire. Coordinated and conducted data collection, including recruitment and support for Indigenous research staff. Data analysis with statistical advice. Write-up, including literature review. Key liaison role with study communities.	Publication # 3: Katherine M Conigrave, Alan R Clough, Timothy A Dobbins, Muriel J Jaragba, George C Patton	Cohort study: face-to-face interviews with community members (aged 13–36 at baseline in 2001) from a combined randomly selected and opportunistically recruited sample at baseline (N=100; 2001) and five year follow-up (N=83; 2005–2006) for whom complete data were available.
4.1	Write-up including literature review, conceptual planning, manuscript drafts and submission of publications and corresponding author responsible for liaison with journal.	Publication # 4: Katherine M Conigrave, George C Patton, Alan R Clough	Commentary paper.

Chapter	Contribution	Co-Investigators	Design
4.2	Participated in survey design, including coordination of liaison with local linguists about local Indigenous language and concepts used in survey questionnaire. Coordinated and conducted data collection, including recruitment and support for Indigenous research staff. Data analysis with statistical advice. Write-up, including literature review. Key liaison role with study communities.	Publication # 5: Alan R Clough, Muriel J Jaragba, Katherine M Conigrave, George C Patton	Cross-sectional study: face-to-face interviews with community members (aged 13–42) from a combined randomly selected and opportunistically recruited sample at 2005–2006 (N=106).
5.1	Write-up, including literature review. Assisted in liaison with study communities.	Publication # 6: Katherine M Conigrave, Alan R Clough, Cate Wallace, Edmund Silins, Jackie Rawles	Mixed methods: semi-structured interviews with young people, community members and relevant stakeholders (N=73); review of corporate documents (June 2003–June 2005); retrospective weekly diary of the community-driven initiative's co-ordinator (during a seven week period in 2004); review of data routinely collected by health and other agencies.

Chapter	Contribution	Co-Investigators	Design
5.2	Contributed to conceptual planning for write-up, interpretation of results and reviewed manuscript drafts. Designed Figure 1	Publication # 7: Alan R Clough, Katherine M Conigrave	Mixed methods: review of de-identified client records (N=35); semi-structured interviews with case workers (N=4) and the primary funding agency (NT Police)
5.3	Assisted Indigenous researchers to design and disseminate an approach for communicating research results to study communities, including liaison with local linguists about local Indigenous words used in the community feedback resources, and production of community feedback resources	Publication # 8: Muriel J Jaragba, Alan R Clough, Katherine M Conigrave	Semi-structured interviews with Indigenous community members and relevant local stakeholders

Appendix B: List of publications and presentations supporting this thesis

Peer-reviewed publications arising from this thesis

Lee KSK, Conigrave KM, Patton GC, Clough AR. Cannabis: endemic yet neglected in remote Indigenous Australia (editorial) *Med J Aust*, 2008;190:228-9.

Lee KSK, Clough AR, Conigrave KM. High levels of cannabis use persist in Indigenous communities in Arnhem Land, Northern Territory (letter). *Med J Aust*, 2007;187:594-5.

Lee KSK, Conigrave KM, Clough AR, Dobbins TA, Jaragba MJ, Patton GC. Five year longitudinal study of cannabis users in three remote Indigenous communities in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2009 (in press).

Lee KSK, Conigrave KM, Patton GC, Clough AR. Does cannabis use contribute to depression in Indigenous Australians? *Transcult Psychiatry*, 2008 (submitted, revisions requested).

Lee KSK, Clough AR, Jaragba MJ, Conigrave KM, Patton GC. Heavy cannabis use and depressive symptoms in three Indigenous communities in Arnhem Land, Northern Territory, Australia. *Med J Aust*, 2008;188:605-8.

Lee KSK, Conigrave KM, Clough AR, Wallace C, Silins E, Rawles J. Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:75-82.

Clough AR, Lee KSK, Conigrave KM. Promising performance of a juvenile justice diversion program in remote Indigenous communities, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:433-8.

Lee KSK, Jaragba MJ, Clough AR, Conigrave KM. *Wa! Ningeningma arakba akina da!*: (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use, Arnhem Land, Northern Territory. *Med J Aust*, 2008;188:113-6.

Peer-reviewed publications supporting this thesis

Clough AR, Lee KSK, Cairney S, Maruff P, O'Reilly B, d'Abbs P, Conigrave KM. Changes in cannabis use and its consequences over three years in a remote Indigenous population in Northern Australia. *Addiction*, 2006;10:696-705.

Presentations related to this thesis (conferences, seminars and lectures)

Lee KSK. "Engaging Indigenous young people: a community-driven preventive initiative in Arnhem Land, Northern Territory" (14 November 2005). Australian and New Zealand Adolescent Health Conference (Melbourne)

Lee KSK. "Substance misuse in Arnhem Land, Northern Territory" (24 July 2006). Invited presentation, Centre for Adolescent Health, University of Melbourne, Seminar series (Melbourne).

Lee KSK, Jaragba MJ, Numamurdirdi H. "Community feedback about our research findings: cannabis in three communities in Arnhem Land" (6 November 2006). Australasian Professional Society on Alcohol and Drugs, National Conference (Cairns).

Lee KSK, Jaragba MJ, Clough AR, Conigrave KM, Patton GC. "Mental health and cannabis use in three Arnhem Land communities" (7 November 2006). Australasian Professional Society on Alcohol and Drugs, National Conference (Cairns).

Lee KSK. "Responses to cannabis use in Arnhem Land" (21 March 2007). Invited presentation, University of Sydney, Substance Abuse Research Day (Sydney).

Lee KSK, Conigrave KM. "Responses to substance misuse in Arnhem Land" (22 March 2007). Invited presentation, University of Sydney, School of Public Health, Seminar series (Sydney).

Lee KSK, Conigrave KM. "Smoking cessation in remote Arnhem Land communities: a broad-based approach to tackle a huge problem" (31 August 2007). Invited presentation, University of Sydney, Smoking Cessation Unit, Seminar series (Sydney).

Lee KSK, Jaragba M, Clough AR, Conigrave KM, Patton GC. "Heavy cannabis use and depressive symptoms in three Arnhem Land communities in the Northern Territory, Australia" (7 November 2007). Australasian Professional Society on Alcohol and Drugs, National Conference (Auckland).

Lee KSK, Conigrave KM. "Smoking cessation in Arnhem Land: a health promotion perspective" (26 May 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health in Substance use (Sydney).

Lee KSK. "Cannabis use: epidemiology, harms and interventions" (27 May 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health in Substance use (Sydney).

Lee KSK. "Communicating research findings from studies of cannabis use in Indigenous communities in Arnhem Land, Northern Territory" (12 August 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health Promotion (Sydney).

Lee KSK. "Communicating research findings from studies of cannabis use in Indigenous communities in Arnhem Land, Northern Territory" (24 August 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health Promotion (Sydney).

Lee KSK. "Research methods: longitudinal study of substance use in remote Indigenous Australia" (24 September 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health Promotion (Sydney).

Lee KSK. "Research methods: longitudinal study of substance use in remote Indigenous Australia" (15 October 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health Promotion (Sydney).

Lee KSK. "Preventive measures targeting youth substance misuse among Indigenous Australians" (21 October 2008). Invited lecture, University of Sydney, Graduate Diploma of Indigenous Health in Substance use (Sydney).

Appendix C: Print versions of the publications arising from and supporting this thesis

- C.1: Lee KSK, Conigrave KM, Patton GC, Clough AR. Cannabis: endemic yet neglected in remote Indigenous Australia (editorial) *Med J Aust*, 2008;190:228-9.
- C.2: Lee KSK, Clough AR, Conigrave KM. High levels of cannabis use persist in Aboriginal communities in Arnhem Land, Northern Territory (letter). *Med J Aust*, 2007;187:594-5.
- C.3: Lee KSK, Conigrave KM, Clough AR, Dobbins TA, Jaragba MJ, Patton GC. Five year longitudinal study of cannabis users in three remote Aboriginal communities in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2009 (in press).
- C.4: Lee KSK, Conigrave KM, Patton GC, Clough AR. Does cannabis use contribute to depression in Indigenous Australians? *Transcult Psychiatry*, 2008 (submitted, revisions requested).
- C.5: Lee KSK, Clough AR, Jaragba MJ, Conigrave KM, Patton GC. Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory, Australia. *Med J Aust*, 2008;188:605-8.
- C.6: Lee KSK, Conigrave KM, Clough AR, Wallace C, Silins E, Rawles J. Evaluation of a community-driven preventive youth initiative in Arnhem Land, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:75-82.
- C.7: Clough AR, Lee KSK, Conigrave KM. Promising performance of a juvenile justice diversion program in remote Aboriginal communities, Northern Territory, Australia. *Drug Alcohol Rev*, 2008;27:433-8.
- C.8: Lee KSK, Jaragba MJ, Clough AR, Conigrave KM. *Wa! Ningeningma arakba akina da!* (Oh! Now I know, that's it!) Providing feedback to communities about studies of cannabis use, Arnhem Land, Northern Territory. *Med J Aust*, 2008;188:113-6.

C.9: Clough AR, Lee KSK, Cairney S, Maruff P, O'Reilly B, d'Abbs P, Conigrave KM. Changes in cannabis use and its consequences over three years in a remote Indigenous population in Northern Australia. *Addiction*, 2006;10:696-705.

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Appendix D: Longitudinal cannabis use study – information statement and consent forms, and data collection templates

D.1: Information statement form

D.2: Consent form

D.3: Structured survey questionnaire used at baseline (2001)

D.4: Template used by proxy respondents to make estimations of cannabis use and other substance use for randomly selected subjects in the study communities

D.5: Structured survey questionnaire used at five year follow-up (2005–2006)

D.6: Semi-structured interview format about the community feedback approach

INFORMATION TO ACCOMPANY CONSENT STATEMENT: AMARDA (cannabis) STUDY

This study is about cannabis use and behaviour that is harmful

We will:

- Interview and assess the people in your community aged between 13 and 36 years who we have interviewed before. Some of them will have used cannabis. Others will not have used it. Others will have used it in the past but gave up.
- Ask them about cannabis (amarda) and find out about their behaviour.
- Find out if there have been any changes in their attitudes and behaviour.
- Interview health workers and other key people about cannabis use in the people we assessed before.

There are some risks of participating in this study that you should know about before giving your consent to participate. The risks come about because there is no law to guarantee that the information you give to the researcher about illegal behaviour, your own or that of others can be kept confidential if the information is requested by the Police or a court.

We are NOT trying to find out about:

- Who is selling cannabis and who is buying it, i.e. about trafficking in cannabis.
- Who may have been buying or selling cannabis in the past.
- Crimes that have not come before the court or which are still being investigated.

We ARE trying to find out about:

- How much cannabis people have been smoking and whether the amount they have been smoking has caused harm to their health
- Behaviour that is harmful to the rest of the community, the person's family and to the person themselves.
- How and why the person started smoking cannabis and for those who don't smoke cannabis, what stopped them from taking it up or what helped them give up.
- Any past trouble with Police and the courts and any trouble with family, arguments in the community or people wanting to hurt themselves and others.

We are working closely with Police and the Department of Public Prosecutions to make sure that the chances of them needing the detail of confidential interviews with participants is very small. But we cannot guarantee absolutely that they will not ask for this information.

Contact details for the Secretary of the Human Research Ethics Committee of the Menzies School of Health Research and the NT Department of Health and Community Services – Gabrielle Falls, phone 89228624.

**PARTICIPANT INTERVIEWS
CONSENT STATEMENT
AMARDA/MULMU (cannabis)
STUDY**

I, _____ agree to be in this study.
I understand that the research is to find out if amarda/mulmu is having any effects on me and my family.

I understand the information given to me about the risks that the researcher might need to provide this information to Police or a court if they request it.

This has been explained to me by

I understand that I do not have to be in the study if I don't want to. I can contact Alan Clough (8987 0479 or 0417 844161) to get me off the study any time.

(cross out one)

- I am 18 years old or older.
- I am not 18 years old yet and my (father/mother/uncle/aunt) understands this and agrees for me to be in the study

Signed _____(participant)

I _____(relative)
agree for my (son/nephew/daughter/niece) to be in this study.

Signed _____relative)

Witness _____ Date _____

Appendix D.3

ID Number: _____

2001: GANJA QUESTIONNAIRE

Some questions about you

1. Where do you live?
Community _____
Homeland _____
2. Where do you spend more time?
 Community
 Outstation
 Half outstation-community
 Other _____
3. Earning money?
 CDEP or Job _____
 Kids money
 Mothers' pension
 Pension
 UB/Jobsearch
 No money
 Other way _____
 Abstudy/Austudy
4. Do you want to work or get a job?
 No
 Yes
What kind? _____
5. Any school or training now?
 School
 Training but no job or CDEP
 Training with job or CDEP
 No school or training
6. Do you want to do more training?
 No
 Yes, What kind _____
7. Do you play sport or exercise?
 No
 Yes _____
8. Do you want to do more sport, exercise or recreation?

- No
 Yes
What kind? _____

9. Which size (chart)? _____
10. Different size lately (chart)? _____
11. Weight up or down lately
 Weight up
 Weight down
 Stayed the same

GO TO PAGE 3

Some questions about ganja thinking about how you have been feeling since last time we talked.

12. Compared to when we talked last time do you smoke ganja
 less now? more now? the same?
13. With ganja since last time did you
 have a fit or pass out
 go to the clinic
 go to hospital
 argue with family
 get trouble with police
 other _____
14. Just lately (in the last year) did you feel (for no reason)
 Uptight or cranky
 Had trouble sleeping
 Angry
 Changes in eating food (appetite)
 Hearing voices
 Seeing things other people couldn't
 Forgetting things
 Confused or mixed up
 Couldn't make up your mind
 Thought about hurting yourself
 (Did you try to hurt yourself?)
 Felt tired or slack all the time
 Need extra ganja to get stoned
 Smoked more ganja than you wanted
 Tried to give up but couldn't
 Smoke ganja in the morning to get going
 Tried to cut down but couldn't
15. How do you feel when you run out of ganja or try to stop ganja?

	TOBACCO	ALCOHOL	KAVA	PETROL SNIFFING	GANJA
Ever used?	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> not often <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day
Did you quit since last time?	<input type="checkbox"/> No -still smoking <input type="checkbox"/> Yes -gave up When? _____ Why? _____	<input type="checkbox"/> No -still drinking <input type="checkbox"/> Yes -gave up When? _____ Why? _____	<input type="checkbox"/> No -still drinking <input type="checkbox"/> Yes -gave up When? _____ Why? _____	<input type="checkbox"/> No -still sniffing <input type="checkbox"/> Yes -gave up When? _____ Why? _____	<input type="checkbox"/> No -still smoking <input type="checkbox"/> Yes -gave up When? _____ Why? _____
Did you start since last time?	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____
When last used?		<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year
How much?	Sticks a day? _____		Bags a week? _____	<input type="checkbox"/> Heavy <input type="checkbox"/> Not heavy	Do you smoke more than 3-5 cones a night? <input type="checkbox"/> No <input type="checkbox"/> Yes
Ever try to quit?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	FINISH PETROL. How many cones last time? _____ How many cones every time? _____ How many \$50 bags per week _____ Smoking by <input type="checkbox"/> sticks or joints? <input type="checkbox"/> Bucket bong? <input type="checkbox"/> Other bong? <input type="checkbox"/> Mix with tobacco? Ever try to give up but couldn't? <input type="checkbox"/> Yes <input type="checkbox"/> No	
FINISH GANJA – GO BACK TO Q. 9					

Appendix D.5

2005 GUNJA QUESTIONNAIRE

IDNO: _____

Some questions about you

1. Where do you live?
Community _____
Homeland _____
2. Earning money?
 CDEP or Job _____
 Kids money
 Mothers' pension
 Pension
 UB/Job search
 No money
 Other way _____
 Abstudy/Austudy
3. Do you want to work or get a job?
 No
 Yes, What kind _____
4. Any school or training now?
 School
 Training but no job or CDEP
 Training with job or CDEP
 No school or training
5. What do you do in your spare time?

6. What would you like to do in your spare time?
(E.g. more training, sport, recreation)

7. Weight up or down lately
 Weight up Weight down Stayed the same
If changed, Is this anything to do with using gunja?
 No
 Yes
 Weight: _____ Height: 1) _____ 2) _____

GO TO NEXT PAGE

Some questions about gunja, thinking about how you have been feeling since last time we talked.

8. Compared to when we talked last time do you smoke gunja:
 Less now? More now? The same?
(How has your use changed?)

9. With gunja since last time do you argue with family?
 No
 Yes – Is this when you smoke gunja or run out of gunja? Neither Smoke Run out
10. How old were you when you first used gunja? _____
Have you been using right through? No Yes
(stopped before? No Yes, how long? _____)
11. What makes you feel like using gunja?
 Like it Bored
 Calms me down Helps me sleep
 Other drugs not available (List _____)
 Other _____
12. Just lately (in the last year) did you feel (for no reason):
 Uptight or cranky
 Had trouble sleeping
 Angry
 Not interested in eating food (eat less)
 Hearing voices
 Seeing things other people couldn't
 Forgetting things
 Confused or mixed up
 Thought about hurting yourself
 (Did you try to hurt yourself?) What did you do?
 Felt tired or slack all the time

 Need extra gunja to get stoned (D1)
 Smoked gunja in the morning to get going (D2)
 Smoked more gunja than you wanted (D3)
 Tried to give up or cut down but couldn't (D4)
 Gunja stops you from doing the things you like (D6)
(fishing, hunting, swimming, time with family)
 Do you spend a lot of time getting, smoking or (D5)
getting over (recovering) gunja?
 Feel like you want gunja all the time?
 Has gunja caused you any problems (D7)
 (Do you still keep using it?)
13. How do you feel when gunja runs out and you can't get any? (D2)
 Get uptight or cranky
 Have trouble sleeping
 Get into fights (violence)
 Get headaches
 Sniff petrol
 Drink alcohol
14. What do you want to do about gunja?
 Cut down
 Give up
 Use the same/manage
 Get some help or find out more

GO TO LAST PAGE (Q.15)

	TOBACCO	ALCOHOL	KAVA	PETROL SNIFFING	GUNJA	
Ever used?	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> Once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> Once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> Not often <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	<input type="checkbox"/> Never <input type="checkbox"/> Tried once <input type="checkbox"/> Used to. Gave up <input type="checkbox"/> Once a month (not often) <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> Every day	
How old? <i>(as a prompt)</i>						
Did you quit Since last time?	<input type="checkbox"/> No –still smoking <input type="checkbox"/> Yes –gave up When? _____ Why? _____	<input type="checkbox"/> No –still drinking <input type="checkbox"/> Yes –gave up When? _____ Why? _____	<input type="checkbox"/> No –still drinking <input type="checkbox"/> Yes –gave up When? _____ Why? _____	<input type="checkbox"/> No –still sniffing <input type="checkbox"/> Yes –gave up When? _____ Why? _____	<input type="checkbox"/> No –still smoking <input type="checkbox"/> Yes –gave up When? _____ Why? _____	
Did you start Since last time?	<input type="checkbox"/> N <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes When? _____ Why? _____	<input type="checkbox"/> No <input type="checkbox"/> Yes (how old? _____) When? _____ Why? _____	
When last used?		<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	<input type="checkbox"/> Last night/yesterday <input type="checkbox"/> Last week <input type="checkbox"/> Last month <input type="checkbox"/> Last year	
How much?	Sticks a day? _____ (just you, how many)		Bags a week? _____	<input type="checkbox"/> Heavy <input type="checkbox"/> Not heavy	Do you smoke more than 3-5 cones a night?	
Ever try to quit?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> No <input type="checkbox"/> Yes	
	FINISH TOBACCO	Any change in community with new grog rules? _____ _____ _____ (E.g. bush club, DV) FINISH ALCOHOL	FINISH KAVA	FINISH PETROL		
				How many cones last time? _____ How many cones every time? _____ GUNJA still comes in same plastic bag (40X50)? <input type="checkbox"/> Yes <input type="checkbox"/> No (If no, what size? _____) (draw) Bags still \$50 each? <input type="checkbox"/> Yes <input type="checkbox"/> No (If no, what price? \$ _____) How many bags bought each week? _____ How many cones get out of plastic bag? _____ Of these cones per bag, how much is shared with friends/family? _____; use yourself? _____		
Tried any new drugs? (anything else)	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, what: _____			Smoking by: <input type="checkbox"/> Sticks or joints? <input type="checkbox"/> Bucket bong? <input type="checkbox"/> Other bong? <input type="checkbox"/> Mix with tobacco? <input type="checkbox"/> Other _____		
				Ever try to give up but couldn't? <input type="checkbox"/> No <input type="checkbox"/> Yes If Yes, how: _____		
				FINISH GUNJA – GO BACK TO Q.8 if use gunja. Go to Q.12 if do not use gunja		

15. Just lately (in the last 2 weeks, last 2 pays) did you feel (for no reason):

- Don't like doing the **fun things you normally like** to do, enjoy (fishing, music, time with family) (P1)
 Nara Little bit/Sometimes A lot
-

- (In wurrumangkadirra way, sometimes we say we feel **depressed**, down in the dumps, hopeless...) You felt this way? (P2)
 Nara Little bit/Sometimes A lot
-

- Trouble **getting to sleep** (falling) or **staying asleep** or **sleeping too much**? (P3)
 Nara Little bit/Sometimes A lot
-

- Feel **tired all the time**, no energy to do things you like? (P4)
 Nara Little bit/Sometimes A lot
-

- Not eating much** or **eating too much**? (P5)
 Nara Little bit/Sometimes A lot
-

- (L'eningaba? How are you?) (Have you been...) **Feeling bad about yourself**, like you were no good for your family, you can't do anything right? (P6)
 Nara Little bit/Sometimes A lot
-

- Trouble doing work** or **doing things you like** (fishing), you **keep thinking about other things**? (P7)
 Nara Little bit/Sometimes A lot
-

- Have you ever seen someone **speaking really slowly**, more slow than normal? You been feeling this way? In wurrumangkadirra, we say we **feel restless** (fidgety) when we can't sit still, like we are jumping around like a little kid. You been feeling this way? (P8)
 Nara Little bit/Sometimes A lot
-

- Thought about **hurting yourself** or **better if you were not here, dead**? (P9)
 Nara Little bit/Sometimes A lot
-

- You have said you have felt... (summarise...), thinking about this feeling, **have these problems made it hard to do work**, or with **family time** or being around (**get along with**) **other people**? (P10)
 Nara difficult (somewhat – very) Extremely difficult
-

THE END

Appendix D.6

COMMUNITY FEEDBACK EVALUATION INTERVIEWS WITH KEY INFORMANTS, COMMUNITY MEMBERS AND KEY STAKEHOLDERS ABOUT THE FEEDBACK RESOURCES (BOOK, POSTER, DVD)

CONTENT

1. What do you think about the community feedback resources?
(book, poster, DVD)
2. Can you explain what the [book or poster] means (prompt about
the pictures drawn by Kirk Watt)
3. Do you have any suggestions for how we could present this
information better for Warnumamalya (Indigenous people)?
4. Do you think the resources will be good for younger people, why?
5. Other comments?

Appendix E: Youth program evaluation (preventive and diversion components) – information statement and consent forms, and data collection templates

E.1: Information statement form

E.2: Consent forms

E.3: Semi-structured interview format

E.4: Template of information gathered from diversion client records

Appendix E.1

INFORMATION TO ACCOMPANY CONSENT STATEMENT

Youth Development Unit (YDU) STUDY

This study is about the Youth Development Unit (YDU). We want to find out from community members how they think YDU is going, and how they would like to see it develop in the future.

In this study we will:

- Interview about 10 young people in your community aged between 12 to 18 years. Young people will be interviewed as a group. If you prefer it, you can be interviewed on your own.
- Interview some adults and other key people in the community including teachers and health workers
- Ask you about the youth development unit and its activities
- Ask how you would like to see the youth development unit develop in the future
- Ask about what young people in general do in their free time. We will also ask if there has been any change in what they do, since the Youth Development Unit started. This will include questions on how much you young people are using cannabis (armada), alcohol and cigarettes. These will be questions about young people as a group, not about you yourself. We will not ask you to name any person.
- Run workshops to talk about the issues and the results.

There are some risks of participating in this study that you should know about before giving your consent to participate. The risks come about because there is no law to guarantee that the information you give to the researcher about illegal behaviour, your own or that of others, can be kept confidential if the information is requested by the Police or a court.

We are NOT trying to find out about:

- The names of any person who is using or selling cannabis.
- Crimes that have not come before the court or which are still being investigated.
-

We ARE trying to find out about:

- If you think the Youth Development Unit is making any impact on what young people do with their time.
- How you think alcohol, cannabis and smoking in the community is changing.

We have worked closely with Police to make sure that the chance of them needing the detail of these interviews is very small. But we cannot guarantee absolutely that they will not ask for this information.

If you have any concerns about this study, you can contact the Secretary of the Joint Institutional Ethics Committee (RDH and Menzies School of Health Research) – Ms Gabby Falls, Menzies School of Health Research (ph 8922 8196). You can contact Alan Clough (8987 0479 or 0417 844161) to remove you from the study at any time.

Appendix E.2

**KEY INFORMANT/ ADULT
CONSENT STATEMENT
YDU STUDY**

I, _____ agree to be in this study.

I understand the information provided to me about the risks of the researcher being obliged to provide this information to Police or a court if they request it.

This has been explained to me by

I understand that I do not have to be in the study if I don't want. I can contact Alan Clough (8987 0479 or 0417 844161) to remove me from the study at any time. Information already provided can be removed from the study if I request.

I understand that the results of my interview will only be used for the purposes for which this research is carried out.

Signed _____ (key informant)

Name _____

Witness _____ Date _____

Appendix E.2

**YOUNG PEOPLE'S INTERVIEWS
CONSENT STATEMENT
YDU STUDY**

I, _____ agree to be in this study. I agree to be interviewed by the researchers. I understand that the research is to find out about the Youth Development Unit, and about what young people do in their free time.

I understand the information given to me about the risks that the researcher might need to provide this information to Police or a court if they request it.

This has been explained to me by

I understand that I do not have to be in the study if I don't want to. I can contact Alan Clough (8987 0479 or 0417 844161) to get me off the study any time.

I am 18 years old or older.
(cross out one)

I am not 18 years old yet and my (father/mother/uncle/aunt) understands this and agrees for me to be in the study

Signed _____ (participant)

Name _____

_____ (relative) agree for my
(son/nephew/daughter/niece) to be in this study.

Signed _____ (relative)

Name _____

Witness _____ Date _____

Appendix E.3

YDU study Interviews with Key Informants

CONTENT:

- 1) Do you know about the work of the Youth Development Unit?
(Skip this question for adults with major involvement in YDU but record how they are involved)

(Prompt with reminder that this is about the work of [name of staff member], [name of staff member], [name of staff member] (no longer) (no longer) and [name of staff member] for those who don't know what YDU is; record comments about work with diversion cases and work for general youth)

- 2) How has the work of the Youth Development Unit been going?
(Record comments, type of activities YDU has been observed doing)

(Record separately for activities of general unit [name of staff members] and diversionary side ([name of staff member], [name of staff member] (no longer) and [name of staff member])

- 3) Has the Youth Development Unit helped with more sport or music or art for young people? (how, comments)
 - a) Do young people like these activities?
(Seek any estimate of numbers participating eg few, mane; notes on each major activity type listed)

(Note separately for recreational and cultural activities; where feasible note approximate numbers, ages of young people involved)

 - b) Do the (community) parents like the young people doing (this type of activity)?

 - c) Are these activities run by non-Indigenous or Indigenous people?

 - d) Is there any other type of sport or music or art that you would like to see the young people have?

- 4) Has the Youth Development Unit helped in providing more training for young people? (*how, comments*)
- a) Do young people like these activities?
(*Seek broad estimate of numbers and ages involved for each training activity?*)
- (*From coordinators: seek more detailed information [approximate numbers, ages, involved passively or as organisers] on nature of youth and Indigenous adult involvement in recreational, training and cultural activities*)
- b) Do the (*community*) parents like the young people taking part in ...
(*This type of training*)?
- c) Is there any other type of training that you would like to see young people have?
- 5) When the Youth Development Unit started, the community said they would like it to help young people respect their culture, and respect their elders. Do you think the YDU might help with this?
- 6) When the YDU started, the community said they would like it to help cut down problems with young people, like gunja and violence. Do you think the YDU might help with this problem?
(*Also record any statements on changes in level of substance use*)
- 7) How do you think the Youth Development Unit could be made better?

Additional specific questions for service providers

For Aboriginal key informants, who have knowledge of the youth diversion program:

- At present the police are present when a young offender has a family conference with the Youth Diversion Unit. Do you think this works alright?

Police:

- How has the YDU affected your work? *feedback on process of diversion unit, challenges and achievements*
- Have there been significant changes in past 18 months in police numbers or enforcement strategies?
- Have there been significant changes in the pattern of youth offences over the past 2 years? *Note comments on general and substance related offences*
- How has the YDU affected your work? *(made it easier, harder etc)*
- At present the police are present when a young offender has a family conference with the Youth Diversion Unit. Do you think this works alright?

Schools/training providers:

- Have numbers of young people attending changed over the past year? *(how, why)*
- How has the YDU affected your work? *(e.g. numbers attending, type of attendees, other)*
- Has the number and type of training activities available to young people changed over the past 2 years?
 - (See excel database: change in community activities, extend or check this database if possible)

Sport and rec providers/youth worker:

- Have numbers of young people attending changed over the past year? *(how, why)*
- How has the YDU affected your work? *(e.g. numbers attending, type of attendees, other)*
- Has the number and type of recreational and cultural activities available to young people changed over the past 2 years?
 - (See excel database: change in community activities; extend or check this database if possible)
 - Also cross check this database with at least one community member from each community

Council staff:

- Has the number and type of recreational, cultural and training activities available to young people changed over the past 2 years?
 - (See excel database: *change in community activities*)

Further observations needed:

Number of female and male attendees at recreational and other activities (note separately, extent and nature of involvement)

Appendix F: Ethical approvals

F.1: Longitudinal cannabis use study

F.2: Youth program evaluation (preventive and diversion components)

Appendix G: Cannabis and mental health screenplay

Excerpt from the screenplay 'Angbilyuwa amarda-langwa' (Sickness from gunja)

Written by Muriel Jaragba and Kylie Lee, Aboriginal Mental Health program. Directed by [study community] film students and D.A. Hansen (November 2007). Answers to interview questions were provided by Muriel Jaragba.

Many men, women, boys and girls use *amarda* across our communities. Most smoke every day from morning to night. When they smoke *amarda*, that *amarda* goes up into their mind. Then slowly, even though you might not feel it straight away, when you keep using that *amarda*, it starts to affect your mind.

This film is about *amarda* and *angbilyuwa amarda-langwa*, how it affects our mind, mental health way.

INTERVIEWER: HOW DOES AMARDA AFFECT PEOPLE?

Amarda affects people in many different ways. This depends on the person using the *amarda* – whether they have used *amarda* before, how much they smoke and what is happening in the person's life at the time.

Some immediate effects from *amarda* include:

- giggly, relaxed
- munchies
- bloodshot eyes
- dizzy or nauseous
- heart beating fast
- false feeling of happiness (even though you feel good, this is not a true feeling).

Other *angbilyuwa amarda-langwa*, people feeling:

- rubbish about themselves (worthless)
- confused and mixed up (can't keep your mind straight)
- uptight and cranky
- angry for no reason
- tired and weak
- forgetful
- sad and heavy (*awerrikbarrngwarrnga*)
- hearing voices and seeing things that are not there (not culture way, but because of *amarda*)
- thinking about hurting yourself
- fights between husband and wife, because they cannot get money for *amarda*; or they cannot get *amarda* from other family members
- want it all the time
- not doing things you like to do (like going out bush or fishing), stay at home and smoke and sleep
- hard for grandparents who get a hard time because many young parents smoke *amarda* and they leave their children to be looked after by the grandparents.
- If you are pregnant and smoke *amarda*, this can make your baby sick.
- If you smoke *amarda* near little kids or babies, they can feel sick from breathing in that smoke (passive smoking).

INTERVIEWER: IS IT TRUE *AMARDA* CAN AFFECT THE BRAIN?

Amungdungwa, *amarda* can make you feel these things. Sometimes *warnumamalya* think they feel this way because of black magic. But *nara*, it is

that *amarda*, along with other things happening in your life, that is making you feel this way.

INTERVIEWER: WHAT CAN HAPPEN WHEN *WARNUMAMALYA* SUDDENLY GO WITHOUT *AMARDA*?

When *warnumamalya* doesn't have any *amarda*, often we see in the community that they really miss it. Sometimes people get into fights or other trouble when they are starving for that *amarda*.

INTERVIEWER: WHAT CAN HAPPEN WHEN *WARNUMAMALYA* SMOKE *AMARDA* EVERY DAY?

In the *amarda-langwa* research project, we have found a lot of *awerrikbarrngwarrnga* (depression) in *warnumamalya* who are heavy and every day *amarda* smokers.

We also looked at other things going on in people's lives: whether they drink *anija*, smoke *dambakwa*, have sniffed petrol, their age, if they are male or female and if they have a job.

Looking at all males and females that we talked to (106 people):

Those heavy way every day *amarda* smokers were **4 times more likely** than everyone else to report symptoms of *awerrikbarrngwarrnga*.

Looking at just the women and girls (49 people):

Those heavy way every day *amarda* smokers were **6 times more likely** than everyone else to report symptoms of *awerrikbarrngwarrnga*.

WHAT CAN PEOPLE DO IF THEY ARE TRYING TO CUT DOWN OR GIVE UP *AMARDA*?

- Get support by visiting family members that you are close to.
- Take your mind off *amarda* by going fishing, hunting and spending time with your family.
- Look to the old ways of doing things and bring them back to life (weaving, spear making, carving etc).
- Stay away from heavy *amarda* users.
- Come to clinic to talk with health workers, nurses, doctors.